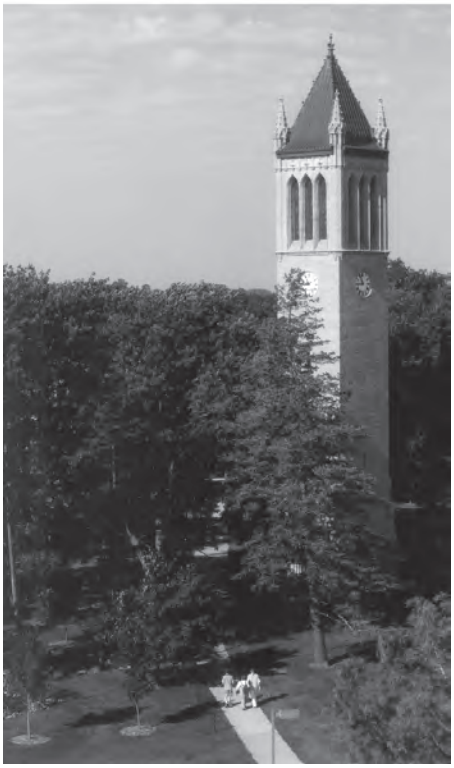
Iowa State University Catalog

Undergraduate and Graduate Courses and Programs 2003-2005

IOWA STATE UNIVERSITY

Iowa State University Courses and Programs Catalog 2003 - 2005



The Iowa State University Catalog

The Iowa State University Catalog is a two-year publication which lists all academic policies, and procedures. In addition, it includes information for fees, curriculum requirements and first-year courses of study for over 100 undergraduate majors, course descriptions for nearly 5000 undergraduate and graduate courses, and a listing of faculty members at Iowa State University.

New courses developed and offered since catalog publication can be found on the Web at www.iastate.edu/~catalog/exp/.

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

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Academic Calendar 2003 - 2005

Fall Semester 2003

Classwork begins
Monday, August 25

University holiday, offices closed
Monday, September 1

Thanksgiving break, classes recessed,
Monday through Friday, November 24-28

University holidays, offices closed
Thursday and Friday, November 27-28

Classes resume
Monday, December 1

Commencement
Friday and Saturday, December 19-20

University holidays, offices closed
Thursday and Friday, December 25-26

Spring Semester 2004

University holiday, offices closed
Thursday, January 1

Classwork begins
Monday, January 12

University holiday, offices closed
Monday, January 19

Spring break, classes recessed
Monday through Friday, March 15-19

Classes resume
Monday, March 22

Commencement
Friday and Saturday, May 7-8

Summer Session 2004

Classwork begins Session I
Monday, May 17

University holiday, offices closed
Monday, May 31

Classwork begins Session II
Monday, June 14

University holiday, offices closed
Monday, July 5

Commencement
Saturday, August 7

Fall Semester 2004

Classwork begins
Monday, August 23

University holiday, offices closed
Monday, September 6

Thanksgiving break , classes recessed
Monday through Friday, November 22-26

University holidays, offices closed
Thursday and Friday, November 25-26

Classes resume
Monday, November 29

Commencement
Friday and Saturday, December 17-18

University holidays, offices closed
Thursday and Friday, December 23-24

Spring Semester 2005

University holiday, offices closed
Friday, December 31

Classwork begins
Monday, January 10

University holiday, offices closed
Monday, January 17

Spring break, classes recessed
Monday through Friday, March 14-18

Classes resume
Monday, March 21

Commencement
Friday and Saturday, May 6-7

Summer Session 2005

Classwork begins Session I
Monday, May 16

University holiday, offices closed
Monday, May 30

Classwork begins Session II
Monday, June 13

University holiday, offices closed
Monday, July 4

Commencement
Saturday, August 6

Approved by the Board of Regents,
State of Iowa

The University

Iowa State University is one of the most respected land-grant universities in the nation. Created by the Iowa General Assembly in 1858, the Iowa Agricultural College and Model Farm was designated the first land-grant college when Iowa became the first state to accept the terms of the federal Morrill Act in 1864.

The act allowed Iowa to sell federal land to finance a new college open to all, regardless of wealth, race or gender; offering a practical education in engineering, agriculture and military science as well as classical studies; and sharing research knowledge with all Iowans. Iowa State University officially opened in 1869 and was the first coeducational land-grant school.

In 1903, the nation's first cooperative agricultural extension program was launched when Iowa State professors worked with farmers and county governments to establish demonstration farms and institutes.

It is our institutional commitment to the founding land-grant principles that has produced alumni who are leaders in their professions, research that has forever changed our society and knowledge-based information that has assisted the citizens of our state, nation and world community.

Mission, Role and Scope Statement

(Approved by the Board of Regents, State of Iowa, November 1989); also see www.iastate.edu/~president/2005/plan/mission.html

Mission Statement

Iowa State University of Science and Technology is a public land-grant institution serving the people of Iowa, the nation, and the world through its interrelated programs of instruction, research, extension, and professional service. With an institutional emphasis upon areas related to science and technology, the University carries out its traditional mission of discovering, developing, disseminating, and preserving knowledge.

Iowa State University provides high quality undergraduate programs across a broad range of disciplines, as befits the institution's stature as a university. In its dedication to excellence in learning, the University strives to instill in its students the discernment, intellectual curiosity, knowledge and skills essential for their individual development and their useful contribution to society. A common goal of undergraduate education is to assure that all students, regardless of disciplinary major, acquire literacy in science and technology, an understanding of humane and ethical values, an awareness of the intellectual, historical, and artistic foundations of our culture, and a sensitivity to other cultures and to international concerns. Consonant with its role as a teaching and research institution, Iowa State University has a strong commitment to graduate education that, at both the master's and doctoral levels, emphasizes the development of professional, research, and scholarship skills.

As an integral part of the learning process, Iowa State University fosters the discovery and dissemination of new knowledge by supporting research, scholarship, and creative activity. The University also uses existing knowledge to address problems and issues of concern to the state of Iowa in particular, as well as to the national and global community. The University's endeavors in discovery and innovation are supported by public and private resources and are conducted in an environment of open scientific inquiry and academic freedom.

Engagement through extension, professional service, and continuing education activities is achieved through innovative and effective outreach programs that provide the people of Iowa, and beyond, with practical knowledge and information derived from leading discovery, innovation, and learning/instructional efforts at Iowa State University and elsewhere. Through engagement, the University stimulates and encourages progressive change.

Iowa State University enrolls academically qualified students who represent diverse age groups, socioeconomic levels, racial ancestries, ethnic heritages, and international cultures, and who provide a gender balance. Through the use of a variety of educational opportunities, advanced instructional technologies, and student services, the University supports the development of both traditional and nontraditional students, preparing them for citizenship and lifelong learning in a rapidly changing world.

Finally, Iowa State University participates in international efforts to alleviate world hunger and poverty, to prepare students and faculty to be productive and responsible citizens of the world, and to contribute to increased cultural, educational, economic, scientific, and sociopolitical interchange and understanding between and among Iowans and other members of the world community.

Through its mission, Iowa State University supports the Board of Regents, State of Iowa, in becoming an exemplary model of governance and stewardship of resources, and the best enterprise of public education in the United States.

Role Statement

The role of Iowa State University is defined by the institution's status as the state of Iowa's land-grant university and by its relationship to the other institutions of higher education within Iowa.

- Iowa State University must strive to develop and maintain learning, discovery, and engagement programs that fulfill the responsibilities of a major land-grant institution.

- Iowa State University shares with the other public institutions of higher education within Iowa the joint responsibility of providing a full range of high quality educational opportunities. Coordination among these institutions with respect to programs, clientele, and geographic areas is necessary to ensure that the priority needs of all Iowans are addressed and to avoid unnecessary duplication.

- Iowa State has a statewide system for extension education and information dissemination.

- Iowa State continues to be a leading higher education institution with institutional emphasis on science and technology.

- Consistent with its historic role, Iowa State University contributes to the economic development of the state of Iowa by attracting public and private organizations seeking proximity to leading authorities in particular fields, by participating in technology transfer, and by assisting efforts to strengthen and diversify the economic base of Iowa.

- Iowa State University assumes responsibility for helping to protect, maintain and improve Iowa's natural resources through the discovery and diffusion of knowledge and technology.

Scope Statement

Consistent with the University's role and mission statements, the current scope of Iowa State University is described below.

- Iowa State University of Science and Technology, a broad-based university with an orientation towards science and technology, has sufficient scope and depth in its learning, discovery, and engagement functions to enable it to continue to be a distinguished land-grant university. In addition to its undergraduate and graduate work in the physical, biological, mathematical, and social sciences, it will maintain and develop strong undergraduate programs in the arts and humanities, and will offer such master's and Ph.D. programs in this area as are justified to meet the needs of the state of Iowa and to maintain the overall strength and desirable balance of the University as a whole.

• In Iowa State University's professional programs, principal emphasis will be given to the maintenance and development of strong programs in the sciences, agriculture, engineering, veterinary medicine, design, education, business, and family and consumer sciences. Interdisciplinary programs are offered that seek to combine the perspectives and methods of more than one discipline to better address the questions and problems confronting Iowa, the nation, and the world. The international efforts of Iowa State University are to be expanded and enhanced.

• Iowa State University will offer no major undergraduate or graduate programs in law, library science, human medicine, dentistry, pharmacy, nursing, hospital administration, occupational therapy, physical therapy, or speech pathology.

• Future programs will be determined by the continuing assessment of existing programs and of developing needs. Programs will be curtailed or eliminated when the assessment of need and resources dictates that the resources could be better used for other programs. The University approaches the addition of new programs with considerable caution. Generally, new programs are fashioned out of existing programs in response to developing needs. But if the University is to remain vital, it must be prepared and able to develop, at appropriate times, new programs that are within its general mission and that meet the changing needs of the students and society.

Iowa State's Values

As Iowa State University works toward creating an environment where continual learning serves the promises of a better world, all members of the university community are called upon to act in harmony with core values. *Also see www.iastate.edu/~president/2005/plan/core.html*

• Land-grant values: *access* to education and success; *learning*, encompassing practical and liberal education; *discovery*, encompassing basic and applied research; *engagement*, encompassing service and outreach
• excellence
• quest for knowledge
• shared leadership
• integrity
• commitment
• collaboration
• mutual respect
• inclusiveness
• global perspective

Nondiscrimination and Affirmative Action Policy

Iowa State University is committed to developing and implementing a program of nondiscrimination and affirmative action, a responsibility the university accepts willingly because it is the right and just thing to do. Because an educational institution exposes the youth of Iowa and of the nation to a multitude of ideas that strongly influence their future development, it is an area of our society where removing barriers is critical. ISU insists on promoting the concept of inclusion and participation.

This commitment is part of a larger commitment to developing a safe and supportive climate for all members of the ISU community in classrooms and laboratories, in offices, in the residence hall system, and throughout the campus. Iowa State University recognizes that a nondiscriminatory environment complements a commitment to academic inquiry and intellectual and personal growth.

The goal is to provide a nondiscriminatory work environment, a nondiscriminatory living and learning environment and a nondiscriminatory environment for visitors to the campus. Iowa State University herein recommits itself to comply with all federal and state laws, regulations, and orders, including the policies of the Iowa Board of Regents, State of Iowa, which pertain to nondiscrimination and affirmative action. All administrators and personnel providing input into administrative decisions are directed to ensure that all decisions relative to employment, conditions of employment and access to programs and services will be made without regard to race, color, age, religion, national origin, sexual orientation, sex, marital status, disability, or status as a U.S. Vietnam Era Veteran.

Exceptions to this directive may be made in matters involving bona fide occupational qualifications, business necessity, actions designed to eliminate workforce underutilization, and/or where this policy conflicts with federal and state laws, rules, regulations, or orders. Iowa State University does not and will not tolerate unlawful discrimination. Iowa State will recruit, hire, train and promote persons without regard to race, color, religion, sex, national origin, age, disability, veteran status, marital status, or sexual orientation. Iowa State University will base employment decisions so as to further the principle of equal employment opportunity and diversity.

No otherwise qualified person will be denied access to, or participation in, any program, activity, service, or the use of facilities on the basis of factors previously enumerated. Reasonable accommodation will be made to facilitate the participation of persons with disabilities in all such activities consistent with applicable federal and state laws, orders and policies.

Further, all supervisory personnel will be responsible for maintaining an environment that is free of racial, ethnic or sexual abuse and harassment. The university has adopted policies and procedures on Racial and Ethnic Harassment and Sexual Harassment. Copies of these policies and procedures may be obtained from the Affirmative Action Office, at the address listed below. Acts by anyone that adversely affect another person's employment, conditions of employment, academic standing, receipt of services, and/or participation in, or enjoyment of, any other activity, will be regarded as a violation of university policy and thereby be subject to appropriate disciplinary action. Retaliation against persons filing complaints, for bringing the violation of this policy forward for review, or for assisting in a review, pursuant to a filed complaint or grievance, is prohibited.

Iowa State University's commitment to nondiscrimination and affirmative action is of the highest priority and is to be adhered to as such. It applies to all university-sponsored programs and activities as well as those that are conducted in cooperation with the university.

Iowa State University has designated Carla Espinoza as the affirmative action officer and assigns overall program responsibility to her as the Director of Affirmative Action. Questions regarding complaints and/or compliance with affirmative action or equal opportunity should be directed to:

Carla Espinoza
Iowa State University
Ames, IA 50011-2038
515-294-7612.

Iowa State's Points of Pride

-The world's first electronic digital computer was developed at Iowa State by math and physics professor John V. Atanasoff and graduate student Clifford Berry, in the late 1930s. Their invention, the ABC computer, has been called the most important technological innovation of the 20th century.

-The university is a leader in virtual reality research and its most advanced virtual reality theater, the C6, is the nation's first six-sided theatre that totally immerses the user in images and sound.

-Iowa State's faculty are recognized for their scholarly efforts. Fifty serve as editors of national or international academic professional journals and almost 300 serve on editorial or advisory boards of such journals.

-Iowa State is a member of the prestigious Association of American Universities, which has a membership of only 62 major research universities in the United States and Canada.

-Iowa State's learning communities program for undergraduate students is one of the top five such programs in the nation.

-The university is consistently listed among the top schools for enrolling National Merit Scholars.

-Every state and more than 100 foreign countries are represented in Iowa State's student body.

-Iowa State students have a reputation for winning national and international awards. Over the past two years they have won such contests for apparel design, NASA food technology, news writing, and music composition

-Iowa State is nationally ranked for its beautiful campus and its central campus has been honored by the Association of Landscape Architects as one of only three university Centennial Medallion sites in the nation.

-Iowa State's 400 works of art on campus make its collection the largest in any public university in the nation.

-Iowa State's Reiman Gardens has been recognized for having the nation's most outstanding public rose garden.

-Iowa State holds the record for making the world's largest Rice Krispie Treat, according to the *Guinness Book of World Records*. Mildred Day, an Iowa State alumnus, helped create the recipe for the popular snack food.

-Iowa State graduate Cael Sanderson's perfect collegiate wrestling record of 159 wins has been recognized by *Sports Illustrated* as the second most impressive feat in college sports history.

Strategic Plan–To Become the Best Land-grant Institution in the Nation.

The aspiration to become the nation's best land-grant university was set forth in the strategic plans that have guided Iowa State University since 1990, and Iowa State's plan for 2000-2005 continues this commitment. In addition, Iowa State's strategic plan reflects the expectations of the Board of Regents, State of Iowa, Strategic Plan and its four key result areas of quality, access, diversity, and accountability.

The Engaged University

In order to become the nation's best land-grant university, Iowa State embraces the concept of engagement as defined by the Kellogg Commission on the Future of State and Land-Grant Universities. Engagement is an evolution and a transformation of traditional outreach. It is two-way outreach; an institution reaching out to provide programs and services to constituents, resulting in a greater connectedness between public universities and the larger society they serve. Intrinsic to engagement is the creation of partnerships with government, business, and the nonprofit world. These partnerships are defined by mutual respect for what each partner brings to the table in addressing the issues that confront us. This definition of engagement encompasses all aspects of our mission—academic and research programs, as well as extension and other outreach programs and services.

Goal 1: Learning—Enhance learning through exceptional learner-centered teaching, services, and enrichment opportunities.

Iowa State believes that learning is at the heart of our university. It occurs in many contexts and by all members of the community. As a land-grant institution, Iowa State University is among the world leaders in providing postsecondary access. However, access to success through Iowa State University will mark our commitment to enhancing learning, and it will be accomplished by providing exceptional learner-centered teaching, services, and enrichment opportunities; and by paying attention to lifelong learning needs.

Goal 2: Discovery—Promote discovery and innovation characterized by preeminent scholarship, including increasingly interdisciplinary and collaborative activities.

Iowa State believes that discovery and innovation characterized by preeminent scholarship encompassing research, creative activities, teaching/learning, and extension/professional practice, will mark our commitment to discovery, thereby enhancing our national and international distinction. Institutional agility and interdisciplinary collaboration will allow Iowa State to undertake bold visionary initiatives with special attention to ethics and social, economic, and environmental responsibility.

Goal 3: Engagement—Engage with key constituencies through synergistic sharing and partnership of knowledge and expertise to address needs of communities and society.

As Iowa's engaged land-grant university, Iowa State will synergistically deploy its knowledge and expertise toward increased response and productive involvement in improving Iowa's communities and the larger society, at home and abroad. This will be marked by our commitment to sharing—to enrich and to learn, two-way partnerships with internal and external constituencies to achieve shared goals and to demonstrate the public purposes of Iowa State University.

Iowa State University Administration

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

Board of Regents, State of Iowa

Owen J. Newlin, President

Gregory S. Nichols, Executive Director

Terms expire April 30, 2003
Neala R. Arnold.....Bettendorf

David J. Fisher.....West Des Moines

Dr. Clarkson L. Kelly, Jr .....Charles City

Terms expire April 30, 2005
David G. Neil .....LaPorte City

Owen J. Newlin .....Des Moines

Deborah A. Turner .....Mason City

Terms expire April 30, 2007
Amir I. Arbisser.....Davenport

Mary Ellen Becker.....Oskaloosa

Sue Erickson Nieland.....Sioux City

Accreditation

Iowa State University is accredited by the Higher Learning Commission of the North Central Association of Colleges and Schools.

Higher Learning Commission of the North Central Association of Colleges and Schools
30 N. LaSalle Street, Suite 2400
Chicago, IL 60602-2504
(800) 621-7440; (312) 263-0456;
Fax: (312) 263-7462
www.higherlearningcommission.org

Officers of Administration

Gregory C. Geoffroy, Ph.D.
President of the University

Benjamin J. Allen, Ph.D.
Vice President for Academic Affairs and Provost

Warren R. Madden, M.B.A.
Vice President for Business and Finance

Thomas L. Hill, Ph.D.
Vice President for Student Affairs

Catherine E. Wotecki, Ph.D.
Dean of the College of Agriculture

Labh Hira, Ph. D.
Dean of the College of Business

Mark C. Engelbrecht, M. Arch.
Dean of the College of Design

Walter H. Gmelch, Ph.D.
Dean of the College of Education

James L. Melsa, Ph.D.
Dean of the College of Engineering

Carol B. Meeks, Ph.D.
Dean of the College of Family and Consumer Sciences

Peter F. Rabideau, Ph.D.
Dean of the College of Liberal Arts and Sciences

Norman F. Cheville, DVM, Ph.D.
Dean of the College of Veterinary Medicine

James R. Bloedel, M.D., Ph.D.
Vice Provost for Research and Advanced Studies

Stanley R. Johnson, Ph.D.
Vice Provost for Extension

Howard N. Shapiro, Ph.D.
Vice Provost for Undergraduate Programs

Peter D. Englin, Ph.D.
Dean of Students

Olivia M. Madison, M.A.,
Dean of Library Services

Admissions and Registrar

Office of Admissions
Director: Marc Harding, B.A.

Office of the Registrar
Registrar: Kathleen M. Jones, M.S.

Associate Registrars: Larry Dau, B.S.; Laura Doering, M.S.

Admission

When to Apply
Applicants for the fall semester are encouraged to apply during the fall of the year preceding their entry to Iowa State University. Applications for other terms should be submitted well in advance of the desired entry date. Application deadlines are available at www.admissions.iastate.edu.

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

How to Apply
Applications for admission are available on the Web at www.admissions.iastate.edu.

Applicants seeking admission for the fall semester may be notified of the action taken on their applications as early as the September preceding enrollment, upon receipt of all application materials. Applicants for other terms will be notified on a rolling basis after receipt of all materials. Admission offers are issued for a specific term and are valid only for the term specified.

Visits to the Campus
Visitors to Iowa State University are always welcome!

The Office of Admissions, located in Alumni Hall, is open Monday through Friday from 8 a.m. until 5 p.m., and most Saturday mornings from 9 a.m. until noon when classes are in session. Counselors are available to speak with prospective students and their families about admission, financial aid, housing, student life, academic programs and opportunities. Visitors are offered student-guided walking tours of the campus.

Prospective students and parents are encouraged to visit the campus and the Office of Admissions. Arrangements for a campus visit or registration for "Experience Iowa State," a special open house program, can be made at www.admissions.iastate.edu or by contacting the Office of Admissions, Alumni Hall, Iowa State University, Ames, Iowa 50011-2011; phone 515-294-5836 or 800-262-3810; fax 515-294-2592; or admissions@iastate.edu.

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

Undergraduate Admission into Degree Programs Directly from High School
Students who seek admission must meet the following requirements and also any special requirements for the college or curriculum of their choice.

Applicants must submit an application for admission, the appropriate application fee (check www.admissions.edu for current application fee information). In addition applicants must have their secondary school provide an official transcript of their academic record, including credits and grades, rank in class, and certification of graduation.

Applicants must also arrange to have their scores from either the ACT Assessment (ACT) or the Scholastic Assessment Test (SAT I) reported to Iowa State directly from the testing agency. Applicants whose first language is not English should also provide the results of a Test of English as a Foreign Language (TOEFL), if their scores on the ACT or SAT are not adequate to place them into freshman composition courses at Iowa State. Applicants may be required to submit additional information or data to support their applications.

a. Graduates of approved Iowa high schools who have the subject-matter background required by Iowa State University and who rank in the upper half of their graduating class will be admitted. Students who do not rank in the upper half of their graduating class may be considered for admission to the university on an individual basis if they achieve the following combination of high school rank and ACT or SAT I scores:

High School Rank (99% is high)	ACT Composite Score	SAT I Combined Score
49-47%	20	930
46-45%	21	970
44-42%	22	1010
41-39%	23	1050
38% or below	24	1090

Those who do not meet these requirements but who have a high school rank of 20% or above may be given the opportunity to enroll for a trial period during a preceding summer session to establish their qualifications for fall admission. Those who have a high school rank below 20% (and an ACT below 24) will be denied admission.

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

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

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

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

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

High School Preparation Required for Admission
Graduation from an approved high school shall ordinarily precede entrance into Iowa State University.

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

English/Language Arts
Four years, emphasizing writing, speaking, and reading, as well as an understanding and appreciation of literature

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

Science
Three years, including one year each of courses from two of the following fields: biology, chemistry, and physics

Social Studies
Two years

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

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

Undergraduate Admission into Degree Programs by Transfer from Other Educational Institutions

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

Applicants must submit an application form for admission, together with the appropriate fee (see www.admissions.iastate.edu for current application fee information) and request that each college they have attended send an official transcript of record to the Office of Admissions. Failure to provide transcripts from all colleges or universities attended may result in denial of the application or dismissal from the university. If less than 24 semester hours of graded transferable college credit will be completed prior to entry at Iowa State University, applicants must also request that their official high school transcript and ACT or SAT I scores be sent to the Office of Admissions. Other transfer applicants are encouraged to provide high school academic information. Students who do not do so may be asked to take course placement examinations during orientation.

Applicants whose first language is not English should provide the results of a Test of English as a Foreign Language (TOEFL). The TOEFL may be waived if their scores on the ACT or SAT are adequate for placement in Iowa State freshman composition courses.

a. Transfer applicants with a minimum of 24 semester hours of graded transferable credit from regionally accredited colleges or universities, who have achieved for all college work previously attempted the grade point average required by Iowa State for specific programs, will be admitted. A 2.00 grade point average (on a 4.00 grading scale) is the minimum transfer grade point average requirement. Some programs may require a transfer grade point average higher than this minimum. Higher academic standards may be required of students who are not residents of Iowa, including international students.

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

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

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

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

Transfer Credit Practices

Iowa State University endorses the Joint Statement on Transfer and Award of Academic Credit approved by the American Council on Education (ACE) and the American Association of Collegiate Registrars and Admissions Officers (AACRAO). The current issue of *Transfer Credit Practices of Designated Educational Institutions*, published by AACRAO is an example of a reference used in determining transfer credit.

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

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

—credit in courses determined by Iowa State University to be of a developmental, vocational, or technical nature
—credit in courses or programs in which the institution granting the credit is not directly involved.

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

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

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

c. Students from colleges and universities not regionally accredited.
When students are admitted from colleges and universities not regionally accredited, they may validate portions or all of their transfer credit by satisfactory academic study at Iowa State, or by examination. The amount of transfer credit and the terms of the validation process will be specified at the time of admission.

In determining the acceptability of transfer credit from private colleges in Iowa which do not have regional accreditation, the Regent Committee on Educational Relations, upon request from such institutions, evaluates the nature and standards of the academic program, faculty, student records, library, and laboratories.

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

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

Additional Transfer Credit Policies

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

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

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

d. College Level Examination Program (CLEP).
Iowa State University will award credit for each of the following 12 examinations, for test scores equivalent to a "B" grade: Principles of Accounting, American Government, Biology, Calculus, Humanities, Principles of Macroeconomics, Principles of Microeconomics, Natural Sciences, Introductory Psychology, Social Sciences and History, Introductory Sociology, Trigonometry. Iowa State will also award credit equivalent to a grade of "C" or "B" (grade determines amount of credit awarded) for two CLEP foreign language exams: French Language and Spanish Language.

Application of CLEP credit to a degree program varies with the department, so students should consult with their department before they register for CLEP examinations. Additional information is available at www.iastate.edu, Index, Credit by Examination.

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

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

Articulation/Transfer Agreements

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

b. Associate of Arts (A.A.) Articulation Agreement with Iowa public community colleges.
Students who plan to enter the College of Liberal Arts and Sciences at Iowa State University with an associate of arts degree from an Iowa public community college, and who have at least 60 prescribed semester (90 quarter) credits acceptable for transfer and at least a 2.00 cumulative grade point average, will be considered to have met the general education requirements of the college (with the possible exception of the foreign language and library requirements).

c. Vocational-technical credit from Iowa public community colleges.
Iowa State University will accept up to 16 semester (24 quarter) credits earned in vocational-technical courses where the sending Iowa public community college will accept such courses toward its associate of arts or associate in science degree. Certain vocational-technical courses at Iowa community colleges may be articulated to Iowa State University as academic credit. The hours earned in these articulated courses would transfer in addition to the 16 semester hour vocational-technical maximum. Please refer to the course equivalency guides on the Web (www.iastate.edu) or contact the Office of Admissions for more information.

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

Nondegree Undergraduate

Students who wish to attend Iowa State University to take undergraduate courses but who do not plan to seek an undergraduate degree from Iowa State University should apply as nondegree undergraduate students. Credit taken under the nondegree undergraduate classification is applicable for undergraduate degree purposes for those who are later admitted as degree-seeking undergraduate students. Credit obtained under the nondegree undergraduate classification may not, however, be applied toward a graduate degree.

Students enrolled in the Intensive English and Orientation Program (IEOP) are classified as nondegree students in the College of Liberal Arts and Sciences, and usually are not permitted to enroll in academic courses until they have satisfied requirements for admission as degree-seeking students. Permission to enroll in one academic course in addition to full time intensive English study may be granted under special circumstances.

Reentering Students

Reentering students are those who have previously attended Iowa State University and are returning after an absence of at least one full year. See Index, *"Academic Renewal Policy"* and *"Reentry."*

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

Reentering graduate students do not need to complete a reentry form but should notify their department and the Office of the Registrar of their intent to reenter Iowa State University. See Index, "*Reentry*" for more information.

Residency

Classification of Residents and Nonresidents for Admission and Tuition Purposes

These criteria are contained in the *Policy Manual, Board of Regents, State of Iowa and or the Iowa Administrative Code: Board of Regents, State of Iowa*.

Graduate Assistants

Students with graduate assistantships of 1/4-time or more are assessed Iowa resident tuition and fees. Nonresident students with graduate assistantships of 1/4-time or more retain their nonresidency classification, but are assessed resident tuition and fees as long as the graduate assistantship is continued.

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

General

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

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

meet the residency requirements as established by the Board of Regents, State of Iowa, for admission, tuition, and fee purposes.

C. The registrar, or designated person, is authorized to require written documents, affidavits, verifications, or other evidence deemed necessary to determine why a student is in Iowa. The burden of establishing that a student is in Iowa for other than educational purposes is upon the student. A student may be required to file any or all of the following:

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

D. Change of classification from nonresident to resident will not be made retroactive beyond the term in which application for resident classification is made.

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

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

Guidelines

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

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

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

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

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

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

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

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

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

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

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

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

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

Facts

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

1. Reside in Iowa for 12 consecutive months, and be primarily engaged in activities other than those of a full-time student, immediately prior to the beginning of the term for which resident classification is sought.
2. Reliance upon Iowa resources for financial support.
3. Domicile in Iowa of persons legally responsible for the student.
4. Former domicile in the state and maintenance of significant connections therein while absent.
5. Acceptance of an offer of permanent employment in Iowa.
6. Other facts indicating the student's domicile will be considered by the universities in classifying the student.

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

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

Registration/Enrollment

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

Enrollment Status

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

Full-time status is defined as follows: Undergraduates: 12 credits for fall or spring semester; Graduates: 9 credits for fall or spring semester.

Half-time status is defined as follows: Undergraduates: 6 credits for fall or spring semester; Graduates: 5 credits for fall or spring semester.

Summer status depends on the number of weeks a student is enrolled. Always contact the Office of the Registrar to verify a student's status for a summer session.

Credit by Examination (CBE)

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

Types of CBE Programs

Students may earn academic credit in any of four ways and have that credit recorded on their academic record when they enroll. Programs accepted at Iowa State include the Advanced Placement (AP) Program, the International Baccalaureate (IB) Examinations, departmental examinations, and the College Level Examination Program (CLEP).

Advanced Placement (AP) Program of the College Board

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

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

Correspondence concerning the Advanced Placement Program should be addressed to the College Board Advanced Placement Examinations, P.O. Box 977-IS, Princeton, New Jersey 08541, or visit their web site at www.collegeboard.org/ap/students/index.html.

International Baccalaureate Examinations

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

Iowa State University awards credit for most higher level examinations and some standard level examinations. Students must receive a minimum score of 4 to qualify for academic credit in most subject areas. Some departments, require a minimum score of 5.

Correspondence concerning the International Baccalaureate Program should be addressed to International Baccalaureate, North America, 200 Madison Avenue, Suite 2301, New York, New York 10016, or visit their web site at www.ibo.org.

Departmental Examinations

Students may take locally constructed departmental examinations for undergraduate credit in specified subject areas for which they and the department feel they have the necessary preparation. These exams are generally administered by the department which offers the course (for exceptions, see CLEP offerings below). Students interested in taking departmental (or CLEP) examinations should contact the appropriate department for specific information on the course covered by the exam and the exam itself. A nonrefundable fee is charged for each departmental examination requested. If an acceptable exam score is achieved, a grade of T will be reported to the Office of the Registrar. The T grade represents performance equivalent to a C or better in the course. T grades are not used in computing students' grade point averages; however, the credit does become part of their official academic record and may be applied toward their graduation requirements.

A list of the most frequently requested exams and the date(s) and time(s) they are administered each semester is published on the Schedule of Classes web site at www.iastate.edu/~catalog/schedule. Most examinations for credit are prepared by the departments offering the courses. In some cases, the examination used is part of the College Level Examination Program (CLEP), where the content of the CLEP test has been judged to be an equivalent to the content of the course.

College Level Examination Program

CLEP is available on computer only. Iowa State University will award up to six semester credit hours in each of these three CLEP tests (Social Sciences and History, Humanities, and Natural Sciences) if the test score places the student at a "B" grade level. Iowa State University does not accept the CLEP tests in either College Mathematics or English Composition. In addition, the College of Engineering does not allow credit earned from CLEP Social Sciences and History, Humanities, and Natural Sciences tests to be used in their students' degree programs.

CLEP tests accepted at Iowa State University at a "B" grade level include American Government (Pol S 215); Principles of Accounting (Acct 284 and 285; engineering majors should consult with their academic adviser before registering for this examination); Biology (Biol 109, not for biology or engineering majors); Introductory Psychology (Psych 101); Introductory Sociology (Soc 134); Principles of Macroeconomics (Econ 102); Principles of Microeconomics (Econ 101); Trigonometry (Math 141); and Calculus (Math 165). Students must receive a score equivalent to a "B" grade to qualify for credit.

In addition, Iowa State University will award up to 14 semester credit hours for CLEP French Language and up to 16 semester credit hours for CLEP Spanish Language, depending on the student's score, which ranges from a "C" grade equivalent for Span 101 or Frnch 101 to a "B" grade equivalent for Frnch 202 and Span 202. Please note that native or near native speakers of French or Spanish may not test out of the beginning or intermediate levels in these languages.

A nonrefundable fee is charged for each CLEP test requested, and all requests should be made one week prior to the test date. CLEP tests are administered by the Student Counseling Service Testing Office Monday through Friday. For information on whether to take any of the CLEP tests, contact the department that offers the course. To obtain information on any of the CLEP tests, contact the Testing Office, 2030 Student Services Building, Iowa State University, Ames, Iowa 50011, or send e-mail to scsclep@iastate.edu. To print a copy of the institutional CLEP registration form, go to www.iastate.edu, Index, Testing (Student Counseling Service). Then click on the link "CLEP Testing."

Policies and Procedures Governing CBE Tests

1. Departmental and CLEP tests are offered to newly admitted or currently enrolled students at Iowa State University. Former and future students will receive credit only if they enroll sometime during the twelve months immediately following the test(s).

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

3. Students may ordinarily attempt a CBE test only once in any course or area. Under special

circumstances a retest may be taken upon approval of the department in which the course is offered.

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

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

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

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

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

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

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

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

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

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

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

Office of New Student Programs

Orientation

The purpose of orientation is to help new undergraduate students make a smooth transition to Iowa State University. At orientation, students plan their academic programs, take tests to ensure placement in appropriate courses, register for classes, learn about university policies and procedures, and prepare for their personal and social adjustment to the university. The university Orientation Committee, composed of Iowa State University students, faculty, and staff, is responsible for the orientation programs; the undergraduate colleges of the university, in cooperation with the Office of New Student Programs, have responsibility for the implementation of orientation programs for new students and their families.

The Orientation Committee conducts an extensive orientation program during the summer, with additional programs held prior to each term. Special orientation sessions are conducted for transfer students during the spring. Special orientation programs are also held for nontraditional students, international students, and graduate students. New students receive a written invitation to attend an orientation program before their first semester at the university. Family members are encouraged to accompany students.

Summer Orientation

Summer orientation is a two-day program scheduled in June. As early as January, new students and their family members are asked to select a convenient time from among a number of orientation sessions that are scheduled during June. In addition to preparing their class schedules for fall semester, new students with their family members participate in guided tours of the university, attend informational meetings about policies and procedures at the university, and meet formally and informally with faculty, staff, and other new students and their families. These sessions, held in a comfortable, informative atmosphere, lessen existing anxieties, assist each person in the development of a clearer understanding of the challenge of the university environment, and make it possible for new students—with support from their family members—to begin to make the academic and social decisions that are faced by all students at the university.

Cyclone Aides, Iowa State undergraduate students with widely varying backgrounds and interests, help acquaint new students and their families with the university.

Housing and meals are available at campus residence halls for a nominal fee. Cyclone Aides live in the residence halls with the new students and are available at all times for informal discussion.

Destination Iowa State

The Destination Iowa State program is held on the Thursday, Friday, and Saturday before classes begin fall semester. The program helps new students develop academic, computer, and social strategies to ensure a successful transition to Iowa State University.

WelcomeFest

WelcomeFest activities are scheduled during the first week of fall semester to welcome students to campus. All students, including transfer students, are invited to participate in WelcomeFest.

Continuing Education and Communication Services

Continuing Education and Communication Services

Iowa State University remains true to the land-grant tradition of extending knowledge far beyond campus borders. Annually thousands of students enroll in ISU courses without setting foot in Ames. In addition to the traditional method of instructors traveling to classrooms off campus, technology has provided new ways for Iowa State University faculty to reach students. ISU offers distance education courses over the Iowa Communications Network (ICN), by videotape, CD-ROM and DVD, and online.

Courses are the same as those offered on campus, carry residential credit, and are taught by ISU faculty members. Credit earned in off-campus courses becomes a part of the academic record at Iowa State University and may be used to meet degree requirements in the same manner as credit earned on campus.

ISU Continuing Education personnel provide leadership and support to faculty in their efforts to identify the needs of Iowans and to reach and satisfy adult learners who wish to earn college credit without attending classes on campus. The Continuing Education staff also helps off-campus students access student services and information at Iowa State University.

For a list of courses and programs available, or to request specific courses and programs, visit www.lifelearner.iastate.edu, or contact Continuing Education in Ames (515) 294-6222 or (800) 262-0015. You may also contact any of the ISU Extension offices across the state.

Some off-campus credit courses are offered to serve the special interest or needs of a particular group. Often courses are offered to fulfill certification or degree program objectives. The programs currently offered off campus by Iowa State University are:

College of Agriculture

The faculty of the College of Agriculture offers two master's degrees off-campus. For more information call (515) 294-1438 or (800) 747-4478.

Master of Agriculture

Statewide via the Iowa Communications Network; U.S. and Canada via videotape, CD-ROM and online

Prepare for a proactive role in addressing and responding to personal, professional, and societal issues and challenges in a changing agriculture and food system. Position yourself for emerging opportunities within or outside your current employment. Individuals enroll in the Master of Agriculture program for a variety of reasons from career advancement, to teacher certification renewal, to professional development, to personal interests.

The core 13 credits emphasize leadership development, technological change, use of statistics, economic issues, and sustainability issues. You select another 15 credits in consultation with your graduate committee to meet your individual interests. The capstone of the program is a creative component of four credits. The degree is 32 total credits. The program began in 1979. Up to 10 credits of approved transfer courses may be used.

Master of Science in Agronomy

U.S. and Canada via CD-ROM and online

Designed for professionals who are working in industry and government, the degree ensures you have an advanced knowledge of agronomic systems and superior problem-solving skills. The computer-based program, begun in 1998, emphasizes practical, professional, and technical skills involved in crop management, soil and water management, and integrated pest management.

The curriculum consists of 12 courses plus a one-credit workshop and a three-credit creative component, for a total of 30 credits. The workshop is the only course that requires attendance on campus—three or four days one summer. The course prerequisites for admission to the program are limited to fundamental agriculture courses, recognizing that many potential students will not have majored in agronomy as undergraduates. Generally, students who have completed a degree from a College of Agriculture will meet the requirements.

College of Business

A Master of Business Administration is offered in Des Moines as part of ISU's initiative in the capital city.

Master of Business Administration

On-site evenings in Des Moines

The Des Moines MBA program debuted fall 1999. For information, send to busgrad@iastate.edu or call (515) 294-8188 or (877) ISU-4MBA.

College of Design

The Department of Community and Regional Planning offers several undergraduate courses as part of an agreement with Iowa community colleges. The department also offers an off-campus master's program. For more information, call (515) 294-0220.

2+2+2 Community and Regional Planning transfer program

Statewide via the Iowa Communications Network (ICN) and DVD

The agreement offers a "two plus two plus two" plan, where you earn a two-year associate degree from a community college, take two Iowa State courses as a part of that community college curriculum, and then complete a bachelor's degree in as little as two years after transferring to the ISU Department of Community and Regional Planning.

Community and regional planning is a professional field of study aimed at assessing the socio-economic and physical environments of communities and planning for their future. About two-thirds of ISU community and regional planning graduates work in local, state, or federal governments or for regional planning councils. An increasing number also pursue graduate studies in planning or related fields.

Master of Community and Regional Planning

Statewide via the Iowa Communications Network (ICN) and DVD

The off-campus program is designed to enhance the skills and broaden opportunities for working professionals in the field of planning. Complete a core curriculum and courses in an area of concentration. Concentration areas include transportation and land use planning, housing and social planning, community economic development, environmental planning and design. Students with an undergraduate degree in a field other than planning, but currently working in the field of planning, are encouraged to apply.

College of Education

The College of Education tries to identify needs of educators across the state and provide courses and programs to meet those needs.

Certificate of Advanced Studies State of Iowa Superintendent Certification

Statewide via the Iowa Communications Network

A post master's curriculum of 30 credit hours provides training for the school superintendent license. The program emphasizes leadership skills; child and adolescent development; curriculum and instruction; school law and ethics; resource management; community relationships; and data-driven decision-making. Courses are scheduled on Friday evenings and Saturdays. For information, call (515) 294-4871.

Master of Education in Educational Leadership, emphasis in preparation for leadership
Statewide to selected Area Education Association sites

A master's program of 36 credits, called PREparation for LEADership (PreLEAD) leads to licensing as a school administrator. Courses are structured to build leadership skills in organizational processes, scope and framework of schools, and interpersonal dimensions. PreLEAD students attend a two-year program of night and Saturday classes, or commit to three summers of intensive preparation. Students are paired with practicing administrators, experiencing firsthand the leadership roles for which they are training. For information, call (515) 294-4871.

Master of Education in Higher Education
On-site at Des Moines Area Community College (DMACC), Ankeny

The Teaching and Learning for Community Colleges (TL2C2) is for mid-career faculty who have a passion for providing teaching and learning leadership. TL2C2 helps community college faculty maximize their effectiveness as educators, as well as the students' potential for learning. The 30 credit-hour program leads to a master's degree in higher education with an emphasis in community colleges, or applies up to 30 credit hours towards a Ph.D. in the Educational Leadership and Policy Studies department. For information, call (515) 294-1241.

College of Engineering
ISU engineers have offered college credit courses via distance learning since 1969 when Iowa State University sent reel-to-reel tapes to industry sites. Today, courses for practicing engineers are delivered by more advanced technology methods. For more information, call (515) 294-7470 or (800) 854-1675 or send to ede@iastate.edu.

Certificate in Electric Power Systems
U.S. and Canada via videotape and streaming media and CD-ROM

The Department of Electrical and Computer Engineering debuted this graduate-level certificate program in fall 2002. The nine-credit certificate provides advanced information for power engineering specialists in government, private industry, and academia.

Certificate in Information Assurance
U.S. via videotape, streaming media, and National Technological University (NTU)

To increase technology proficiency and policy issues critical to the security of information infrastructure, Iowa State faculty developed a graduate certificate program for those who have a bachelor of science in computer science, computer engineering, or a closely related field. The program was launched in fall 2001. It is designed to meet the needs of information system security specialists in government, the private sector, and educational institutions. The certificate consists of four computer engineering courses.

Master of Engineering in Systems Engineering
U.S. and Canada via videotape and streaming media

The systems engineering program extends the ability of engineers to work across disciplinary boundaries. It also develops the management capabilities needed in today's work environment. Engineers, regardless of undergraduate discipline, can develop the analytical abilities needed to design, evaluate, and build complex systems involving many components and demanding specifications. The degree is 30 semester credit hours, including 27 credits of formal course work distributed among four broad groups: systems engineering core courses, elective engineering courses, area of specialization courses, and elective non-engineering courses. The final three credits are a creative component.

Master of Science in Computer Engineering
Master of Science in Electrical Engineering
U.S. and Canada to industry sites via videotape and streaming media

The College of Engineering at Iowa State University, in cooperation with the University of Iowa and local industries, offers two off-campus Master of Science programs. Each program totals 30 graduate credits; a thesis or non-thesis option may be selected. Areas of specialization within the program include communications and signal processing, computer systems architecture, electric power and energy systems, information systems security and networking, microelectronics and photonics, nondestructive evaluation and electromagnetics, software systems, systems and controls, and VLSI design.

Master of Science in Mechanical Engineering
U.S. and Canada to industry sites via CD-ROM and streaming media

The graduate program offers study in design and research in fluid mechanics, turbomachinery, fluid power, controls, heat transfer, machines and systems, materials and manufacturing processes, thermodynamics and energy utilization. Instrumentation, design of experiments, and computational methods may be applied to any of these areas. The program is 30 credits. It has a thesis and non-thesis option.

College of Family and Consumer Sciences
Many off-campus programs from Family and Consumer Sciences were originally developed to meet the needs of students in Iowa. Iowa State is now converting courses to online delivery and working with other universities in the Great Plains. For more information, call (515) 294-5982 or (877) 891-5349 or send to mfcsinfo@iastate.edu.

Master of Family and Consumer Sciences
Statewide via the Iowa Communications Network and online

Delivered off-campus since 1994, the non-thesis Master of Family and Consumer Sciences is designed for working professionals to enhance skills in a current position and increase chances for promotion. The comprehensive degree requires a minimum of 18-21 credits in two or more of the College of Family and Consumer Sciences departments. With electives, the degree program totals 36 credits.

Master of Family and Consumer Sciences with specialization in Family Financial Planning
Certificate in Family Financial Planning
U.S. and Canada online

Financial planners are increasingly in demand as Americans seek advisors to help manage their income, assets, and debts. In response to this demand, Iowa State joined other universities to create interinstitutional programs. You seek admission from one of the participating institutions and take online courses from Iowa State and other universities. The program is 42 credits of set courses.

Courses cover various disciplines including financial counseling, housing and real estate, retirement planning, and employee benefits. The program has no thesis component, but requires a practicum and capstone course that focuses on case studies. The graduate certificate is 18 credits of the master's program. Graduates of the master's and certificate programs are eligible to take the Certified Financial Planner™ exam.

Certificates in
— Dietetics Communication and Counseling
— Dietetics Management
— Advanced Medical Nutrition Therapy
Statewide via the Iowa Communications Network and online

The courses are designed for working professionals. Each certificate program is 11 credits. You may even start with a graduate certificate and then apply the courses to the Master of Family and Consumer Sciences degree with a dietetics specialization. Acquire both theoretical and applied knowledge in the certificate programs.

Master of Science or Master of Education in Family and Consumer Sciences Education Leadership Academy
On campus plus online

Expand and update your content knowledge with courses offered in a three-week summer resident setting and online fall and spring semesters. This new delivery method for a longstanding, prestigious graduate program was initiated in summer 2002. Either master's program is a total of 30 credits.

College of Liberal Arts and Sciences
The political science, mathematics, and statistics departments offer graduate-level programs off-campus. The Bachelor of Liberal Studies degree is the only bachelor's completion degree offered off-campus.

Bachelor of Liberal Studies
On-site at Des Moines Area Community College (DMACC), Ankeny and via distance learning deliveries

The Bachelor of Liberal Studies (BLS) is a general studies degree in the liberal arts. It provides the opportunity to earn a degree with the flexibility to choose courses based on your interest and goals. Instead of a traditional major, you select course work from three of the following five distribution areas: humanities, communications and arts, natural sciences and mathematical disciplines, social sciences, and professional fields.

The BLS degree is offered with similar requirements by all three Iowa regent universities, and provides a framework to assemble all the educational opportunities you may have locally available into a coherent four-year educational program. Up to three-fourths of the total degree requirements can be transferred from accredited institutions. For information, call (515) 294-4831.

Certificate of Public Management Master of Public Administration
Statewide via the Iowa Communications Network and on-site in Des Moines

The programs are designed to prepare or improve the performance level of mid-career public managers and administrators in federal, state, and local government and in related areas of other organizations. Become skilled at conducting research and preparing thorough research summaries. Identify and address complex political questions, taking into account related ethical, legal, economic, and social issues.

The degree program is 37 credits including core and methods courses central to both the theory and practice of public management, a concentration area for specialization, and a creative component. Select from concentration areas of public management; public policy analysis; and public budgeting and finance. The 15-credit certificate program includes at least nine credits from core and methods courses. The remaining six credits are selected from a list of electives. For information, call (515) 294-7256.

Master of School Mathematics
Statewide via the Iowa Communications Network

The Master of School Mathematics program is designed for current secondary mathematics teachers. The degree program is built on three objectives: enhanced knowledge of algebra, geometry, calculus, statistics, and discrete mathematics; effective strategies for creating a student-centered classroom emphasizing problem solving; and computing technology in learning and teaching mathematics.

The program is 36 semester credits and includes a creative component. A Master of School Mathematics fulfills the 'master's degree in an area of endorsements' requirement listed under the certification rules for a professional teacher's certificate. For information, call (515) 294-8169 or send to msm@math.iastate.edu.

Master of Science in Statistics
U.S. via videotape to employees of companies who sign a letter of agreement

The Department of Statistics offers courses and the degree option only to employees of companies who sign a letter of agreement. Students at these companies earn exactly the same degree as the students on campus and fulfill the same program requirements, including the written master's exam, creative component, and a final oral exam.

In 1994, the statistics department signed an agreement with General Motors Corporation to deliver a Master of Science to GM employees. Since then, 3M, Mayo Clinic, Wells Fargo, and John Deere have signed agreements with Iowa State. For information, call (515) 294-3440 or send to statistics@iastate.edu.

Continuing Education Units
ISU Continuing Education awards Continuing Education Units (CEUs) for short courses, workshops, and other educational activities sponsored by Iowa State University, which do not carry academic credit. A given activity may award CEUs to some participants and academic credit to others, under the following policies:

1. The activity must be administered through Iowa State University Continuing Education.

2. The dual arrangement must have received prior approval by the department head or chair, upon recommendation of the course instructor, and the department curriculum committee.

3. Learners may enroll for either CEUs or for credit, but not for both.

4. Credit enrollees must meet the same academic standards they would have to meet if the course did not also award CEUs.

5.Assignments for credit students must be clearly articulated. Substantial sequential learning experiences and careful evaluation of outcomes are required for academic course credit; these standards will not be reduced to accommodate the participation of CEU learners. Whenever graduate credit is offered, course prerequisites will be enforced and not routinely waived.

Once CEUs have been awarded, Iowa State cannot and will not convert CEUs to academic credit. A student may switch from CEU to credit during an offering only at the discretion of the course instructor.

Tuition, Fees and Expenses

All fees, tuition, expenses, and policies listed in this publication are effective as of summer session 2003 and are subject to change without notice by Iowa State University and the Board of Regents, State of Iowa. Tuition and fees are based on credit load at 5:00 p.m. on the 15th day of class. This is the last day for adjustments downward in tuition and fee assessment.

For the most complete information see www.iastate.edu/~registrar/fees

Tuition

Enrollment is not complete until fees are paid. Tuition is charged at the per credit rate as given below. Maximum charges start at 12 credits for undergraduate and veterinary medicine students. Maximum charges start at 9 credits for graduate students.

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

Registration Fee Schedule Per Semester

	Resident	Nonresident
Undergraduate (12 or more credits)	$2171	$6842
Graduate (9 or more credits)	$2519	$7107
Veterinary Medicine (12 or more credits, entered prior to Fall 2002)	$4538	$12131
Veterinary Medicine (12 or more credits, entered Fall 2002 or later)	$4925	$13181

For students enrolled for less than a full course load see the Fee Schedule Per Credit list on the following page of this catalog. Most students are assessed a minimum 2-credit fee.

Additional information:
Saturday MBA and Des Moines MBA classes: assessed the graduate rate plus $74 per credit supplemental tuition fee (supplemental tuition fee subject to change without notice).

Audits and zero credit courses: assessed according to contact hours; maximum charge for zero credit courses is three credit hours

R credits: assessed for the minimum fee only if no other credits are taken.

Continuous registration fee for graduate students: $70.

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

Summer session: based on per credit as indicated in the fee schedule.

Tuition assessment for study abroad credits: up to a maximum of 12 credits, is above and beyond tuition for other courses taken during the same term.

Fees

Following are the descriptions of several commonly assessed fees for Iowa State University students. *The list is not inclusive.* All fees are subject to change without notice.

Activity, Services, and Building Fee
All students will be charged a $161 activity and services fee per fall and spring semester, $80.50 per summer semester, except for students exclusively registered for the following: distance education courses; courses for which no tuition is assessed; continuous registration status courses; and high school students enrolled under the Post-Secondary Enrollment Options Act. Students who are exempt from the activity fee may elect to pay the fee, which allows them to pay student admission rates to concerts, lectures, debates, and athletic events.

An adjustment to the activity fee is applied according to the tuition adjustment schedule for students who withdraw or change to an exempt status as defined above.

Application: The application fee for undergraduates is $30, for graduate students is $20 and $50 for international students. This is a nonrefundable fee and must accompany the application for admission. This fee does not apply to special students or workshop applicants, and is subject to change without notice.

Camp: A special tuition rate is assessed to students participating in camp programs. The undergraduate assessment is $181 per credit and the graduate rate is $280 per credit. Summer camp programs entitled to the special rate are Anthropology and Geology. Students will be charged other fees in addition to tuition for enrolling in these programs. To obtain total fee information, students should contact the director of the individual program.

Change of Schedule: Starting the sixth day of classes an $8 fee is charged for course drops, additions, and section changes. One fee is assessed for multiple changes processed at the same time for the same term.

Computer: All students will be charged a computer fee each semester. Full-time students enrolled in the College of Engineering (including Biomedical Engineering and Systems Engineering) are charged $202 per semester. Full-time students in the Department of Computer Sciences or undergraduates in the major of Management Information Systems are charged $161 per semester. All other full-time undergraduate students are charged the standard computer fee of $94 per semester. Full-time graduate students are charged a $75 per semester computer fee. Students enrolled less than full-time are assessed prorated computer fees according to the number of credits for which they are enrolled. For students who withdraw, the adjustment schedule for tuition will also be used for computer fees. Students enrolled exclusively in any one of the following categories will not be assessed computer fees: high school students enrolled under the Postsecondary Enrollment Options Act, or courses for which no tuition is assessed.

The credit adjustment schedule for reduction from a full load to light classification is 100 percent through the third week, with no refunds after the third week.

Students who change their major will be charged the full computer fee for the major into which they transfer if the change occurs before the end of the third week. If the change occurs after the third week, then no change in the computer fee assessment will occur.

Continuing Education and Communication Services (CECS): Undergraduate students pay $181 per credit with a maximum charge of $2,171; graduate students pay $280 per credit, with a maximum of $2,519. Students enrolled in MBA courses pay $318 per credit with a maximum of $2,860. (MBA fees based upon the 2002-2003 academic year and are subject to change.) Nonresident students who enroll in a combination of on- and off-campus courses are assessed the nonresident rate for all credits. The tuition applies to both credit and audit enrollments.

Developmental Mathematics: Students enrolled in Math 10-30 courses will be charged $362. This is a separate fee which is charged in addition to other fees and tuition. Students will be charged the developmental math fee each term they are enrolled in a Math 10-30 course.

Graduation Fee: Undergraduate and graduate students are charged a $20 graduation fee the term they receive their degree.

Health Facility: All students are charged an $8 Health Facility Fee each semester except for students exclusively registered for the following: distance education courses; courses for which no tuition is assessed; continuous registration status courses; and high school students enrolled under the Postsecondary Enrollment Options Act. For students who withdraw or change to an exempt status as defined above, the refund schedule for tuition will be used for the health facility fee. These exceptions do not apply to international students (except where noted) or graduate students on "C Base" assistantships.

Health Fee (Student Health): An $80 student health fee, which partially finances the services of the Thielen Student Health Center, is charged to all students each semester. This fee is not assessed to students enrolled for four credits or less or students exclusively registered for the following: distance education courses; courses for which no tuition is assessed; continuous registration status courses; weekend MBA courses; Lakeside Laboratory courses; and high school students enrolled under the Postsecondary Enrollment Options Act. (These exemptions do not apply to international students or to graduate students on C- base assistantships.) Students who are exempt from the health fee may participate in the Health Plus Plan.

Students who withdraw or change to an exempt status as defined above will receive a credit adjustment of 100 percent during the first three weeks, with no credit adjustment after the third week. Students who add courses at any time during the semester will be assessed the student health fee if applicable according to the guidelines stated above.

Students who carry the ISU sponsored insurance must also be assessed the student health fee. If spouse or domestic partner is covered under the insurance plan, the spouse (domestic partner) must also be covered under the Health Plus Plan.

Health Insurance: All international students and their accompanying dependents must enroll in the ISU Student and Scholar Health Insurance Program. ISU requires nonimmigrant international students and their dependents to purchase and maintain coverage through the ISU health insurance plan for the duration of their tenure at the university. Insurance plans purchased outside the university may be used for supplemental coverage, but cannot be substituted for the ISU plan. Students not assessed the mandatory Student Health Fee and spouses of students are eligible to participate in the Health Plus Plan. Contact the Student Health Insurance Office at 515-294-4820 for more information.

Late Fee Payment: If payment of the minimum due is not made by the deadline printed on the billing statement, all fees become due immediately. A one-percent finance charge will be assessed on the total amount due at that time. These students will also have a hold placed on their registration until payment of the total amount due has been made.

Late Registration: Undergraduate students who do not complete their registration before the first day of classes are charged a $20 late registration fee. Graduate students who do not complete their registration before the first day of classes are charged a late registration fee of $20 during the first week of classes, $50 the second week of classes, and $100 the third week of classes or anytime later.

New Student Programs: A nonrefundable fee of $131 is assessed to all new degree-seeking undergraduates (including new direct from high school and new transfer students). The fee covers full costs associated with orientation and Destination Iowa State programming, including publications, mailings, programming, and student assistants who provide services to students and their families during orientation and Destination Iowa State.

Private Music Instruction: The music fee is charged to students receiving private music instruction and is in addition to regular tuition. The fee offsets the costs of one-on-one instruction. One credit of instruction is $90; while the fee for 2 credits is $130.

Senior: A $2 fee covers the cost of special senior activities. This fee is optional and is assessed spring term only.

Special Course Fees: Some courses have expenses above the cost of tuition that enhance the instruction. These fees may cover the cost of field trips, use of equipment, materials or supplies, or professional support. Applicable special course fees are listed with the specific course in the Schedule of Classes available at www.adp.iastate.edu/cgi-bin/class. Special course fees also appear on each student's schedule detail available on AccessPlus.

Effective Summer 2003, Fall 2003 & Spring 2004
Fee Schedule Per Credit

No. of	Undergraduate		Graduate		Vet. Med. Entered before Fall 2002		Vet. Med. Entered Fall 2002 or later	
Credits	Res.	Nonres.	Res.	Nonres.	Res.	Nonres.	Res.	Nonres.
1	$362*	$362*	$560*	$560*	$758*	$758	$822*	$822*
2	362*	362*	560*	560*	758*	758*	822*	822*
3	543*	543*	840*	840*	1137*	1137*	1233*	1233*
4	724*	724*	1120*	1120*	1516*	1516*	1644*	1644*
5	905	2855	1400	3950	1895	5055	2055	5495
6	1086	3426	1680	4740	2274	6066	2466	6594
7	1267	3997	1960	5530	2653	7077	2877	7693
8	1448	4568	2240	6320	3032	8088	3288	8792
9	1629	5139	2519	7107	3411	9099	3699	9891
10	1810	5710			3790	10110	4110	10990
11	1991	6281			4169	11121	4521	12089
12 or more	2171	6842			4538	12131	4925	13181

*Resident rate charged for 4 credits or less for Fall, Spring and Summer Semesters

Sponsored International Student: This fee is assessed to the sponsor of international students as a way to compensate for the special record keeping, billing requirements, correspondence, and the deferred payment option extended to sponsoring agencies. The current fee will be 5 percent of the total tuition charge billed the sponsor. In succeeding years, the fee may be raised after 90 days advance notice to the sponsoring agency.

Study Abroad: Tuition assessment for study abroad credits, up to a maximum of 12 credits, is above and beyond tuition for other courses taken during the same term.

Transcript: Students may obtain an official transcript of their student academic record for $7. An additional $2 service charge for each transcript is assessed for same day service.

Workshops: The fee for one-credit workshops, with no other course enrollments, is $181 for undergraduate students and $280 for graduate students.

Other Fees

Catalog	$5
Diploma Replacement	$20
Identification Card Replacement	$20
Returned Check Charge/ Returned Direct Debit	$20
Masters Thesis	$15
Ph.D. Thesis	$70

Fee Payment

The Receivables Office bills students for tuition, room and board, and various other university charges. A statement of charges will be mailed on the first of each month to students at their in-session or interim address. It is the student's responsibility to ensure the Office of the Registrar has a correct mailing address. The billing statement is also available on the student's account on AccessPlus on the first of each month. Students may pay their university bill by direct debit through AccessPlus.

Students who do not receive a billing statement before the term begins and are unable to use AccessPlus to view their bill, should contact the Receivables Office to learn the amount of their account balance due. *Failure to receive a billing statement or view their account on AccessPlus will not exempt students from late penalties or from having a hold placed on their registration.*

If payment of the minimum due is not made by the deadline printed on the billing statement, all fees become due immediately. A one-percent finance charge will be assessed on the total amount due at that time, and a "hold" will be place on the student's registration until payment of the total amount due has been made.

If a student's registration has been canceled for nonpayment of fees, he or she may be reinstated with written permission from their college.

Deferred Payment

Students who do not pay their first payment in full by the due date will automatically select the deferred option, and will be charged a $20 administrative fee. Summer fees may be deferred for a $15 administrative fee.

University fees are payable in three installments for fall and spring semesters. Payments for fall semester will be due August 20, September 20, and October 20. Payments for spring semester will be due January 20, February 20, and March 20. Summer fees may be will be due May 20, June 20 and July 20. If any of the payment dates fall on a holiday, Saturday or Sunday, the payment is due the next day the university is open for business.

Twelve-Month Payment Plan

Under the Twelve-Month Payment Plan, students pay the academic costs for fall and spring semesters in 12 installments beginning April 20 and ending the following March 20. A $50 enrollment fee is due with the first monthly payment. All payments are deducted from the student's designated bank account. For more information about the Twelve-Month Payment Plan, contact the Receivables Office.

Past Due Accounts

Students with past due accounts receivable charges prior to the beginning of classes will be dropped from enrollment if these past due accounts are not paid before the first day of classes.

Refunds

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

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

Withdrawal Date	Student Pays
Before first day of classes	0%
During class days 1-8	10%
During class days 9-20	50%
During class days 21-40	75%
After the fortieth day of classes	100%

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

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

Fee refund for students who drop into light classification (less than full-time): 100 percent if change is made during first three weeks. No adjustment is made after the third week.

Appropriate prorated adjustments in the refund schedule are made when partial term courses are involved.

Workshop and Short Courses Refunds: Students who drop workshops or short courses of one or two weeks on or before the first class meeting receive a 100% tuition adjustment for the course. No tuition adjustment will be made after the first day of classes. Students who drop three-week courses receive a 100% adjustment if they drop on or before the first day of classes, a 90% adjustment if they drop on the second day of classes, and no adjustment after the second day of classes.

Student Financial Aid

The Office of Student Financial Aid staff helps families afford Iowa State University. Grants, scholarships, loans, and part-time employment opportunities are available in various combinations to pay the difference between the amount the student and his or her parents can reasonably be expected to provide and the cost of attending Iowa State University.

All state and federal aid programs are subject to review by their respective governing agencies and may be changed without notice.

Eligibility for many forms of financial aid is determined by the Free Application for Federal Student Aid (FAFSA). These applications are available from high schools or online at www.fafsa.ed.gov by November of each year. Students should submit the FAFSA by mid-February prior to the fall term of enrollment, in order to receive priority consideration. A new application must be completed each academic year. **Applications must be received no later than March 1.** Applications received after March 1 will be awarded as funds are available. New students enrolling spring semester or summer session should complete the current year's aid application to apply for any available financial aid. To be eligible for financial aid, a student must be a U.S. citizen or permanent resident, enrolled on at least a half-time basis, and making satisfactory academic progress toward a degree. If signed copies of the student's and parents' income tax returns are requested, they should be sent directly to the Office of Student Financial Aid.

Students may use their financial aid for study in other countries if they have clearance for the transfer of credit to their degree programs and have made financial aid arrangements prior to departure. For further information, contact the Study Abroad Center, 256 Memorial Union, or the Office of Student Financial Aid, 210 Beardshear Hall.

Financial aid programs generally consist of three types: gift aid (scholarships and grants), loans, and part-time employment. Laws, regulations, and policies governing these programs are subject to change.

I. Gift Aid

A. Scholarships

1. ISU Scholarship/Grants. These awards are based on financial aid eligibility as determined by the FAFSA. A student must complete the FAFSA to be considered. Many of these awards are based on academic or other special talent in addition to financial eligibility.

2. Entering freshmen can obtain information on the Web at www.iastate.edu/~fin_aid_info/.

3. College and Departmental Scholarships. Students are encouraged to contact the scholarship chair in their department or college. Scholarships based on academic achievement and/or financial need are available in most areas of study, but students may need to complete separate applications to be considered.

4. Military Officer Education (ROTC) Scholarships:
Army. The Military Science Department offers 4-, 3-, and 2-year Army ROTC scholarships to qualified students on a competitive basis in virtually any academic discipline. These scholarships provide payment of tuition, all required fees (except student health), books and supplies allowance, and a monthly cash subsistence allowance. For applications or additional information, contact the Military Science Department at 132 Armory or call 515-294-1852.

Navy. The Naval Science Department offers several scholarship programs to qualified students. The scholarships cover payment of tuition, fees, books, and a monthly stipend. Information is available from the Naval Science Department, 3 Armory, or by calling 515-294-6050.

Air Force. The Air Force offers Air Force ROTC scholarships for periods of 2, 3, or 4 years, with up to 1 additional year for qualified applicants in selected majors. The scholarships provide payment of tuition and fees. In addition, scholarship cadets receive between $250-$400 monthly subsistence allowance and $510 per year book allowance. Express scholarships are also available to students qualified in certain technical academic majors. Details on scholarship qualification, application procedures, and eligibility are available from the Department of Air Force Aerospace Studies, 515-294-1716.

5. Other Scholarship Sources: Students are encouraged to pursue funds from agencies and private organizations on campus and in their hometowns. An excellent resource is the Financial Aid Web site: www.iastate.edu/~fin_aid_info.

B. Grants

1. Federal Pell Grant. The maximum annual award under this program is $4,000. All undergraduate applicants for financial aid must apply for the Federal Pell Grant by completing the FAFSA. These forms are available from high school counselors, the Office of Student Financial Aid, or online at www.iastate.edu/~fin_aid_info/.

2. Federal Supplemental Educational Opportunity Grant. An eligible undergraduate student may be awarded a grant of $100 to $4,000 on the basis of financial need. A student must complete the FAFSA in order to be considered.

3. Iowa Grant. Iowa residents demonstrating financial need may be eligible for a $1,000 Iowa Grant. Students must complete the FAFSA to be considered.

4. Officer Education (ROTC) Financial Assistance Grants. All students enrolled in Advanced ROTC (third and fourth years) in the Army, Navy, and Air Force programs are provided a monthly stipend. For further information, contact the appropriate ROTC department in the Armory.

5. Tuition Assistance Grant for Undergraduate Foreign Students. Undergraduate foreign students who are faced with financial hardship resulting from unforeseen circumstances may apply for this grant. The maximum award is $700 per academic year. Apply to the Office of International Education Services, 252 Memorial Union.

6. International Student Financial Aid. International students may contribute a small voluntary fee to this fund. These monies will be used to assist international students who have unforeseen financial emergencies. For further information, contact the Office of International Education Services, 252 Memorial Union.

II. Loans

A. Federal Perkins Loan. An eligible undergraduate student may borrow up to $4,000 per year, depending on financial need and the availability of funds. A maximum total of $40,000 may be borrowed for undergraduate and graduate programs combined. Interest of 5 percent on the unpaid balance begins with repayment of the loan principal 9 months after ceasing at least half-time enrollment. A student must complete the FAFSA in order to be considered for a Federal Perkins loan.

B. University Long-Term Loans (ULTL). Private donors contribute the funds for these loans, which are awarded on the basis of need to undergraduate and graduate students. The interest rate of 5 percent begins with repayment of principal 6 months after ceasing at least half-time enrollment. Deferment provisions are available in some instances. A student must complete the FAFSA in order to be considered.

C. Federal Health Professions Loans and Scholarships. These programs are limited to those students accepted for enrollment in the College of Veterinary Medicine. The loan funds have a 5 percent interest rate. Deferment and cancellation provisions are available in some instances. The FAFSA is required, and parental information must be provided, regardless of age or dependency of the student.

D. University Emergency Loans. The Emergency Loan Program is intended to meet students' unplanned and unexpected education-related expenses. (These loans are not available to students who are enrolled only in off-campus courses.) Applicants must demonstrate that they have a verifiable means by which to repay their loans by the due date. Interest on emergency loans will begin on the

date the loan is processed in the Treasurer's Office and is computed at the simple monthly rate of .75 percent of the unpaid balance (an annual percentage rate of 9 percent). Emergency loan applications can be obtained at the Office of Student Financial Aid, Room 0210, Beardshear Hall. Students should allow 48 hours for processing the emergency loan application.

E. William D. Ford Federal Direct Loans. Several types of Federal Direct loans are available to students.

1. The **Federal Direct Subsidized Stafford Loan** and the **Federal Direct Unsubsidized Stafford Loan** are low-interest loans made by the government to help pay for education after high school. Subsidized Direct Stafford loans will have all interest charges paid by the federal government while the student is enrolled in school on at least a half-time basis. The interest on the unsubsidized Direct Stafford loan will be the responsibility of the student and can be paid while the student is in school or added to the outstanding loan balance for payment after graduation.

Students must complete a FAFSA form to be considered for either loan. Students are eligible to borrow up to the amount of their financial need in the subsidized loan. The student may then choose to borrow any remaining amount, up to the federal maximum, in an unsubsidized Direct Stafford loan. Freshman students may borrow a combined total through either program of up to $2,625 per year. Sophomore students may borrow up to $3,500 per year, and junior and senior students may be eligible for up to $5,500 per year, with a $23,000 undergraduate maximum for all years combined. Graduate students may be eligible for up to $8,500 per year, with a $65,500 maximum, including all undergraduate loans.

For new borrowers, the interest rate is a variable rate which is tied to the 91-day treasury bill plus 1.7 percent. The interest rate is adjusted annually and is capped at 8.25 percent. Repayment does not begin until six months after graduation. Students are strongly advised to counsel with a financial aid adviser as increased loan indebtedness occurs.

2. Federal Direct Unsubsidized Stafford Loan for Independent Students. To be eligible, a student must be either an independent undergraduate student or a graduate/professional student. Completion of a FAFSA form is required. Eligible freshman and sophomore students may borrow up to $4,000 per year. Eligible juniors and seniors may borrow up to $5,000 per year, with a cumulative undergraduate maximum of $23,000. Graduate/professional students may be eligible to borrow up to $10,000 per year, with a cumulative total of $73,000.

Eligible independent students who borrow through both the subsidized and the unsubsidized Federal Direct Stafford Loan programs and are freshmen can borrow up to a total of $6,625 per year. Independent sophomores can borrow up to $7,500 per year, and independent juniors or seniors, $10,500 per year. Cumulative borrowing for undergraduate years could reach a total of $46,000.

Eligible graduate students can borrow up to $18,500 per year between the subsidized and the unsubsidized programs. Total indebtedness for a graduate student borrowing through both programs may not exceed $138,500. This amount includes undergraduate debt in these two programs.

All students are strongly advised to discuss their loan indebtedness with a financial aid adviser before combining several types of loans.

3. Federal Direct PLUS Loan. The interest rate for Federal Direct Parent Loans for Undergraduate Students (PLUS) is tied to the 91-day treasury bill rate plus 3.1 percent, with maximum interest being 9 percent. Through the Federal Direct PLUS program, parents may borrow the entire cost of education, less the amount of any financial aid the student is receiving. There is no limit on loan indebtedness, although a credit analysis will be conducted before funds can be disbursed.

F. Alternative Loans. Private financial institutions provide these loan funds, which are approved on the basis of a credit analysis. Amounts, interest rates, and repayment terms will vary, depending upon the financial institution selected. Interest will begin to accumulate immediately, although forbearance of the interest and principal can be made until after graduation. Some programs will require the student to obtain a creditworthy cosigner. A FAFSA form is not required to apply for this loan.

III. Part-time Employment

A variety of employment opportunities are available for students to earn a portion of their educational expenses.

A. Federal Cooperative Education Program. This program combines classroom learning with paid work experience designed to develop students into the federal government's future professionals and managers. The federal government seeks highly motivated, flexible, and creative students to fill co-op assignments across the country in laboratories, offices, forests, parks, hospitals, and in ocean and space programs in a wide variety of occupational fields. There are two different types of work schedules: alternate periods of work and study (full-time student one semester and full-time worker the next) or part-time (parallel periods of work and study). Students interested in the Federal Cooperative Education Program can contact the director of ISU Career Planning and Placement Services by calling 515-294-9490.

B. Internship Programs. Most college departments offer internship programs to enhance the student's education and career preparation by integrating classroom theory with on-the-job performance. These programs enable students to test career and professional goals; develop confidence, maturity, and work-related skills; and establish professional contacts and interests. Contact the respective department for specific program information.

C. Work-Study Programs. Both federal and state funds subsidize need-based programs that permit students to be employed on campus or off campus in nonprofit agencies. A portion of the student's total earnings is paid by federal, state, or institutional funds, and the remainder is paid by the employing department. Students apply for Work-Study by completing a FAFSA by the priority deadline, and indicating that they wish to work. Part-time job listings are available at the following URL: www.iastate.edu/~fin_aid_info/Employment.

D. University Student Employment. University employment is available to all students who are U.S. citizens or to those international students who have obtained a work permit. Wages are paid 100 percent by the employing department. Many students who live in university residence halls apply for work in the residence hall food service to help meet the cost of room and board. Students interested in food service employment may apply directly to the assistant director of residence in charge of food service, Residence Department, Friley Hall, Iowa State University, Ames, Iowa 50012. Part-time job listings are available at the following URL: www.iastate.edu/~fin_aid_info/Employment.

E. Off-Campus Employment. The off-campus employment program seeks part-time employment opportunities for students who would like to work while they are in school. Restaurants, hotels, service stations, and retail stores are examples of local employers that list positions with the Student Employment Center. These jobs are available to any ISU student, graduate or undergraduate, regardless of financial need. Job listings can be found at www.iastate.edu/~fin_aid_info/Employment

IV. Other Financial Aid

Many other forms of financial aid are available to students who qualify, including Vocational Rehabilitation, Veterans Benefits, and Department of Human Services programs. For further information on these programs, contact the appropriate government office.

Student Housing and Dining

Director of Residence: Randy Alexander

Director of ISU Dining: Jonathan Lewis

Associate Directors: Virginia Arthur, (Residence Life); Darryl Knight (Facilities Operations); Gregory Lee (Administrative Services); Carol Petersen (Residential Dining); Karen Larson (Catering)

Assistant Directors: James Judy (Facilities Planning); Doug Gruenewald, (Academic Services)

The university provides residence hall housing facilities for more than 7,000 single undergraduate students. In addition, more than 1,000 apartments are available on campus for families and for single students.

Each student who accepts his or her admission to the university will receive a housing contract. Priority for housing for new students is based upon the date on which housing contracts and the accompanying $135 prepayment are received in the Department of Residence Administrative Office. Acceptance of admission to the university is necessary before a housing contract will be accepted.

Address correspondence concerning on-campus housing and dining to the Administrative Office, Department of Residence, 2419 Friley Hall, Iowa State University, Ames, Iowa 50012. E-mail: halls@iastate.edu (residence halls), dining@iastate.edu (dining), frederiksencourt@iastate.edu (Frederiksen Courtapartments)or apartments@iastate.edu (University Family Housing), or phone toll free: (800) 854-9050. Additional information may be obtained at www.iastate.edu/dor.

Undergraduate Residence Halls

Most of the rooms in residence halls are planned for double occupancy; however, some rooms accommodate three persons. In addition, a limited number of single rooms are available. All rooms are furnished with extra-long twin beds, innerspring mattresses, chests of drawers, individual study desks, chairs, cable television connections, and Ethernet connectivity. Students provide their own bed linens, throw rugs, blankets, pillows, towels, and study lamps (except in Maple, Willow, and Larch Halls, where study lamps are furnished). Students are responsible for maintaining the cleanliness and order of their own rooms.

Home-style meals are provided for all residents in the halls. Students living off-campus may also purchase a meal plan by visiting the Administrative Office at 2419 Friley Hall. Dining Dollar$ are part of the meal plan and can be used at any residence C-store, Hawthorn Market & Cafe, or for additional meals or services at any residence dining facility.

A single student who resides in an undergraduate residence hall must sign a contract for room and board for the academic year or the remainder thereof, if contract is signed after fall semester begins. All charges are subject to change. The rate for the academic year 2002-03 was $5,020 for a basic double occupancy room and full meal plan.

Students may move out of the residence halls at any time during the academic year upon payment of room and board for the term of occupancy plus forfeiture of the prepayment and a charge of 20 percent of the remainder of the contract if the student remains enrolled. For additional information concerning the residence hall contract, students should contact the Administrative Office (2419 Friley Hall) before making the final decision.

In addition to the basic necessities, several special services are available for use by residents. These include house dens for informal get-togethers and relaxation, lounge areas for meeting and entertaining guests, vending areas for snacks, hall desks with fax and copy machines, entertainment and recreational equipment, mail delivery and check-in and check-out location within the residence halls, indoor and outdoor recreation areas and intramural equipment owned by student government, fitness centers, laundry facilities in each hall, special study areas in each complex, private dining rooms for specially- prepared house and organization dinners, meeting rooms and offices for student organizations, computer labs, and parking lots assigned to the residence halls.

The residence halls are organized geographically into three neighborhoods: Towers, Richardson Court, and Union Drive. The students in each of these neighborhoods elect a group of executive officers to be responsible for coordinating neighborhood events and activities. Each neighborhood funds and maintains a social program, an intramural program, and numerous committees that supplement the total social and educational development of the individual residents. The three neighborhoods, in addition to having their own individual student governments, also are joined in an Inter-Residence Hall Association (IRHA) with an all-residence hall parliament; they jointly sponsor the KURE FM stereo radio station, Residence Hall Week, weekly movies, scholarships, leadership conferences, and more.

Each neighborhood is further organized into smaller living groups called houses. These houses of 40 to 60 members are the foundation of Iowa State University's residence hall program. Members of the houses elect their own officers, and the majority of programs is planned on a house participation basis. Participation in the house program is a great way for students to receive full benefit from the residence hall experience.

Students may choose to live in coed houses. These houses have male and female students living at opposite ends of the house or on separate levels of the house. They have separate bathroom facilities, but share lounge facilities and house activities.

Learning communities, which bring together students who have similar academic goals, are also available in the residence halls. These communities offer a collaborative living and learning environment, increased student/faculty interaction, social and academic networks essential to student success, and a sense of membership in the ISU community.

Currently, the following learning communities are available: ACES (Agriculture Community Encourages Success); ABE (Agricultural and Biosystems Engineering); Animal Ecology; BEST (Biology Education Success Team); BLT (Business Learning Teams); CCLC (Cross-Cultural Learning Community); Common Threads (Textiles and Clothing); Computer Engineering Learning Teams (CELTS); Computer Science; Design Exchange; FSHN (Food Science and Human Nutrition); Honors; HDFS (Human Development and Family Studies); LEAD (Leadership Through Engineering Diversity); MLC (Multicultural Learning Community); and WiSE (Women in Science and Engineering). A leadership-themed house is also available. For the most up-to-date information on learning community opportunities at Iowa State, see www.iastate.edu/~learncommunity/.

Undergraduate and Graduate Single Student Apartments

Frederiksen Court is one of the newest communities at Iowa State, providing on-campus apartments to single graduate and upper-class undergraduate students. The apartments include such amenities as central air-conditioning, living room and bedroom furniture, microwave, dishwasher, and garbage disposal, as well as a washer and dryer in each apartment. The Frederiksen Court Community Center is the center of activity at Frederiksen Court. It features meeting rooms and lounge space, a fitness center for residents, office equipment for resident use, and a retail dining facility at Hawthorn Market and & Cafe. Hawthorn Market & Cafe offers hot meals, snacks, beverages, and convenience items.

The apartments, which are available in two- and four-bedroom layouts, accommodate four persons of the same gender. Rent for academic year 2002-03 was $3,229 for a two-bedroom and $3,826 for a four-bedroom. Rent includes electricity, water, garbage pickup, basic phone service, basic extended cable, and Ethernet, and rent is conveniently paid as part of the resident's university bill.

University Family Housing

The university provides 760 apartments in University Village and Schilletter Village. The 2002-03 academic year rates for these apartments were $431-492 per month for University Village, and $462-509 per month for Schilletter Village. The apartments are furnished with stove and refrigerator, and central air conditioning units are included in the University Village apartments. Rental rates include cable television, high-speed Internet connectivity, water, and garbage removal service. Residents pay for their own gas, electricity, and telephone.

To be eligible for a University Family Housing apartment, residents must be registered for classes during the semester of move-in.

A number of University Village apartments also are available to single students. Single students must be either a graduate student or at least 23 years of age.

Off-campus Housing for Students

Availability and cost are factors to be considered when living off campus. Sleeping rooms in older houses, apartments, and duplexes make up the bulk of off-campus housing.

The Off Campus & Adult Student Services, B6 Memorial Union, keeps a listing of off-campus rental units. Other housing may be obtained through real estate agents, local newspapers, or by contacting individual owners.

It is best that the student come to Ames well in advance of the time he or she plans to begin academic work, as many units are rented 3 to 6 months in advance. The single occupancy room rental rates average $200 to $500 per month. Average rental rate per student sharing an apartment or house would be in the $250 to $400 range per month. Board for students living in off-campus rooms may be obtained in residence hall dining rooms, private restaurants, or the Memorial Union.

A meal plan is available in the Department of Residence to off-campus students that provides any one meal per day, Monday through Friday, while classes are in session. Information may be obtained from the Administrative Office, Department of Residence, 1215 Friley Hall, Iowa State University, Ames, Iowa 50012-0003.

Fraternities and Sororities

Of the 51 fraternity and sorority chapters on the Iowa State University campus, 43 have chapter houses, and provide housing for about 1,800 undergraduate students. The seven historically Black Greek fraternities and sororities do not provide residential facilities for members, but are active in scholastic, service, and social projects.

The chapter house facilities are similar to a private residence: living room, den, kitchen, dining room, laundry room, etc. The staff in the Office of Greek Affairs, a department in the Dean of Students Office, provide advising, programs, and services for the Greek chapters and organizations. Local alumni work with each fraternity and sorority to ensure that the chapter structure meets all the state and local building, safety, and fire codes that are required with incorporation under the State Law of Iowa.

The average cost of living in a fraternity or sorority chapter house ranges from $300 less to $300 more per year than living in the residence halls, or an off-campus apartment. The cost includes room, board, and social dues. Fees average $50 for a pledging fee and $150 for the initiation fee.

Men may move directly into a fraternity house at the beginning of an academic year if they pledge a chapter that has a house. Typically, they continue living there throughout their college years. Women pledging a sorority during formal recruitment or informally throughout the year generally live in the residence halls for the academic year. However, as space becomes available in a chapter house, sorority members often move into the house as sophomores or upper-class women.

If a student moves into a chapter house from the residence halls and has to break a contract, the student will forfeit the deposit and owe a percentage of the cost of the contract. Most of the chapters compensate a student to a degree. Because the compensation amount differs among houses, a student should communicate with the chapter before changing residences.

Student Services

The University Library

Dean of Library Services: Olivia M.A. Madison, M.L.A.

General Information–(515)-294-3642
Library Hours–(515)-294-4849

The University Library provides a wide array of print, non-print, and electronic information resources, which are housed in the main Parks Library, the e-Library, the Veterinary Medical Library, and four subject-oriented reading rooms (design, economics and sociology, mathematics, and physical sciences). The library's extensive collections support research and study for all ISU graduate programs, with the strongest support at the Ph.D. level. These collections are nationally recognized for their strengths in basic and applied fields of biological and physical sciences. Library holdings include more than 2,300,000 volumes and approximately 20,000 serial subscriptions.

The library encourages use of its collections and many services, and assistance is provided at eight public service desks. These desks include the Reference Desk, Reserve and Media Services, Interlibrary Loan/Document Delivery, the Circulation Desk, the Periodical and Newspaper Room, the Microforms Center, Special Collections, and the Map Room. In addition, instruction in the use of library resources is offered to graduate and undergraduate students.

The library's e-Library, accessed through the Internet, provides access to the local online catalog; indexing and abstracting databases; electronic journals and books; and selected Internet sites. Assistance in using this vast body of electronic resources is available at the Reference Desk and through individually arranged appointments with reference librarians.

The Parks Library has a limited number of semiprivate study rooms available for faculty, graduate students and professional and scientific staff. They are intended for research and other scholarly activities that require extensive use of library material. Normally, assignments are made for a semester at a time.

Student Counseling Service

Director: Terry Mason, Ph.D.
Associate Director: Michelle P. Clark, Ph.D.

Professional Staff: Patricia G. Andersen, Ed.D.; Lenore M. Biden, Ph.D.; Jonathan H. Brandon, Ph.D.; Janet S. Croyle, M.Ed.; Marty I. Martinez, Ph.D.; Michelle M.Hall, M.Ed.; Martha S. Norton, M.S.; Jennifer L. Sikute, Ph.D.; Suzanne Zilber, Ph.D.

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

Available services include individual counseling, relationship/couples counseling, career counseling and exploration, substance abuse assessment, and learning disabilities screening. Group counseling is also available for a variety of issues including adult children of alcoholics, depression, eating disorders, self-esteem and relationships, problem solving, and relaxation/stress management. SCS also offers a number of outreach programs and workshops.

Counseling services are offered at no cost to ISU students. However, a nominal fee for testing may be required. Counseling is strictly confidential. SCS staff will not release any information to anyone outside of the Student Counseling Service without the written permission of the client, unless an imminent harm condition exists.

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

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

Thielen Student Health Center

Director: James O. Nelson, H.H.A., C.H.E.
Physicians: Mark Blaedel, M.D.; Charlotte Cleavenger, D. O.; Robin Engstrom, M.D.; Rebecca Fritzsche, M.D.; Malhar Gore, M.D.; Pauline Miller, M.D.; Cosette Scallon, M.D.; Marc Shulman, M.D.; Lee Wilkins, M.D.

Thielen Student Health Center is located on the corner of Sheldon Avenue and Union Drive, just west of Beyer Hall. Services include doctor and nurse consultations, physical exams, laboratory and x-ray services, sports medicine and physical therapy, immunizations, pharmacy, diet and nutrition consultation, fitness consultation, computerized health risk appraisal, stress management, wellness assessment, workshops, free and confidential HIV testing, and referral services.

The student health fee partially finances the services of the Thielen Student Health Center and is charged to all students taking 5 or more credits each semester. Those taking 4 or fewer credits may access services at reduced cost by paying the health fee. Spouses/domestic partners of students who opt to pay the health fee also have access to services. Students with less than 5 credits who elect not to pay the health fee may still be seen at the Thielen Student Health Center, but will be charged for the services provided. International students and their spouses/domestic partners are required to participate and pay the health fee. The health fee is not a substitute for health insurance. It is a prepayment plan that complements the student's individual insurance coverage.

Clinic hours:
Monday and Tuesday, 8 a.m.-8 p.m.
Wednesday, 9 a.m.-6 p.m.
Thursday and Friday, 8 a.m.-6 p.m.
Saturday, 8 a.m.-12 noon.

Hours vary during breaks. Patients are seen by appointment. Each patient has the option of seeing the provider he/she requests.

The Thielen Student Health Center operates on an appointment/assessment system. Students are encouraged to call ahead for an appointment. For urgent medical needs, no appointment is needed to come to the clinic. Those students will be assessed by a staff nurse to determine whether they need to see a physician immediately, or if they should make an appointment for later in the day. Students with urgent medical needs will see a physician right away. Those with less urgent needs will see a physician at a later time. For more information, call 515-294-5801.

Service is available for emergency problems after regular clinic hours at Mary Greeley Medical Center Emergency Room. The cost is the responsibility of the student and/or the student's insurance plan. All records are confidential. Student records are not available without the student's written permission.

Career Services Offices

Director: Beverly S. Madden, M.S., 0570 Beardshear Hall
Agriculture: Michael Gaul, M.S., 141 Curtiss Hall
Business: Steven Kravinsky, M.S., 208 Carver Hall
Design: Margaret Hutcheson, M.Ed., 297 College of Design
Education: Toni Humpfer, M.S., E105 Lagomarcino Hall
Engineering: Larry Hanneman, M.S., 301 Marston Hall
Family and Consumer Sciences: 132 MacKay Hall
Liberal Arts and Sciences: Steven Kravinsky, M.S., 208 Carver Hall
Veterinary Medicine: Elizabeth Reidesel, DVM, 2270E Veterinary Medicine

Career services are provided in each college to assist students, undergraduate and graduate, and alumni with their career-related needs. A broad range of programs and services are offered including online registration, position listing and interview scheduling; résumé referral; coordination of co-op and internship programs; workshops and seminars on career exploration, résumé preparation, letter writing, job search techniques, interview skills, applying to graduate and professional schools, and adjusting to the first job.

Each year career services sponsor six college career-information days plus the graduate and professional school day, an international opportunities festival, the social services career day, and a summer job fair. Extensive career and job search information is provided online. Each college career services office serves as a point of entry for students, alumni, and employers to the entire ISU network of coordinated, decentralized career services.

Student Answer Center

www.answer.iastate.edu/

Students who have questions but are not sure where to find an answer may contact the Student Answer Center located on the ground floor of Beardshear Hall. A staff member will answer campus-related questions on the spot or provide referrals to other university departments as needed. Information may include registration instruction, financial aid status, or classroom directions. Students can pick up forms, information brochures, campus maps, or use one of the computers to access AccessPlus or e-mail. Answers to frequently asked questions also are available at www.answer.iastate.edu/. Questions can be sent by e-mail answercenter@iastate.edu or by phone 515-294-4469.

International Education Services

www.public/iastate.edu/~internat_info/

Study Abroad Center: www.iastate.edu/~study-abroad/

Director: Dennis Peterson, M.A.

Assistant Director, International Students and Scholars: Brenda Thorbs-Weber, Ph.D.

Assistant Director, Study Abroad Center: Trevor Nelson, Ed.D.

Coordinator of International Services: Rebecca Matters

Coordinator of Administration: Deborah Vance, M.B.A.

Senior Program Coordinator: Chistine Gemignani, M.A.

Program Coordinators: Luiza Dreasher, Ph.D.; Jane Edwards, M.S.; Kamal Elbasher, Ph.D.; Creighton Gaynor,B.M.; Nancy Guthrie, B.A.; Virginia McCallum, M. A.

Program Assistant: Arlis Penner
International Education Services (IES) is committed to courteous, accurate, timely service and informative programs for international students and visiting scholars, Americans seeking overseas opportunities, and citizens of Iowa interested in international education. IES staff members orient and advise internationals on university procedures, community resources, U.S. visas and personal concerns. Persons interested in study and/or work abroad find a wealth of information at the IES Study Abroad Center. The Center maintains information on scholarships, health and safety abroad, world cultures, and travel, as well as over 200 ISU programs and thousands of opportunities through other institutions. Staff assist not only students, but also faculty and staff traveling abroad. Project Assist provides logistical and other support to faculty developing new group study abroad programs. IES intercultural programs, such as the Culture Corps, Friendships International, Conversational English and activities developed with the International Student Council and dozens of international student organizations, bring international students and Americans together for mutual learning. We welcome volunteers to join these and other programs.

Dean of Students Office

www.dso.iastate.edu/
Dean of Students: Peter Englin, Ph.D., Student Services Building

Assistant Dean of Students: Vernon A. Wall, M.S., B6 Memorial Union

Assistant Dean of Students: Alisa Frandsen, M.Ed., B6 Memorial Union

Assistant Dean of Students: Grace Weigel, M.S., Student Services Building

Assistant Dean of Students: Sharon McGuire, Ph.D., Student Services Building

Academic Success Center
Assistant Dean of Students: Sharon McGuire, Ph.D., Student Services Building

Manager Disability Resources: Bea Awoniyi, M.S., Student Services Building

Coordinator, Disability Resources: Todd Herriott, M.S., Student Services Building

Coordinator, Supplemental Instruction: Kari Hensen, M.S., Student Services Building

Greek Affairs
Assistant Dean of Students: Alisa Frandsen, M.Ed., B6 Memorial Union

Judicial Affairs
Assistant Dean of Students: Grace Weigel, M.S., Student Services Building

Program Assistant: Bethany Schuttinga, M.S., Student Services Building

Lesbian, Gay, Bisexual, and Transgender Student Services
Dean of Students: Peter Englin, Ph.D., Student Services Building

Margaret Sloss Women's Center
Director: Penny Rice, M.S., Sloss House

Minority Student Affairs
Associate Dean of Students & Minority Student Affairs Director:

Program Assistant: Irma Wilson-White, B.A., Student Services Building

Program Assistant: Grif Kolberg, B.A., Student Services Building

Program Assistant: Yanira Pacheco, B.A., Student Services Building

Parents Association (ISUPA)
Bethany Schuttinga, M.S., Student Services Building

Recreation Services
Director: Mike Harvey, M.S., 2220 State Gymnasium

Associate Director: Scott White, M.S., 2220 State Gymnasium

Coordinator, Intramural Program: Garry Greenlee, M.S., 1264 State Gymnasium

Coordinator, Intramural Sports: Linda Marticke, M.S., 1262 State Gymnasium

Coordinator, Intramural Sports: Randy Heimerman, M.Ed., 1224A State Gymnasium

Coordinator, Fitness Programs: 111 Lied Recreation Center

Coordinator, Sports Clubs: Alan Murdoch, Ph.D., 1227 State Gymnasium

Coordinator, Outdoor Recreation Center and Programs: Jerry Rupert, M.S., 2220 State Gymnasium

Coordinator, Facility Operations: Doug Arrowsmith, M.S., 119 Lied Recreation Center

Administrative Specialist: Pamela Lyon, B.A., 2220 State Gymnasium

Program Assistant II, Facility Operations: Lied Recreation Center

Student Activities Center
Assistant Dean of Students: Vernon A. Wall, M.S., B6 Memorial Union

Assistant Director, Student Activities: Laura Bestler-Wilcox, M.S., B6 Memorial Union

Student Assistance Services
Dean of Students: Peter Englin, Ph.D., Student Services Building

Student Legal Services
Student Legal Advisor: Paul Johnson, J.D., B11 Memorial Union

Student Legal Advisor: Michael Levine, J.D., B11 Memorial Union

Student Support Services
Director: Japannah Kellogg, M.S., Student Services Building

Program Assistant: Laura Thilmany, M.S., Student Services Building

Program Assistant: Deb DeWall, M.S., Student Services Building

The Dean of Students Office (DSO), comprised of 13 different units in seven different campus locations, provides a wide array of services and programs outside of the classroom that enhance each student's education at Iowa State. Its goal is to support the University's commitment to academic success and the holistic development of each individual student by challenging students intellectually, physically and socially.

The DSO coordinates a variety of services that are each distinct and different, but nonetheless similar in their orientation toward maximizing students' educational opportunities.

Staff members in the various units of the DSO provide assistance for students with their personal adjustment to college, with academic problems, or with interpretation of university or legal policies and procedures. Assistance services are also provided for students in particular populations, such as: those with disabilities; adult and off-campus students; lesbian, gay, bisexual, and transgender students; first-generation college students; and women students. Educational programs and workshops in the areas of leadership, time management, and interpersonal skills are presented on an ongoing basis and when requested by campus groups. Recreation Services provides a wide variety of intramural and recreational activities for all skill levels. Activities and programs for and about women are facilitated by the Women's Center. The Student Activities Center (SAC) registers and provides services and programs for student organizations and Greek Affairs coordinates fraternity and sorority chapters.

Academic Success Center (ASC)

The Academic Success Center encompasses several academic assistance programs. The services available at the ASC include the following: resources for students with disabilities; course-specific Tutoring Services and Supplemental Instruction; general assistance through the Learning Lab, providing individual consultations for those with needs related to study skills/time management; and a one-credit study skills class (Psychology 131). All programs are focused on helping students learn how to learn and achieve their academic goals. For more information visit the web site at www.dso.iastate.edu/dept/asc/.

Disability Resources (DR) coordinates support services that students may need in order to reach their fullest academic potential. The DR staff members provide accommodations and serve as a resource within the university community concerning students who have physical or learning disabilities. DR provides assistance, information, support, counseling, education, referral, and awareness to students, faculty, staff, the Ames community, and the state of Iowa. Call 515-294-6624, TTY 515-294-6635, for further information.

The mission of Tutoring Services is to enhance academic growth and success. Tutoring is the process by which students can get more individualized instruction for undergraduate courses offered at ISU. Tutoring recruits and screens tutors, works out convenient times to meet, collects fees, and pays tutors. For information call 515-294-6624.

Supplemental Instruction (SI) is a free academic assistance program for difficult selected 100 and 200 level courses. Peer SI leaders who have demonstrated competence in the course, attend classes and conduct biweekly sessions to help students learn and study the course material. A complete schedule can be viewed on the Web.

The Learning Lab is a "learning how to learn" center. A service to students, the Learning Lab helps them with tips on how to succeed in the classroom. The Learning Lab is staffed with psychology graduate assistants who work with students to pinpoint areas in their study strategies that might need improvement.

A one-credit study skills course, Psychology 131, that addresses academic success strategies as well as a variety of reading and study strategies and tactics from time management to test taking is offered each semester. Class size is limited to allow for group interaction as well as individual attention.

Greek Affairs

The Office of Greek Affairs oversees ISU's fraternities, sororities, and affiliated Greek organizations. Greek Affairs provides advising, consultation, and educational services to the fraternities and sororities at Iowa State. Professional staff and graduate assistants work with student leaders, members, and chapter advisers to provide support to the chapters and to advise Collegiate Panhellenic Council, Interfraternity Council, National Pan-Hellenic Council, Greek Week, Fall Blood Drive, Spring Blood Drive, Order of Omega, Junior Greek Council, and other student organizations and activities affiliated with the Greek Community.

The 49 fraternities and sororities at Iowa State University have approximately 2,600 student members (1,600 men and 1,100 women), or about 12 percent of the undergraduate student population. The Greek Affairs staff and local alumni work with each fraternity and sorority to ensure that the chapter is meeting the educational objectives of the university, their national affiliates and the developmental needs of the students. Fraternities and sororities have been active at Iowa State University since 1875. For more information visit B6 Memorial Union, call 515-294-1023, or view from the web, www.dso.iastate.edu/dept/greekaffairs/.

Judicial Affairs

The Office of Judicial Affairs is responsible for the university's Centralized Judicial System. Representatives from the Office of Judicial Affairs interpret university policies and conduct student disciplinary hearings for academic and nonacademic violations of the ISU Student Disciplinary Regulations. As members of the Iowa State University community, all students have certain rights and responsibilities. When an alleged violation of the Student Disciplinary Regulations occurs, a representative from the Office of Judicial Affairs investigates the complaint, interprets general university regulations and guidelines, conducts student discipline hearings which ensure the standards of due process, and consults with faculty, staff, and students regarding student conduct issues.

Student discipline hearings are conducted in accordance with the rules and regulations as set forth in university policies and procedures. Disciplinary hearings are administered by a member of the Judicial Affairs staff or by members of the All-University Judiciary (AUJ) committee. The Office of Judicial Affairs serves as a resource for anyone with

questions regarding a student conduct issue and is located in the Dean of Students Office, 1010 Student Services Building; 515-294-1021; or www.public.iastate.edu/~deanstdt_info/ja.

Lesbian Gay Bisexual Transgender Student Services (LGBTSS)

LGBTSS is a safe space for all members of the ISU community to explore aspects of sexual orientation and gender issues in an open nonjudgmental atmosphere. LGBTSS is committed to providing information and education that enhances the educational experience and overall quality of student life on campus.

LGBTSS, its staff, and advisory board work to provide assistance and support and to promote visibility and diversity through programming, a variety of services, and referral. In achieving its mission, LGBTSS strives to promote full inclusion of LGBT persons and their allies at ISU and to eliminate homophobia, heterosexism, and sexism on campus.

Programs and services of LGBTSS include the speakers bureau, peer-facilitated support groups, Lavender Graduation, Small Victories Celebration, National Coming Out Days events, supporting campus LGBT organizations, the Safe Zone sticker project, the lending library, and brochures and workshops on various LGBT issues. For more information: 1010H Student Services Building, (515) 294-5433, lgbtss@iastate.edu, or www.dso.iastate.edu/lgbtss.

Margaret Sloss Women's Center

The Margaret Sloss Women's Center promotes the educational, personal and career development of all women in the ISU/Ames community. Along with other departments, the Women's Center shares the university's responsibility of creating a safe and supportive environment for all individuals. The purpose of the Women's Center is to promote and sustain women through assistance, programs and information and referral services. The Women's center provides:

· A clearinghouse of information including a lending library, resource files, a calendar of events, and a variety of videos and audio tapes.

· Educational programming that focuses on helping students, staff, and faculty thrive in an academic environment by motivating them toward a greater understanding of, and involvement with, women's issues. Educational programs presented in residence halls, departments and organizations include workshops on a variety of topics – some require one gender audiences: self-esteem, images of women in the media, eating disorders, sexual harassment, date rape drugs and sexual assault, dating violence, what men can do to reduce the violence against women, gender roles and stereotypes, homophobia and sexism, men and masculinity, and more).

· Coordination and co-sponsorship of special events including Women's Week, National Coming Out Day, Sexual Assault Awareness Week, and Women's History Month. Throughout the year, the Women's Center also sponsors a number of speakers on current issues, hosts conferences, and coordinates support and discussion groups.

· Assistance and support for women who work toward changing situations, which adversely affect them, both individually and institutionally.

· A space for women to meet, study, eat, network, discuss, find support, watch a video or just relax.

· A place to gain experience and/or credit as a journalism or design intern, practicum student, student programmer, board member, or volunteer.

· Other services include an electronic breast pump, lockers to rent, free condoms, meeting rooms for campus and community organizations, kitchen facilities, a TV and VCR.

The Women's Center is open Monday through Friday, 8 a.m.-5 p.m. and is housed in the Sloss House, located between Curtiss Hall and the Memorial Union. Call 515-294-4154 or view www.dso.iastate.edu/dept/mswc.

Office of Minority Student Affairs

Minority Student Affairs was established to assist the university in keeping it's commitment to equal educational opportunity. MSA is responsible for the leadership in retention and graduation of undergraduate ethnic minority students by identifying climate, cultural, educational and financial barriers to their success. Minority Student Affairs staff work closely with all units of the University to achieve the following objectives:

· Increase the number of ethnic minority students entering and graduating from Iowa State University.
· Ensure access, choice, and persistence with all departments and organizations interested in the growth and development of students.
· Maintain liaison and coordinate programs with all departments and organizations interested in the growth and development of students.
· Develop students for a future beyond their undergraduate college experience – professionally, intellectually and culturally.
· Provide leadership for diversity awareness education.

These objectives assist in the achievement of the Office of Minority Student Affairs' mission. This is accomplished through the following programs:

Academic Program for Excellence (APEX) Summer Challenge, Carver Academy Program, George Washington Carver Scholarships, the Minority Student Affairs Emergency Loan Program, Early success Program – (ESP), Ethnic cultural celebrations – Hispanic Heritage Month, Black History Month, Asian American Celebrations, and the symposium on the American Indian.

Parents Association (ISUPA)

All parents of ISU undergraduate students are automatically considered to be members of the ISU Parents Association. The ISUPA serves as a link between the University and parents and families. Its mission is to serve and inform parents and to enhance the quality of student life at Iowa State.

There are no membership fees in the ISUPA; it is funded exclusively by contributions and fund-raisers, like the annual tuition raffle. The ISUPA Board of Directors, comprised of 36 parents, along with members of the Dean of Students Office staff, sponsors programs which include:

· Family Handbook, distributed to all new ISU parents at June orientation

· Parents Advisory Line (PAL), 1-800-772-8546, toll free assistance for parents

· Parent Calling Project, phon-a-thon to new ISU parents each autumn

· Family Weekend, the annual fall event largely funded by the ISUPA

· Involvement in ISU admissions events

For more information on the ISUPA, call the Dean of Students Office, 294-6054 or view www.dso.iastate.edu, then Web site Index, Parents Association.

Recreation Services

Recreation Services is dedicated to the provision of quality recreational opportunities for the campus community. Programs include intramural sports, sport clubs, informal recreation, outdoor recreation, special events, fitness programs, and recreation facility management. Assistance for other recreational services is provided.

The informal recreation program includes the opportunity for recreational sports activity in Beyer Hall, State Gymnasium, Forker Building (east campus), Lied Recreation/Athletic Center, outdoor tennis courts near the Forker Building, recreation fields east of the Towers and Maple-Willow-Larch Residence Halls, and the Southeast Field Complex east of the football stadium. Two regulation golf holes north of the Armory are open for ISU recreation golf use at no charge. The Ames/ISU Ice Arena is also available for drop in open skating or organized events.

The Group Fitness program provides nearly 60 classes per week for staying fit. The types of aerobics classes available include: high/low impact, step, toning and aqua. We also offer personal trainers for those that would like to have one on one assistance with their workout. The Rec Milers Program is designed to help students stay interested and involved in a regular exercise program. Participants have the flexibility to choose their own activities and can exercise at their own pace and convenience. Participants keep track of their recreational mileage for each month. To get mileage credit, progress slips must be deposited in the Rec Miler's boxes at the

Recreation Services Office, 2220 State Gym, or at the Lied Recreation/Athletic Facility. Monthly totals for each participant are posted at State Gym.

Participants may earn awards for specific milestones. Aerobic activities for Rec Miler credit include: bike, walk, basketball, handball, cross country skiing, stationary bike, fitness class, jump rope, soccer, jog/run, swim, racquetball and tennis.

The outdoor recreation program is composed of four basic elements: the camping-outdoor equipment checkout program; the organized trip program; basic instruction activity workshops; the Resource Center and Library. All of these programs and activities are designed to provide opportunities for natural environment experiences.

The sports club program is designed to serve individual interests in different sports club activities and is student-oriented in every aspect. Sports clubs offer team or individual recreational opportunities. Following are the sports clubs: archery, badminton, ballroom dance, baseball, bowling, boxing, canoe and kayak, cycling, equestrian, fencing, flying, hapkido, hockey, judo, karate, kum do, lacrosse, motorcycle, mountaineering/rock climbing, paintball, pool, racquetball, rifle and pistol, rodeo, rollerhockey, rugby, running, sailing, scuba, shotokan karate, ski and snowboard, skydivers, soccer, table tennis, tae-kwon-do, tennis, trap and skeet, triathlon, ultimate frisbee, unicycle, volleyball, water polo, water ski and weightlifting.

These clubs offer instruction and competition at the local and intercollegiate levels. The club members set dues, and most clubs receive financial subsidy from the Government of the Student Body to enable students to participate regardless of their financial situation.

The Intramural Sports Program involves competition among participants who enter as teams or individuals and play according to specific schedules. There are more than 50 intramural sport activities ranging from football to innertube water basketball and curling. Activities include men's, women's and co-rec divisions. Numerous special events add spice to the recreation program. These activities are of an endless variety and usually take place in a short time span. In general, they encompass demonstrations, performances, special contests, mass group participation, social occasions, excursions, displays, or special instruction.

Other physical, cultural, and social recreation programs are sponsored in coordination with various departments, organizations, and groups on and off campus. For further information concerning campus recreation activity, contact the Recreation Services Office, 2220 State Gym, or call (515) 294-4980, or www.recservices.iastate.edu/.

Student Activities Center

The Student Activities Center is committed to student involvement and retention. Its programs and services, including leadership development and organization participation, strive to ensure student success. These practical experiences work toward enhancing the quality of student life. With over 600 organizations from which to choose, students learn about themselves and appreciate the diversity in others. The staff of the Student Activities Center is dedicated to utilizing their knowledge and experience to provide unique living and learning opportunities for all Iowa State students.

The Student Activities Center is responsible for registering the 600+ student, campus, and community organizations. The staff provides consultative services to student leaders, members, and advisers of organizations on an individual and group basis. They also provide training workshops and facilitate retreats for student groups. This office produces Newsline, an online newsletter distributed twice each semester to presidents and advisers of registered student organizations.

The Student Activities Center also annually publishes the Student Organizations Resource Manual (SORM), which informs the campus community about university policies and procedures that affect student organizations. The SORM is available online at the Student Activities Center web site which also includes information on the university's event and activity authorization process. The staff of the Student Activities Center also advises students involved in the Government of the Student Body (GSB) and VEISHEA. For more information visit the Student Activities Center, B6 Memorial Union, 294-1023, or view www.sac.iastate.edu/.

Student Assistance Services

When student life at Iowa State becomes overwhelming or situations arise when students need some advice, the staff of Student Assistance Services is ready to help. The Dean of Students Office staff provide resources for students to work though issues including:

· Academic concerns
· Personal concerns
· Personal and family emergencies, and
· Formal grievance procedures.

Assistance in understanding and navigating the University judicial systems and other university policies and procedures is also provided. Personalized referrals to other University resources and services are key in providing proactive and comprehensive assistance to students. Consultation and assistance is provided in an atmosphere of confidentiality and concern for each student's personal well being and educational objectives. For more information visit 1010 Student Services Building, call (515) 294-1020, or see Web site Index at www.dso.iastate.edu/.

Student Legal Services (SLS)

Student Legal Services is a cost-free legal aid office available to any student currently enrolled at Iowa State and registered student groups. SLS is staffed by full-time, practicing attorneys who are available to consult with students and offer advice with respect to most legal problems. While SLS is a part of the Dean of Students Office, its financial support comes from the Government of the Student Body (GSB). The types of cases most often handled by the staff of the SLS include:

· Family Law and Divorce
· Criminal Law
· Landlord-Tenant Problems
· Off-Campus Employment Problems
· Consumer Issues
· Administrative Issues

However, SLS cannot actively represent students in controversies involving student vs. student, student vs. ISU, and ISU student judicial matters and does not handle the following cases: fee generating cases; felony defense; Federal Court matters; cases involving excessive time. More information is available at SLS, B11 Memorial Union, (515) 294-0978, see Web site Index at www.dso.iastate.edu/.

Student Support Services Program (SSSP)

SSSP, a federally funded program, provides academic support to eligible students and is designed to increase the retention and graduation rates of low-income individuals who are first generation college or individuals with disabilities. The needs of the students who are accepted into SSSP are thoroughly assessed through testing and counseling. SSSP participants receive personal and career counseling, along with academic advice, tutoring, and assistance in receiving financial aid.

Participants in SSSP are encouraged to work with an SSSP student mentor to become acclimated to the ISU environment. These relationships also encourage participants to fully access ISU resources. Study skills improvement sessions and basic skills instruction are provided in the areas of math and writing. In addition, cultural enrichment (i.e. theatre, dance, and musical events) and educational (leadership conferences, graduate/professional, etc.) activities are planned. These services are provided free of charge to eligible students after they are accepted into the program. SSSP is located in the Student Services Building; call (515) 294-0210 or view Web site Index at www.dso.iastate.edu.

Vocational Rehabilitation

The State of Iowa Division of Vocational Rehabilitation Services Office provides services to students who based on medical documentation, have a disability and it is a substantial impediment to employment. Rehabilitation services may include the following: medical assessment; vocational evaluation; counseling and guidance; special adaptive equipment or devices; financial assistance toward training; job placement assistance. No direct fees are charged, but there may be some costs through involvement with services. For more information, contact Vocational Rehabilitation, 515-294-5059, Room 1045, Student Services Building, or see www.dso.iastate.edu/dept/vocrehab.

Student Life

Child Care

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

Child care programs located on campus include:
• Center for Child Care Resources: Assistance in locating community child care services, 1038 Pammel Court, 515-294-8833 or 1-800-437-8599
• University Community Childcare at Pammel Court, 891 Pammel Court, 515-294-9838
• The Comfort Zone: Daycare for kids who don't feel so good, 1019 Pammel Court, 515-294-3333.
• Flex-Care: Part time care for children of ISU students, 1052 Pammel Court, 515-294-2471.
• University Child Care Center at Veterinary Medicine, 1700 Christensen Drive, 515-294-2273.
• ISU Child Development Laboratory School, Palmer HDFS Building, 515-294-3040.

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

Forensics: Individual Events

ISU Forensics, the Iowa State speech team, participates in several kinds of competitive speech activities. Please contact Speech Communication Program at 515-294-7670 for further information.

Honor Societies

Alpha Epsilon—Agricultural Engineering
The purpose is to promote the high ideals of the engineering profession, to give recognition to those agricultural engineers who manifest worthy qualities of character, scholarship, and professional attainment, and to encourage and support such improvements in the agricultural engineering profession that make it an instrument of greater service to humanity. Membership is based on scholarship, leadership, and character.

Alpha Kappa Delta—Sociology
Members share interest in the field of sociology, research of social problems, and such other social and intellectual activities as will lead to improvement in the human condition.

Alpha Lambda Delta/Phi Eta Sigma — Freshmen
First-year students who achieve at least a 3.5 GPA for one or more semesters their first year may be members of these national honor societies. These societies encourage superior scholastic attainment among students in their first year at institutions of higher education.

Alpha Pi Mu—Industrial Engineering
Members are chosen for character, achievement, and scholarship in industrial engineering. The group provides social and educational interaction for industrial engineering.

Alpha Upsilon Alpha—Education
An educational honorary that recognizes and encourages scholarship and leadership in the field of reading.

Alpha Zeta—Agriculture
Members must have completed three semesters of study in the College of Agriculture or Veterinary Medicine and be in the upper two-fifths of their class. Meetings are held to foster high standards of scholarship, character, and leadership. Alpha Zeta sponsors lectures, service projects, and promotes the agricultural programs at ISU.

Beta Alpha Psi – Accounting
A national honorary for students in accounting.

Beta Beta Beta Biological Honor Society
A national organization for students in the biological sciences with a purpose to recognize undergraduates with exceptional scholarship, leadership and character.

Beta Gamma Sigma
Honor society for collegiate schools of business.

Cardinal Key—Senior Leadership
The Senior Honor Society of Cardinal Key recognizes those persons who have been outstanding leaders in college life, who have rendered noteworthy service to Iowa State, who are of high moral character, and who rank high scholastically. Members are selected by application and interview.

Chi Epsilon—Civil Engineering
The purpose is to develop the profession of civil engineering through the interaction of members, fellow civil engineering students, and faculty. Scholarship, character, practicality, and sociability are the fundamental requirements for membership.

Chi Sigma Iota-Iota Sigma Upsilon
To promote scholarship, research, professionalism, leadership and excellence in counseling, and to recognize high attainment in the excellence in counseling, and to recognize high attainment in the pursuit of academic and clinical excellence in counseling.

Epsilon Pi Tau—Education in Technology
Members are selected from the upper one-fourth of the juniors, seniors, and graduate students in industrial technology. The group strives to promote skill, social and professional efficiency, and research.

Golden Key—All University
A national nonprofit academic honors organization, Golden Key is dedicated to recognizing and encouraging scholastic achievement in all undergraduate fields of study and to uniting collegiate faculty and administrators.

Iota Sigma Pi—Females in Chemical Sciences
An organization open to female students in the chemical sciences which provides functions for members to socialize and discuss science issues in chemistry.

Kappa Delta Pi—Education
In an effort to promote excellence in and recognize outstanding contributions to education, Kappa Delta Pi maintains a high degree of professional fellowship among its members, quickens professional growth, and honors achievement in educational work. Membership invitations are extended to second semester sophomores, juniors, and seniors with a GPA of 3.25 or above.

Kappa Omicron Nu, Gamma Chapter
Objectives of the honor society are to promote graduate study and research, and to stimulate scholarship and leadership toward the well-being of individuals and families throughout the world. Top 10 percent of junior and top 20 percent of senior students maintaining at least a B average, and outstanding graduate students in family and consumer sciences, are eligible for selection. Research within the college is shared at monthly meetings.

Kappa Tau Alpha—Journalism
Kappa Tau Alpha is the national society dedicated to the recognition and promotion of scholarship in the field of journalism. Members are selected from the upper 10 percent of the senior class. Graduate students and faculty who qualify are also eligible for membership.

Keramos National Ceramic Engineering Honor Fraternity
A national honorary that recognizes students with outstanding academic achievement and encourages interaction between students and alumni.

Mortar Board
Members are recognized for superior academic achievement and community service.

National Society of Collegiate Scholars
To recognize and celebrate high achievement in all academic disciplines, to provide opportunities for personal growth and leadership development, and to organize and encourage learning opportunities through community service.

Omega Chi Epsilon—Chemical Engineering
Membership is open to chemical engineering juniors in the top 20 percent of their class, or seniors in the top 30 percent. The purpose is recognition and promotion of high scholarship, original investigation, and professional service in chemical engineering.

Order of Omega—Fraternity and Sorority Honorary
A national Greek honorary, the Order of Omega was founded at Iowa State in 1957. Criteria for membership include character; scholarship; leadership; service to the individual chapter, the Greek system, the university, and the Ames community. Membership is limited to junior and senior students who comprise one percent of the Greek population.

Phi Alpha Theta—History
Students who have a B average in at least 15 hours of history are eligible for membership. The local branch sponsors social activities, co-sponsors prizes for undergraduate essays in history, and encourages students' participation in state wide, regional, and national Phi Alpha Theta conferences.

Phi Beta Kappa—Liberal Arts and Sciences
Phi Beta Kappa is a national honorary society, founded in 1776 "to recognize and encourage scholarship, friendship, and cultural interests." Membership is by invitation to students enrolled in the LAS curriculum. To be eligible, juniors must have at least a 3.80 cumulative grade point average and seniors, at least a 3.60 average. Other criteria for membership include requirements in the mathematical disciplines and a foreign language.

Phi Kappa Phi—All University
This national honor society recognizes and encourages superior scholarship in all academic disciplines. Membership is open to qualified undergraduates and graduates by invitation and occasionally to faculty and alumni.

Phi Sigma Theta
Phi Sigma Theta is dedicated to recognizing and rewarding academic achievement, and encouraging community service, leadership, and continued academic excellence.

Phi Upsilon Omicron—Family and Consumer Sciences
Members are selected from junior and senior family and consumer sciences students who have demonstrated academic excellence and professional leadership qualities. Membership is a means of furthering professional goals. Outstanding graduate students are also eligible for selection.

Pi Mu Epsilon—Mathematics
Pi Mu Epsilon is the national mathematics honorary society whose purpose is the promotion of scholarly activity in mathematics among students and staff. Members are students and faculty who have completed at least two years of college-level mathematics with honor (at least 3.33 GPA) and have maintained an overall GPA of at least 3.0.

Pi Sigma Alpha
Pi Sigma Alpha is the national honor political science honor society.

Pi Tau Sigma—Mechanical Engineering
Members are juniors and seniors in the upper ranks of their classes in mechanical engineering. Meetings and social functions are held to recognize and encourage outstanding scholastic achievement.

Psi Chi—Psychology
This national honor society in psychology recognizes and honors individuals maintaining high scholarship and documented interest in psychology.

Sigma Alpha – Women in Agriculture
Promotes women in all facets of agriculture.

Rho Lambda
Contact the Student Activities Center (515-294-1023) for more information.

Sigma Gamma Epsilon—Geological Sciences
The objectives of this national honorary society are the scholastic and scientific advancement of its members and the promotion of friendships and assistance among colleges, universities, and scientific schools devoted to the advancement of the earth sciences. Membership is intended for those scientists and students of science whose primary concern is the study of the earth.

Sigma Gamma Tau—Aerospace Engineering
Sigma Gamma Tau is the national honorary for aerospace-aeronautical engineering students who have displayed outstanding scholarship, leadership, and personal characteristics. Members are selected from the upper fourth of the junior class and upper third of the senior class who have maintained a 3.00 or better cumulative grade point average.

Sigma Lambda Chi—Construction Engineering
The purpose is the recognition of outstanding students in construction engineering. Upperclass students in construction engineering may be initiated into the society providing they have an overall scholastic average in the upper 20 percent of their class.

Sigma Xi—Research
Sigma Xi, the scientific research society, is a broad-based scientific honor society with over 500 chapters and clubs at universities and nonacademic scientific institutions. Sigma Xi awards associate membership to undergraduates and graduate students who have demonstrated research potential through participation in an original scientific research activity. Full membership in Sigma Xi recognizes a significant scientific research contribution.

Tau Beta Pi—Engineering
Tau Beta Pi honors engineering undergraduates, graduate students, and outstanding alumni who have distinguished themselves in scholarship and by exemplary character. Members are selected from engineering juniors in the upper eighth and seniors and graduate students in the upper fifth of their classes.

Upsilon Pi Epsilon
Honor society for computer science students.
Xi Sigma Pi—Forestry
Xi Sigma Pi recognizes outstanding juniors, seniors, graduate students and faculty members in forestry. The objective is to encourage high professional standards in the profession of forestry and to promote fraternal relationships among foresters.

Lectures

Throughout the academic year the Committee on Lectures brings to the campus a number of speakers eminent in national and international affairs, the sciences, and the arts. In addition to giving formal lectures, a number of these speakers meet with students informally for discussions. Through these lectures and discussions the students are given a well-rounded presentation on subjects and areas affecting their culture, educational and economic philosophy, and scientific development. Past speakers include scholars E.O. Wilson and Stephen J. Gould; activists Gloria Steinem and Anita Hill; actor and comedian Bill Cosby; poet Maya Angelou; and astronaut Sally Ride.

The Institute on World Affairs is an annual series of speakers and on a topic of international interest held in the fall. Spring semester, the Institute on National Affairs is held with a topic of national concern as its focus. Focus, an annual fine arts festival with emphasis on student creativity in the arts, is held in the spring. The Committee on Lectures also sponsors or co-sponsors dramatic, dance, and musical events.

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

Memorial Union

The Iowa State Memorial Union is regarded as the heart of campus life and the campus center of informal education at Iowa State University. It is the meeting place and headquarters for most student organizations and houses several university offices. Dances, exhibits, films, concerts, lectures banquets, and other campus gatherings are accommodated in its meeting rooms and ballrooms.

A food court with eight food vendors and a variety of choices, catering service, and a 24-hour vending area provide food service to the university community. The Maintenance Shop hosts some of the finest in blues, jazz, rock, and folk music performances at night and is a deli during the day. The Recreation Center offers autoscore bowling, billiards, pinball, and video games, and a large screen television.

Art is a way of life in the Union that includes special film showings, galleries, and a browsing library that offers reading, music, and video materials. The Workspace studios are staffed and equipped for individuals who wish to express themselves creatively.

A small, quiet chapel is available for services, weddings, or meditation. In addition, four wireless-equipped study lounges are available to students.

Campus visitors may choose to stay overnight in the guest rooms on the third, fourth, and fifth floors.

The Memorial Union also has a convenience store, automatic teller machines, a TicketMaster outlet, the University Book Store, a copy center, a full service post office, and an attached 640 car parking ramp.

Opened in 1928 as a proud memorial to the Iowa State men and women who served in the Armed Forces during World War I, the Memorial Union is now a living memorial to all Iowa Staters who have served in the United States military.

Motor Vehicles and Bicycles

Students are permitted to own and operate motor vehicles - automobiles, motor scooters, and motorcycles. However, motor vehicles are in no way necessary for an Iowa State University student. Iowa State University is primarily a pedestrian campus. Those who operate a motor vehicle or bicycle on campus must abide by the rather extensive traffic and parking regulations. Fines are levied for infractions of these regulations. All motor vehicles and bicycles owned or operated by students on university property must be registered with the Parking Division Office located in the Armory. Copies of the traffic and parking regulations also are available at this office.

Music Activities

Iowa State is a regular stop on the arts and entertainment circuit. CY Stephens Auditorium is where the arts come alive, from renowned classical music ensembles, ballets, musicals, operas, and plays to jazz, folk and pop concerts. Hilton Coliseum, with a capacity of over 14,000, hosts family shows and concerts - including rock and roll, country and alternative music, to name just a few.

The ISU Department of Music presents over 100 concerts each year - many of them free - in the Martha-Ellen Tye Recital Hall on central campus and at Stephens Auditorium. The Music Department concert series includes faculty recitals, guest artist performances, and student ensemble concerts. ISU students also have lots of opportunities to study music and to participate in musical ensembles - including five choral ensembles, seven bands, ISU Symphony Orchestra, and numerous chamber groups. Nearly one-fourth of all undergraduate students participate in some aspect of music while attending ISU. In addition, carillon concerts featuring the "The Bells of Iowa State" are heard on central campus daily throughout the academic year.

Sigma Alpha Iota (professional music fraternity for women), Kappa Kappa Psi and Tau Beta Sigma (professional band fraternity), and several professional organizations for music educators are represented on campus.

Religious Life

Iowa State University is a state-supported, nonsectarian institution, but it recognizes the importance of spiritual life and cooperates with the many off-campus groups that fulfill the religious needs of the community.

Most of the larger denominations have places of worship within easy walking distance of the campus. Several denominations have attractive student centers and conduct extensive student programs under the direction of professionally trained persons. A number of campus student organizations also address the religious needs of many students.

Theatre and Dramatics

The Iowa State University Theatre, Department of Music, produces a season of at least five major presentations each year. The season's bill endeavors to offer a variety of theatrical fare, including a musical, well-known dramatic literature and unusual and lesser-known plays. Practical experience in all phases of theatrical production is open to all interested, registered students within the university. The season is partially subsidized by an allocation from the Government of the Student Body; therefore, all students paying activity fees may purchase tickets to a performance at the reduced student price.

Other theatre-sponsored programs include student-produced plays, readers theatre programs, Theta Alpha Phi (a national dramatics honorary), the ISU Theatre Lab productions, the Minority Theatre Workshop, and the ISU Studio Theatre program.

Research Organizations

Research is an important activity at Iowa State University. Faculty members engage in research pursuits as well as teaching. Graduate students, and in some cases undergraduates, play an active part in this search for new knowledge.

Support for research at Iowa State University comes from state and federal appropriations as well as from contracts and grants involving the federal government and nonfederal organizations. As part of its total program, the university also operates extension services, special laboratories, centers, and institutes.

Official Research, Outreach, and/or Instructional Centers and Institutes at ISU as Recognized by the Board of Regents, State of Iowa, are listed below. Additional information concerning any of these organizations and student research opportunities they support may be obtained from their administrative offices.

Agricultural Marketing Resource Center (AgMRC)
www.agmrc.org/
Mary S. Holz-Clause, Co-Director
Donald M. Hofstrand, Co-Director
1111 NSRIC/294-5281

Airworthiness Assurance Center of Excellence (AACE)
www.cnde.iastate.edu/cnde/programs.html
Lisa Brasche, Interim Director
115 Applied Sciences Complex II/294-5227

Ames Center for Animal Health (ACAH)
www.vetmed.iastate.edu/services institutes/acah.asp
James Roth, Professor-in-Charge
2160 Vet. Med./294-1850

Analog and Mixed-Signal VLSI Design Center
vlsi.ee.iastate.edu/
Robert J. Weber, Director
Dept. of Electrical and Computer Engineering, 2215 Coover Hall/294-8723

Bridge Engineering Center (BEC)—part of CTRE
www.ctre.iastate.edu/research.htm
Terry Wipf, Manager
2901 South Loop Drive, Suite 3100/294-9501

Carrie Chapman Catt Center for Women & Politics
www.iastate.edu/~cccatt/
Dianne Bystrom, Director
309 Catt/294-3181

Center for Academic Information Technology (AIT)
www.ait.iastate.edu/
Dorothy Lewis, Director
291 Durham Center/294-3402

Center for Advanced Technology Development (CATD)
www.catd.iastate.edu/
Mark Laurenzo, Interim Director
151 Applied Sciences Complex II/294-4644

Center for Agricultural & Rural Development (CARD)
cardsrv1.card.iastate.edu/
Bruce Babcock, Director
578 Heady/294-1183

Center for Agricultural History & Rural Studies
www.iastate.edu/~history/cenaghis.htm
Douglas Hurt, Director
618 Ross/294-5620

Center for Building Energy Research (CBER)
Michael Pate, Director
2028 Black Engineering/294-9691

Center for Catalysis
George A. Kraus, Director
2759 Gilman Hall/294-7794

Center for Crops Utilization Research (CCUR)
www.ag.iastate.edu/centers/ccur/
Lawrence Johnson, Director
1041 Food Sciences Building/294-0160

Center for Designer Crops
Basil Nikolau, Interim Director
2210 Molecular Biology Bldg./294-9423

Center for Designing Foods to Improve Nutrition (CDFIN)
www.fcs.iastate.edu/fshn/research/cdfin.htm
Colin Scanes, Interim Director
1127 Human Nutritional Sciences Bldg.
294-8489

Center for Excellence in Science and Mathematics Education
www.educ.iastate.edu/scimath/
Brian Hand, Director
N157 Lagomarcino/294-7010

Center for Family Policy
www.fcs.iastate.edu/policy/default.htm
Mary Winter, Director
126 MacKay/294-5982

Center for Family Research in Rural Mental Health—part of ISBR
Carolyn Cutrona, Interim Director
2625 N. Loop Drive, Suite 500/294-4518

Center for Food Security and Public Health
www.vetmed.iastate.edu/services/institutes/cfsph/
James A. Roth, Director
2160 Vet Med/294-7189

Center for Historical Studies of Technology & Science
Alan Marcus, Director
635 Ross/294-5956

Center for Industrial Research & Service (CIRAS)
www.ciras.iastate.edu/
Ron Cox, Director
Suite 2620, 2272 Howe Hall/294-3420

Center for Integrated Animal Genomics
Max F. Rothschild, Co-Director and
Susan Carpenter, Co-Director
2255 Kildee/294-6202 and 1136 Vet Med
294-5158

Center for Interfacial Materials & Crystallization
Glenn Schrader, Manager
3033 Sweeney/294-0519

Center for International Agricultural Finance (CIAF)
Neil Harl, Director
478 Heady/294-2210

Center for Nondestructive Evaluation (CNDE)—including the FAA Aviation Systems Reliability Program
www.cnde.iastate.edu/cnde.html
R. BruceThompson, Director
115 Applied Sciences Complex II/294-8152

Center for Physical & Computational Mathematics (CPCM)
www.iprt.iastate.edu/cpcm.html
Bruce Harmon, Interim Director
311 TASF/294-8902

Center for Plant Genomics
www.plantgenomics.iastate.edu/
Patrick Schnable, Director
G405 Agronomy/ 294-0975

Center for Plant Responses to Environmental Stresses
www.plantstress.iastate.edu/
Charlotte Bronson, Interim Director
351 Bessey/294-2264

Center for Plant Transformation and Gene Expression
www.planttransformation.iastate.edu/
Patrick Schnable, Director
G405 Agronomy/ 294-0975

Center for Portland Cement Concrete (PCC) Pavement Technology—part of CTRE
www.ctre.iastate.edu/research.htm
Dale Harrington, Director
2901 South Loop Drive, Suite 3100/294-8103

Center for Survey Statistics and Methodology
www.stat.iastate.edu/general/overview.html (Survey Section)
Sarah M. Nusser, Director
219 Snedecor/294-9773

Center for Sustainable Environmental Technologies (CSET)
webbook2.ameslab.gov/default.htm
Robert C. Brown, Director
288 Metals Development/ 294-3759

Center for Teaching Excellence (CTE)
www.cte.iastate.edu/
Corley Brooke, Director
207 Lab of Mechanics/ 294-2906

Center for Technology in Learning and Teaching
www.ctlt.iastate.edu/
Ann Thompson, Co-Director
Niki Davis, Co-Director
N108 Lagomarcino/294-3147

Center for Transportation Research and Education (CTRE)
www.ctre.iastate.edu/
Steven Andrle, Director
2901 South Loop Drive, Suite 3100/294-8103

Computational Fluid Dynamics Center
John Tannehill, Manager
2271 Howe Hall, Rm. 1200/294-4766

Electric Power Research Center (EPRC)
www3.ee.iastate.edu/power/eprc/eprc.html
Vijay Vittal, Director
1126 Coover/294-8963

Engineering Research Institute (ERI)
James Melsa, Director
104 Marston/294-5933

Family and Consumer Sciences Research Institute (FCSRI)
Mary Winter, Director
126 MacKay/294-5982

Food and Agricultural Policy Research Institute (FAPRI)
www.fapri.org/
Bruce Babcock, John Beghin, Co-Directors
578 Heady/294-1183

Information Assurance Center (IAC)
www.issl.iastate.edu/infas.html
Doug Jacobson, Director
2419 Coover/294-8307

Institute for Design Research and Outreach (IDRO)
www.design.iastate.edu/framer.php3?list=idro
Mark Engelbrecht, Director
134 College of Design/ 294-7427

Institute for Food Safety and Security, The
Catherine Woteki, Interim Director
138 Curtiss/294-2518

Institute for International Cooperation in Animal Biologics (IICAB)
www.vetmed.iastate.edu/services institutes/iicab/iicab.htm
James Roth, Executive Director
2160 Vet. Med./294-7632

Institute for Physical Research & Technology (IPRT)
www.iprt.iastate.edu/
Tom Barton, Director
311 TASF/294-2770

Institute for Social & Behavioral Research (ISBR)
www.isbr.iastate.edu/
Carolyn Cutrona, Interim Director
2625 N. Loop Drive, Suite 500/294-4518

Interdisciplinary Research Institute for Survey Science (IRISS)
Kirk Wolter, Director
219 Snedecor/294-9773

Iowa Beef Center
John Lawrence, Director
468 Heady/294-6290

Iowa Energy Center (IEC)
www.energy.iastate.edu/
Floyd Barwig, Director
2521 Elwood Drive, Suite 124/294-8819

Iowa Pork Industry Center
www.extension.iastate.edu/ipic/
John Mabry, Director
109 Kildee/294-4103

Iowa Small Business Development Center (SBDC)
www.iabusnet.org/sbdc/index.cfm
Lars Peterson, Interim Director
137 Lynn Avenue/ 292-6351

Iowa State University Biotechnology Outreach Education Center (BOEC)
www.biotech.iastate.edu/publications/BOEC/default.html
Mike Zeller, Coordinator
1320C MBB/294-9818

Iowa State University Industrial Assessment Center (IAC)
www.public.iastate.edu/~cber/
Greg Maxwell, Program Director
2043 Black Engineering/294-3080

Iowa State University Pappajohn Center for Entrepreneurship, The
www.isupjcenter.org/
Steven T. Carter, Director
2501 N. Loop Drive, Bldg. 1, Suite 1615
296-6532

Iowa State Water Resources Research Institute (ISWRRI)
www.water.iastate.edu/
Stewart Melvin, Interim Director
3212 NSRIC/294-8921

Laurence H. Baker Center for Bioinformatics and Biological Statistics
www.plantsciences.iastate.edu/research.html
Robert Jernigan, Director
123 Office & Laboratory/294-7278

Leopold Center for Sustainable Agriculture
www.ag.iastate.edu/centers/leopold/
Fred Kirschenmann, Director
209 Curtiss/294-3711

Materials Preparation Center (MPC)
www.mpc.ameslab.gov/
Lawrence Jones, Director
126 Metals Development/ 294-5236

Meat Export Research Center (MERC)
www.ag.iastate.edu/centers/merc/
Joe Cordray, Contact Person
194 Meat Lab/294-5310

Microanalytical Instrumentation Center (MIC)
www.mic.iastate.edu/
Marc Porter, Director
41 Spedding/294-6433

Microelectronics Research Center (MRC)
www.mrc.iastate.edu/
Vikram Dalal, Director
133 Applied Sciences Complex I/294-7732

Midwest Agribusiness Trade Research & Information Center (MATRIC)
www.card.iastate.edu/matric/home.html
Bruce Babcock, Director
578 Heady/294-1183

Midwest Forensics Resource Center (MFRC)
David P. Baldwin, Director
332 TASF/294-5783

Murray G. Bacon Center for Ethics in Business, The
www.bus.iastate.edu/centers/Bacon/
Tony Smith, Co-Director and
James Werbel, Co-Director
443 Catt/294-0055; 300 Carver/294-8116

NASA Food Technology Commercial Space Center
www.ag.iastate.edu/centers/ftcsc/
Tony Pometto, Director
2901 South Loop Drive, Suite 3700/296-5383

North Central Regional Aquaculture Center (NCRAC)
www.ag.iastate.edu/departments/aecl/ncrac.htm
Joseph Morris, Associate Director
124 Science II/294-5280

North Central Regional Center for Rural Development (NCRCRD)
www.ag.iastate.edu/centers/rdev/
Cornelia Flora, Director
107 Curtiss/294-8321

Plant Sciences Institute (PSI)
www.plantsciences.iastate.edu/
Stephen Howell, Director
112 O & L/294-5255

Raymond F. Baker Center for Plant Breeding
Kendell R. Lamkey, Director
1555 Agronomy/ 294-7826

Research Institute for Studies in Education (RISE)
www.educ.iastate.edu/rise/
Jackie Blount, Director
E005 Lagomarcino/294-7009

Seed Science Center
www.ag.iastate.edu/centers/seeds/
Manjit Misra, Director
102A Seed Science/ 294-6821

Veterinary Medical Research Institute (VMRI)
www.vetmed.iastate.edu/services/institutes/vmri.asp
Nolan Hartwig, Extension Leader
VMRI Building I, Rm 3/294-8790

Virtual Reality Applications Center (VRAC)
www.vrac.iastate.edu/index.html
James Bernard, Director
2274 Howe Hall, Rm 1620/ 294-3092

University Extension

Iowa State University Extension builds partnerships and provides research-based learning opportunities to improve quality of life in Iowa. ISU Extension continues to lead the university-wide effort to engage Iowans with education and information about their issues and priorities.

Iowa State University is the state's land-grant institution with the mission of learning, discovery, and engagement. Historically, ISU Extension has led the university in its formal engagement mission to Iowans. With an active partnership and presence in every county, ISU Extension continues to engage the people of Iowa with education and information through six program areas: Agriculture and Natural Resources; Business and Industry; Communities; Families; 4-H Youth Development; and Continuing Education.

Agriculture and Natural Resources. ISU Extension provides research-based information and education to agricultural producers, landowners, and agribusiness personnel to enhance the value of Iowa's agricultural industry, increase rural vitality, and protect the state's natural resources.

Business and Industry. ISU Extension links Iowa businesses and manufacturers with ISU specialists and research, community resources, training, assessment, and technical assistance for increased productivity and competitiveness.

Communities. ISU Extension helps organizations and local governments develop and build their capacity to make Iowa communities better places to live and work.

Families. ISU Extension offers education for families, professionals, and volunteers to build healthy family environments through meaningful behavior change.

4-H Youth Development. ISU Extension offers hands-on learning and science-based programs to help youth gain skills, confidence, and positive self-esteem so they can become successful, caring adults.

Continuing Education and Communication Services (CECS). CECS leverages resources and adds value to the programs and related materials needed by lifelong learners. CECS leads the development and delivery of ISU credit and noncredit courses, outreach institutes, seminars, conferences, workshops, and ISU Extension program materials to learners around the world.

Academic Life

The Academic Advising Program

Iowa State University's academic advisers are dedicated to enhancing each student's academic and career aspirations.

Each student is assigned an adviser when he or she arrives on campus, usually a faculty member or professional adviser in the student's academic department. If a major has not yet been declared, a member of the college faculty or staff will be assigned as adviser. The adviser can serve as a primary resource for the wide variety of university support services available to Iowa State University students, but it is the student's responsibility to ask for assistance.

Advisers assist in the development of an academic program that meets students' career objectives as well as curriculum requirements. Advisers can help students achieve their academic objectives by advising them about course requirements, recommended electives, and procedures for registration and schedule changes. It is the student's responsibility, however, to be knowledgeable about Iowa State policies and procedures and the graduation requirements for his or her individual program and to ensure that these requirements are met. Advisers will help students to get the most out of their educational experience.

In most departments, students may change advisers. A student who wants to change advisers should check with the department regarding the adviser change procedure.

Learning Communities

www.iastate.edu/~learncommunity

Learning communities are a university-wide initiative providing students the opportunity to connect with peers who have similar academic goals. Students in learning communities typically take two or three courses together and may live together (or near each other) in the same residence hall. Although most of the learning communities are focused on first-year students, opportunities are available for sophomores, juniors, and transfer students.

In addition to developing academic and social networks, advantages of joining a learning community include: getting to know people and making friends in your major or area of interest, getting to know faculty and staff members, making a smooth transition from high school to college, making connections between in-class and out-of-class learning, applying classroom learning to real world situations through hands-on experiences, exploring career opportunities, and having fun!

Most learning communities employ an upper-division student as a peer mentor who organizes various activities for the students, ranging from study groups to social events. We have found that students in learning communities are more satisfied with their overall experience at Iowa State, earn higher first-term grades, and are more likely to remain enrolled at Iowa State after one, two, and three years.

First-year students are offered the opportunity to sign up for learning community courses during summer orientation. For learning communities who offer a residential living environment, students will receive information in the mail prior to summer orientation.

Any student interested in joining a learning community should contact the learning community coordinator for more information. A list of coordinators, along with current opportunities, can be found at www.iastate.edu/~learncommunity.

ISU AccessPlus Information System

accessplus.iastate.edu

AccessPlus is a secure and confidential campus information system that is available via the World Wide Web. Students, employees, and affiliates view personalized menus from campus and home workstations. For public convenience, AccessPlus stations are available in the Memorial Union and at the Visitors Information Center. Students can use AccessPlus to register for classes using the Web Registration system. They can view and print current term schedules, class meeting rooms, class instructors, academic records, final grades, financial aid status, current university bill, academic adviser assignment and projected date of graduation. University employees use the system to view personal information such as pay history and insurance. Some employees also perform business-related functions. Information about and access to AccessPlus may be found at www.iastate.edu/~registrar/info/access.html or accessplus.iastate.edu.

Registration and Advising

Registration is a process by which students become officially enrolled in classes for a given term. Students who attend classes must complete registration and pay their assessed fees. Registration is not complete until all fees are paid, including board and room fees for those living in residence halls.

The registration process starts with an advising period, which begins two to five days prior to the first day of registration. Advisers provide important information to students that allow them to register for classes.

Dates for advising and registration are published in the university calendar on the Web at www.iastate.edu/~registrar/calendar, the ISU Directory, and the *Iowa State Daily*. The dates also are posted on departmental bulletin boards.

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

Responsibilities

The registration process includes advising, enrollment in courses, and schedule changes. This process involves the student, the student's adviser, and the student services staff of the student's college, and in some cases, the dean of the college. Each is responsible for knowing and following the academic policies and procedures.

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

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

The **college student services staff** is responsible for assisting new and reentering students with the registration process; resolving unusual scheduling problems; and updating the advisement/degree audit or solving problems concerning the advisement/degree audit.

The **dean** is responsible for making decisions with respect to requests for deviations from university policies, deadlines, etc. Students and staff should check with the college office to find out who is authorized to grant approvals or exceptions on behalf of the dean.

Registration Process

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

• Registration Worksheet, available for download at www.iastate.edu/~registrar.
• A RAN (registration access number) if required by their college.
• Course information from the Online Schedule of Classes at www.adp.iastate.edu/cgi-bin/class; or the Courses and Programs catalog, available on the Web or for a fee from campus bookstores.
• Other departmental information applicable to their curriculum, available from their adviser.

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

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

a. advisement/degree audit
b. guidance in course selection
c. Registration Worksheet signature
d. Registration Authorization Card, if applicable.

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

3. Review their registration start date/time information and any registration hold information on AccessPlus, under Current Information. Students in those colleges which require a four-digit registration access number (RAN) should meet with their adviser to obtain their Registration Authorization Card on which the RAN is printed.

a. assigned date and time to register
b. registration access number
c. registration holds (prevents registration)

4. Register for courses using the AccessPlus registration system. Instructions are available at www.iastate.edu/~registrar/registration.

Registration Start Dates. Students are assigned a registration start date and time, which is the first day and time they can use the registration system. Registration start dates are assigned based on projected year in school classification (computed by combining total credits, current term credits, and current term test out credits). Then specific start dates within projected year in school are established by using the sum of total credits and current term test out credits. Students may choose to delay their registration until a later date, but courses will begin to fill on the first day of registration and any delay may reduce their course selection. A list of start dates (e.g., juniors) is available at www.iastate.edu/~registrar/registration.

AccessPlus Registration System. Students enter the system via AccessPlus by using university or social security number and university PIN. If required by their college, they also need to enter a registration access number (RAN).

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

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

Schedule Changes. Through the fifth day of classes, students may add courses or make other schedule changes using the registration system. For more information, see *Index, Making Schedule Changes*.

Classrooms are listed for each course in the Online Schedule of Classes at www.adp.iastate.edu/cgi-bin/class.

All changes processed before the first day of classes will be reflected on beginning class lists for instructors.

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

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

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

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

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

Registration for disabled students. Disabled students who need assistance with any phase of registration should contact Disability Resources. (*See Index, Disability Resources*.)

Fee Payment

The Receivables Office bills students for tuition, room and board, and various other university charges. A fee statement is mailed on the first of each month to each student's in-session or interim address. Students also may view their account status on AccessPlus at accessplus.iastate.edu/. It is the student's responsibility to ensure that the Office of the Registrar has a correct billing address. A student who does not receive a billing statement before the term begins should go to the Receivables Office to learn the amount of the account balance due. Failure to receive a billing statement will not exempt students from late penalties or from having a hold placed on their registration. Also see *Index, Fees and Expenses*.

Additional Registration Regulations

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

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

Registration is closed after the tenth day of classes for fall and spring semesters, and after the fifth day of classes for summer session.

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

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

Validating Enrollment

To validate their enrollment in each course at the beginning of the semester, students must attend the first or second meeting (first meeting if the class meets only once a week). Students who add a course after the term begins must attend the next class meeting. The instructor has the option to offer a registered place in the course to another student when a registered student fails to attend and also to obtain prior approval of the instructor. Those students must drop the course or they will receive an F grade.

Making Schedule Changes

Procedures for schedule changes vary by the time period of the semester. The effective date of a schedule change is the date on which the change is entered into the registration system. Schedule change periods are as follows:

Period 1 ends on the fifth day of classes of the full semester. Schedule changes during period 1 are free and do not require adviser signatures. Instructor or departmental approval may be required for adds or section changes in some courses during period 1. Course drops during this period do not count toward a student's ISU course drop limit, and will not appear on a student's grade slip or permanent record. Schedule changes during period 1 may be processed through the AccessPlus registration system or by presenting a Schedule Change/Restriction Waiver form to the Registrar's Student Scheduling Office, 10 Alumni Hall.

Period 2 ends the third Friday of classes after the day midterm grades are due. During this period, schedule changes require signatures of adviser and instructor and are processed on a Schedule Change/Restriction Waiver form. A fee per visit is assessed for adds, drops, and section changes during this period. Course drops after period 1 count toward a student's ISU drop limit and appear as an X on the grade slip and permanent record. A section change does not require a drop.

Drops, including R courses (required courses) and other schedule changes that are judged to be beyond the student's control may be processed as administrative actions if approved by the college dean. There is no fee for administrative schedule changes. Administrative drops do not count toward a student's ISU drop limit and do not appear as an X on the grade slip and permanent record. The effective date of an administrative action is the date it is approved by the college dean.

Period 3 follows period 2. Schedule changes during this period are permitted only for extenuating circumstances beyond the student's control, require a written statement of support from both the instructor and the adviser, and must be approved by the dean of the student's college.

Specific deadlines for adding and dropping half-semester courses are published in the university calendar. Appropriate adjustments to add and drop deadlines are made for other partial term courses. For partial term course deadlines, contact the Registrar's Student Scheduling Office, 10 Alumni Hall.

Drop Limit

Students are limited in the number of courses they may drop during their academic career. (This refers to drops processed after the fifth day of classes of each semester.) Students who entered Iowa State University as freshmen are allowed to drop a maximum of five courses during their undergraduate career. If they entered at a level above freshman classification or in the College of Veterinary Medicine, they are allowed to drop a maximum of four courses. Courses dropped during their first term at Iowa State are not included in this limit, nor does the summer count as a first term for this purpose. Students who enroll at Iowa State University as undergraduates after receiving a bachelor's degree are permitted two drops.

Exceptions may be made for courses that must be dropped for reasons beyond the student's control. These exceptions are granted only by the dean or other authorized person on the dean's behalf in the student's college.

The number of drops students have left is indicated on their grade report (available on AccessPlus) each term. Students are responsible for not exceeding their limit. Students who attempt to drop a course beyond the limit without special permission by the dean of the student's college will continue to be enrolled in the course and will receive a grade at the end of the term.

Course Prerequisites

A prerequisite indicates the specific academic background or general academic maturity considered necessary for the student to be ready to undertake the course. Since an instructor has the prerogative to direct a student who lacks a stated prerequisite to drop the course, students are advised not to enroll in a course for which they lack a stated prerequisite without checking first with the course instructor. Permission of the instructor is understood to be an alternate to the stated prerequisites in all courses.

It is university policy that the instructor shall inform the students at the beginning of each course if students who have not met the prerequisite requirements must drop the course.

Course prerequisites are listed in the Online Schedule of Classes as well as in the Courses and Programs section of this publication.

Cancellation/Withdrawal

Students who decide not to attend classes before the date class work begins must cancel their registration to avoid tuition and fees assessment. Students who decide not to attend classes beginning the first day of class must **withdraw** from the university.

Registration Cancellation

A cancellation is processed when a student notifies the Office of the Registrar, prior to the day class work begins, of their decision not to attend classes for the current semester. All courses are removed and no tuition and fees are assessed.

Students may cancel their registration by contacting the Office of the Registrar at 0460 Beardshear Hall, 515-294-1889. Students who call should request the name of the person taking the call and make a record of the name as well as the time and date called.

Withdrawal

Beginning the first day of classes, a withdrawal is processed when a student notifies their academic adviser and College of their decision not to continue attending courses for a semester. Per the student's request, the "Request for Withdrawal" form is initiated and submitted by the College to the Office of the Registrar. The student is withdrawn from all courses based on the withdrawal date on the form, and tuition and fees are adjusted, if appropriate.

Student-Initiated Withdrawal

Students who find it necessary to leave the university before the end of a term, should follow the procedures described in this section. Otherwise, students' records may be adversely affected and reentry or transfer to another institution may be difficult.

Students who are considering withdrawal from the university should immediately consult their academic adviser, who may be able to provide guidance for more advantageous alternatives.

A request for withdrawal during period 3, (i.e., after the last day to drop a course without extenuating circumstances) will not be approved except for circumstances that are beyond the student's control. The dean of the student's college must approve such requests. Students should check with their college office to find out who is authorized to grant approvals or exceptions on behalf of the dean.

Students should not expect to withdraw during or after the final examination week. In a situation beyond a student's control, when examinations cannot be completed, arrangements should be made for incompletes rather than withdrawal during final exam week. Students who are on temporary enrollment and withdraw during period 3 will not be permitted to enroll the following term, except under extenuating circumstances.

Procedures

To withdraw from the university, students must do the following:

1. Complete a Request for Withdrawal form, with adviser's signature.
2. Request the approval and obtain the signature of the college in which they are enrolled. (If the request is approved, the withdrawal form will be forwarded to the Office of the Registrar where it will be recorded; the information is sent to the appropriate offices.)

The effective date of the withdrawal is the date on which it is approved by the college dean. Students should check with their college office to find out who is authorized to grant approvals or exceptions on behalf of the dean.

If students complete the withdrawal procedure, the courses they are taking will not be included on their permanent record nor counted as part of their drop allowance. Half semester courses completed prior to withdrawal will be included on their permanent record. Incompletes will not be accepted for withdrawals.

Withdrawal procedures must be followed otherwise instructors of the courses involved will assign whatever grades or marks they consider appropriate. Since these grades may be Fs, students are warned that failure to follow the prescribed withdrawal procedures may adversely affect a later application for reentry or transfer to another institution.

University-Initiated Withdrawal

Basis for Interim or Permanent Medical Withdrawal

The University may order involuntary withdrawal of a student if it is determined that the student is suffering from a mental disorder as defined by the current American Psychiatric Association Diagnostic Manual such that the disorder causes, or threatens to cause, the student to engage in behavior which poses a significant danger of causing imminent harm to the student, to others or to substantial property rights, or renders the student unable to engage in basic required activities necessary to obtain an education.

Status of Conduct Proceedings

If the student has been charged with violation of the Conduct Code, but it appears that medical reasons exist for the objectionable behavior, this medical withdrawal policy may be activated prior to issuance of a determination in the conduct process. If the student is ordered medically withdrawn from the University, such action terminates the pending disciplinary action. If the student is found not to be subject to medical withdrawal under this section, conduct proceedings may be reinstated.

Interim Action

The OJA (Office of Judicial Affairs) Administrator or the Dean of students may order interim medical suspension of a student where there appears to be an imminent threat of harm to self or others. If the student is suspended, within 48 hours of ordering interim medical suspension, the Dean of Students will schedule an interim hearing before the Medical Withdrawal Committee, consisting of the Director of Student Health (or designee), the Director of the Student Counseling Service (or designee), and the Dean of Students. The student and the OJA Administrator will have an opportunity to present information as to whether interim medical suspension should be continued or modified, and whether medical withdrawal should be considered.

The Medical Withdrawal Committee may order the student to be referred for an evaluation by a licensed mental health professional of the University's choosing if there is adequate reason to believe that a basis for medical withdrawal exists. The order of referral must be sent to the student and notify the student of the scheduled evaluation to occur no later than seven days from the date of the referral letter. The University will cover the cost of the evaluation. If a student fails to complete the evaluation, the University may continue interim medical suspension and may order restrictions on campus access until the evaluation is completed and reviewed by the University. The decision to continue interim medical suspension and for referral may be appealed within 48 hours, in writing, to the Vice President for Student Affairs. The student may be assisted by any two individuals of his or her choice in any hearing or appeal.

Involuntary Medical Withdrawal

If the medical evaluation supports medical withdrawal, a hearing will be scheduled before the Dean of Students, the Director of Student Health and a member of the Student Counseling staff. The student will have at least 48 hours to independently review the psychological or psychiatric evaluation prior to the hearing. The student and the OJA Administrator may present arguments for or against involuntary Medical Withdrawal. A written decision shall be rendered by the Medical Withdrawal Committee stating the reasons for its determination. The decision may be appealed, in writing to the Vice President for Student Affairs. A student who has undergone involuntary medical withdrawal must reapply, and may not reenter the University without providing competent medical evidence that the medical condition no longer exists, or is sufficiently under treatment so as to remove any substantial likelihood of reoccurrence of the condition which caused medical withdrawal. The University may require the student, at the student's cost, to undergo a medical evaluation by a licensed mental health professional of the University's choosing. A medical withdrawal is not considered a disciplinary action, though a prior medical withdrawal may be considered in subsequent conduct hearings involving the student.

Tuition and Fees Adjustments for Withdrawals

Tuition and fees adjustments are made for withdrawals according to the following schedule for full term courses (appropriate adjustments will be made when partial term courses are involved):

Withdrawal Date	Student Pays
Days 1-8	10%
Days 9-20	50%
Days 21-40	75%
After 40th class day	100%

Students may appeal a tuition and fees assessment for withdrawal by obtaining a "Procedures for Appealing Assessed Tuition" form from the fees section in the Office of the Registrar. The Office of the Registrar will review appeals for possible tuition and fees adjustment for the semester in question only after the written appeal and appropriate support documentation are received from the student. Determinations will be made by the Office of the Registrar based on extenuating circumstances beyond the control of the student. The results will be sent to the student in writing.

Students may appeal the decision of the Office of the Registrar by writing an appeal letter to the Tuition Appeals Review Committee. This letter should be submitted to the Office of the Registrar within 10 calendar days after receiving the original decision. A final appeal of the Tuition Appeals Review Committee decision can be made by submitting a request in writing to the Office of the Provost.

Room and Board Fee Refund

Refund of the unused portion of the contract is based on the daily rate of the remaining room and board fee. If fees have been paid, a refund will be authorized. If fees have not been paid, a charge will be made for the used portion of the contract. A refund is not authorized for any student who leaves the residence halls after December 1 in fall semester or May 1 in spring semester.

Any student living off campus who has contracted for the meal plan to eat in a residence hall dining room and later terminates the contract will be refunded as above.

Returning/Reentry to the University

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

Returning Students

U.S. undergraduate and nondegree undergraduate students planning to return to Iowa State University after an absence of less than 12 months do not complete a reentry form;

however, international undergraduate and nondegree undergraduate students planning to return to Iowa State University after an absence of less than 12 months must complete a reentry form.

Returning U.S. students and graduate students should contact the Office of the Registrar to have their records updated and registration access created. Students should contact their advisers or major professor to select courses and begin the registration process.

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

Reentry Students

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

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

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

International students must complete a reentry form. Forms are available from www.iastate.edu/~registrar/info/reentry.html. Financial certification of ability to cover all educational and living expenses will be required.

The reentry form should be completed and returned to the Office of the Registrar, 0460 Beardshear, well in advance of the term of reentry. Students who have attended another college or university since enrollment at Iowa State University must have an official transcript(s) of all course work attempted sent to the Office of Admissions, 100 Alumni Hall. Reentering students must also contact their departmental office/adviser to prepare a class schedule. Reentry must be approved prior to registration.

Iowa State University requests the information on the reentry form for the purpose of making a reentry decision. If the required information is not provided, the university may not consider the request to reenter.

Reentry Approval Process

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

Academic Renewal Policy

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

Academic Regulations

Class Attendance

Students are expected to attend all class meetings as scheduled. Each instructor sets his or her policy with respect to class attendance, and excuses for absence from class are handled between the student and instructor. The instructor is expected to announce his or her policy at the beginning of the course. See *Index, Validation of Enrollment* for regulations concerning attendance to validate students' enrollment in a class.

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

Veteran Attendance

Students receiving benefits from the Veterans Administration are identified on class lists and are required by the V.A. to attend class regularly to maintain their V.A. eligibility. If the instructor knows that a student receiving V.A. benefits is not attending class, the instructor is obligated to notify the Office of the Registrar and a notification will be forwarded to the Veterans Administration. More information about veteran benefits is available on the Web, www.iastate.edu/~registrar/info/vabeneft.html

Field Trips

Trips away from campus are sometimes arranged as a means of enriching the students' learning experience in a given course. Such trips may not take place during the first or last week of the semester, nor may they extend over more than two consecutive class days (Monday through Friday); these regulations may be waived only by special permission of the dean of the college in which the course is offered. Students should check with their college office to find out who is authorized to grant approvals or exceptions on behalf of the dean.

In order to go on a field trip, students must first obtain permission from the instructors whose classes they will miss. If permission to miss class is not granted, students cannot be required to go on the field trip nor can they be penalized for missing the trip.

Special fees are often charged to cover the costs of field trips. Field trip fees are noted in the Schedule of Classes.

Ownership of Course-related Presentations

The presenter owns course-related presentations, including lectures. Individuals may take written notes or make other recordings of the presentations for educational purposes, but specific written permission to sell the notes or recordings must be obtained from the presenter. Selling notes by students without the required permission is a violation of the Student Disciplinary Regulations.

Recording and Transmission of Classes

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

Because the lectures of faculty represent their intellectual labors, individuals are expected to request permission to make recordings of lectures and other classroom interactions.

Recordings may be used for the purposes of the particular class, although in some cases the recordings may be preserved and used for other classes as well.

Credit Involving a Paid Activity

Students may obtain credit for an activity, either on- or off-campus, for which they are also paid, provided the activity is academically relevant. In order for an activity to be defined as academically relevant, prior arrangements for receiving credit must be made with a faculty member in an appropriate department. The arrangements must include agreement on (1) the academic objectives which the activity is expected to achieve, and (2) the procedure by which the student's learning will be assessed. This policy does not apply to registrations for R credit.

Academic Dishonesty

Academic dishonesty occurs when a student uses or attempts to use unauthorized information in the taking of an exam; or submits as his or her own work themes, reports, drawings, laboratory notes, or other products prepared by another person; or knowingly assists another student in such acts or plagiarism. Such behavior is abhorrent to the university, and students found responsible for academic dishonesty face expulsion, suspension, conduct probation, or reprimand. Instances of academic dishonesty ultimately affect all students and the entire university community by degrading the value of diplomas when some are obtained dishonestly, and by

lowering the grades of students working honestly.

Examples of specific acts of academic dishonesty include but are not limited to:

a. Obtaining unauthorized information. Information is obtained dishonestly, for example, by copying graded homework assignments from another student, by working with another student on a take-home test or homework when not specifically permitted to do so by the instructor, or by looking at your notes or other written work during an examination when not specifically permitted to do so.

b. Tendering of information. Students may not give or sell their work to another person who plans to submit it as his or her own. This includes giving their work to another student to be copied, giving someone answers to exam questions during the exam, taking an exam and discussing its contents with students who will be taking the same exam, or giving or selling a term paper to another student.

c. Misrepresentation. Students misrepresent their work by handing in the work of someone else. The following are examples: purchasing a paper from a term paper service; reproducing another person's paper (even with modifications) and submitting it as their own; having another student do their computer program or having someone else take their exam.

d. Bribery. Offering money or any item or service to a faculty member or any other person to gain academic advantage for yourself or another is dishonest.

e. Plagiarism. "Unacknowledged use of the information, ideas, or phrasing of other writers is an offense comparable with theft and fraud, and it is so recognized by the copyright and patent laws. Literary offenses of this kind are known as plagiarism." One is responsible for plagiarism when: the exact words of another writer are used without using quotation marks and indicating the source of the words; the words of another are summarized or paraphrased without giving the credit that is due; the ideas from another writer are borrowed without properly documenting their source. Acknowledging the sources of borrowed material is a simple, straightforward procedure that will strengthen the paper and assure the integrity of the writer. The *English 104-105 Student Manual*, provides guidelines to aid students in documenting material borrowed from other sources, as does almost every handbook on writing style. Academic dishonesty is considered to be a violation of the behavior expected of a student in an academic setting as well as a student conduct violation. A student found responsible for academic dishonesty or academic misconduct is therefore subject to appropriate academic penalty; to be determined by the instructor of the course, as well as sanctions under the university *Student Disciplinary Regulations*.

If an instructor believes that a student has behaved dishonestly in a course, these steps are to be followed:

1. The instructor should confront the student with the charge of dishonesty and arrange a meeting with the student to discuss the charge and to hear the student's explanation.

2. If the student admits responsibility for academic misconduct, the instructor shall inform the student (a) of the grade on the work in which the dishonesty occurred, and (b) how this incident will affect subsequent evaluation and the final grade.

Because academic dishonesty is also a student conduct violation under Section 4.2.1 of the Student Disciplinary Regulations, **the instructor must report the incident in writing to the Dean of Students**. After investigating the incident and discussing it with the instructor, the Dean of Students, or his/her designee, will meet with the student and depending on the severity of the offense as well as on the student's past conduct record, may handle the matter through an administrative hearing or schedule a hearing before the All University Judiciary (AUJ). This hearing, conducted according to the procedures outlined in the *Student Disciplinary Regulations,* is to determine the disciplinary action to be taken. In any case, the student's academic adviser will be informed of the incident but may not insert any record of it in the student's academic file.

3. If the student claims to be not responsible for the alleged violation of academic misconduct, the instructor may not assign the student a grade for the work in question until the question of responsibility is resolved, unless circumstances require that an interim grade be assigned. The instructor shall consult with his or her department chair and report the incident in writing to the Dean of Students.

The Dean of Students will refer the case to the Office of Judicial Affairs for investigation. After reviewing the report and completing an investigation, the Office of Judicial Affairs will file a formal complaint against the student if it is determined that there is cause to believe academic misconduct occurred. The case may be adjudicated through an administrative hearing or referred to a hearing before the All University Judiciary (AUJ) depending on the nature and severity of the violation as set forth in the *Student Disciplinary Regulations.*

If the case is referred to the AUJ both the student and instructor will be invited to attend an AUJ hearing and present pertinent information. If the Administrative Hearing Officer (in a minor case) or the AUJ (in a major case) finds the student responsible for the charge of academic misconduct, the instructor will inform the student (a) of the grade on the work in which the dishonesty occurred, and (b) how this incident will affect subsequent evaluation and the final grade. The Administrative Hearing Officer or AUJ will determine the appropriate disciplinary action with respect to the nature of the violation.

If the Administrative Hearing Officer or AUJ finds the student "not responsible" for academic misconduct, the instructor will grade the student accordingly on the work in question and the student's grade in the course will not be adversely affected. If the student is found responsible the student's adviser will be informed of the decision but shall not insert any record of the action in the student's academic file.

4. If a student either admits dishonest behavior or is found responsible for academic misconduct by the AUJ, the Office of Judicial Affairs (OJA) or AUJ may impose any of the following sanctions:

a) Disciplinary Reprimand
An official written notice to the student that his/her conduct is in violation of university rules and regulations.

b) Conduct Probation
A more severe sanction than a disciplinary reprimand, to include a period of review and observation during which the student must demonstrate the ability to comply with university rules, regulations, and other requirements stipulated for the probation period.

c) Suspension Deferred Suspension
The suspension is deferred subject to a definite or indefinite period of observation and review. If a student is found responsible for a further violation of the University *Student Disciplinary Regulations* or an order of a judiciary body, suspension will take place immediately.

•Defined Length
The student is dropped from the university for a specific length of time. This suspension cannot be for less than one semester or more than two years.

•Indefinite Suspension
The Student is dropped from the university indefinitely. Reinstatement may be contingent upon meeting the written requirements of the AUJ specified at the time the sanction was imposed. Normally, a student who is suspended indefinitely may not be reinstated for a minimum of two years.

d) Expulsion
The student is permanently deprived of the opportunity to continue at the University in any status.

5. A student accused of academic misconduct has the option to stay in the class or to drop the class if the drop is made within the approved time periods and according to the regulations established by the University. If the student chooses to drop the class, the student will be required to sign a statement of understanding that if the student is later found responsible for academic misconduct, then the student will receive an "F" for the course.

6. Procedures for appeal of either the All University Judiciary's conduct decision or the instructor's grade are outlined in the *Student Information Handbook*.

7. In instances in which the student admits responsibility or is judged to be responsible by OJA or the AUJ, a staff member of the Dean of Students Office will counsel with the student in an effort to deter any further such incidents.

8. Student records concerning academic dishonesty are maintained in the Dean of Students Office for a period of seven years, after which the file records are purged. These student records are confidential; nothing from them appears on a student's academic transcript.

9. In the event that an instructor is uncertain how to handle an incident of suspected academic dishonesty, the Dean of Students is available at any time to provide advice and assistance to the instructor in deciding a proper course of action to be taken.

10. Students enrolled in the College of Veterinary Medicine are bound by an honor code. A charge of academic dishonesty may be made by a student or instructor to the Interclass Honor Board chairperson according to the procedures outlined in the Honor Code, or the instructor may follow procedures outlined above. The Interclass Honor Board functions as the judiciary of the College of Veterinary Medicine for the allegations presented to it.

Other violations related to academic misconduct may include subsection 4.1.11 *Misuse of Computers* and subsection 4.2.20 *Unauthorized Sale of Others' Intellectual Works.* These subsections are located in the Iowa State University *Student Disciplinary Regulations* under section 4 of the Conduct Code.

Progressing Toward a Degree

Classification

An indication that a student is making progress toward a degree is the change in classification. Classification is determined by the number of credits completed and reported to the registrar, and is based on credit hours earned, not merely hours attempted. The grades F and NP and the marks I and X do not count in this classification system.

Classification in all colleges except Veterinary Medicine is as follows:

Sophomore: 30 credit hours earned
Junior classification: 60 credit hours earned
Senior classification: 90 credit hours earned

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

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

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

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

Students enrolled in the Intensive English and Orientation Program (IEOP) are classified as special students in the College of Liberal Arts and Sciences and usually are not permitted to enroll in academic courses until they have satisfied requirements for admission as regular students. Permission to enroll in one academic course may be granted under special circumstances.

Transfer of Credits

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

A student who is admitted as a transfer from another college or university is required to have at least a 2.00 cumulative grade-point average for all transferable work taken elsewhere. If, due to special circumstances, a student is admitted with less than a 2.00 average, that student has a transfer quality-point deficiency. This deficiency will be added to any deficiency accumulated at Iowa State University and will be used to determine whether satisfactory progress toward a degree is being made. To graduate, students must earn sufficient quality points above a 2.00 at Iowa State University to offset any transfer quality-point deficiency.

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

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

Iowa State University students who attend one of the other Iowa Regent universities under the Regent Universities Student Exchange Program will have the credits earned at the other university counted as resident credit and grades received included in their Iowa State University cumulative grade point average. For information on applying to the program see Index, Regent Universities Student Exchange Program.

Degree Planning

In addition to being properly registered, students are responsible for knowing the requirements for their degree and planning their schedule to meet those requirements. Each college has a procedure to determine whether a student will fulfill all degree requirements for graduation.

At each fall and spring registration, students receive an advisement/degree audit printout. This printout shows in a degree program format those courses that have been completed and those courses in which the student is currently enrolled. Also shown are the graduation requirements that have not been completed.

Students should use the information on this printout to help them select courses for the next term and to evaluate their progress toward their degree. Graduation evaluators in the Office of the Registrar use a similar printout during the term a student will graduate to evaluate a student's graduation status.

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

Two Bachelor's Degrees

Students may receive two bachelor's degrees if the requirements for each major (curriculum) are met and the total number of semester credits earned is at least 30 more than the requirements of the curriculum requiring the greater number of credits. The same rule applies to degrees that are not awarded at the

same time. Students should have an academic adviser in each major (curriculum), with one adviser being designated as the registration adviser. Students should request approval to pursue two degrees by completing the form, Request for Double Major/Curriculum or Two Degrees. This form is available from advisers and classification offices. Each adviser will have access to the student's information after this form has been processed. The appropriate department and college must approve each degree program.

Students who have earned advanced degrees and wish to earn a second Bachelor's Degree may be eligible for a college waiver of certain basic and general education requirements. Students should contact the department offering the major for advice and appropriate planning.

Double Major/Curriculum

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

To declare a double major (curriculum), students should complete the form, "Request for a Double Major/Curriculum or Two Degrees." This form, available from advisers and classification offices, should be completed no later than the beginning of the senior year. One major (curriculum) should be designated as primary and the other secondary for purposes of record keeping, but the student's rights and responsibilities are the same in both majors. The adviser of the primary major will serve as the student's registration adviser, but both advisers will have access to the student's information. Degree programs must be approved for each major (curriculum) by the appropriate department and college. One of the majors may subsequently be canceled using the same form.

In addition to their engineering degree, students in the College of Engineering may earn majors in other colleges of the university. A major must meet all requirements of the offering department or program and its college and contain a minimum of 15 additional credits beyond the requirements for a B.S. degree in engineering for each major area of study. Within the College of Engineering, only double degrees are permitted.
Students with a primary major in another college who wish to take a second major in the College of Liberal Arts and Sciences are not required to meet the Liberal Arts and Sciences General Education requirements. They must, however, meet all requirements for the major, including complementary courses. Students in the B.L.S. curriculum in the College of Liberal Arts and Sciences do not have majors.

Second Major (Curriculum) Completed after the Bachelor's Degree

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

Changing Curriculum or Major

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

1. If students are not on temporary enrollment and have never been dismissed and reinstated, they may change their major by consulting first with their adviser. (If, however, they have been on temporary enrollment in the past, they may also be subject to regulation 4, below.) Beyond that, they should follow these procedures:

a. If the change involves majors within the same college, they should check with the college office to obtain instructions as to how to make the change.

b. If the change involves majors in different colleges, they should obtain a Change of Curriculum/Major form and their file from their adviser, present these materials to the classification office of their present college, then to the classification office of the college to which they are transferring, and finally to the office of their new major.

2. Students on temporary enrollment must first obtain permission to enter the new major. Permission comes from the dean of the college responsible for that major in consultation with the department head. If permission is granted, students should then follow the procedures described above. If they are on temporary enrollment and want to transfer to another college in the university, they must do so before the last day to drop a course in period 2 (see Index, Making Schedule Changes).

3. Students who have been reinstated may not transfer to another college during the first term following reinstatement, and they may not at any time transfer back to the college that originally dismissed them without the permission of the academic standards committee of that college.

4. Students who transferred from one college to another while on temporary enrollment, may not transfer back unless they have the permission of the academic standards committee of the college from which they originally transferred.

Declaring a Minor

Many departments and programs in the university specify requirements for an undergraduate minor. A record of requirements completed appears on students' transcripts. All minors require at least 15 credits, including at least 6 credits in courses numbered 300 or above taken at Iowa State. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. Courses taken for a minor may not be taken on a pass-not pass basis. For additional information regarding policies which govern minors, see Index, Minor. To declare a minor, students must submit a completed Request for a Minor form to their college office at least one term before graduation. The minor may be from the catalog under which the student is graduating or a later catalog.

Graduation

Seniors must file a graduation application with the Graduation Office, 10A Alumni Hall, by the Friday of the first week of classes for students who plan to graduate in fall and spring semesters, and the last day of spring semester for students who plan to graduate in summer. Applications may be obtained from the adviser; college office; www.iastate.edu/~registrar/forms; the Student Answer Center, or the Graduation Office, 10A Alumni Hall. Students will be notified by mail approximately four weeks after the semester begins of their graduation status.

Individual college ceremonies take place at the end of fall and spring semesters. The formal commencement ceremony for graduate students takes place on the Friday at the end of the semester, and the undergraduate ceremony takes place on Saturday. A combined undergraduate and graduate college commencement ceremony takes place at the end of the summer term.

Final grade checks will be made approximately two weeks after the end of the semester and diplomas will be mailed to all successful degree candidates.

Students must ensure the following before they can graduate:

1. Registration for the term has been completed and the date of graduation is correct on the advisement/degree audit printout.

2. Sufficient credits, acceptable toward graduation, have been earned to meet the minimum requirements for their curriculum. (Some examples of credit not acceptable toward graduation are: elective credits beyond those allowed in a curriculum, credits earned in passing the same course more than once, more than four credits of Athletics 101, and credit in two courses for which the catalog states that only one may count toward graduation.)

3. Their major department has certified that the student has achieved an adequate level of proficiency in written communication.

4. A cumulative grade point average of at least 2.00 was earned in all work taken at Iowa State and have also met any special grade point averages required by their college, department, or program in specified groups of courses.

a. Students admitted from another college or university with a quality-point deficiency, must have earned sufficient quality points above a 2.00 at Iowa State to offset their transfer grade point deficiency.

b. Students who have taken work at another college or university prior to or after having been a student at Iowa State, must have submitted a transcript of all such college study attempted to the Office of Admissions. This work must average 2.00 or the deficiency of quality points will be assessed against the student. Failure to submit such a transcript is grounds for dismissal.

5. Incompletes in courses required for graduation have been removed by midterm of the term of graduation.

6. At least 32 credits have been earned in residence at Iowa State University, and the final 32 credits were taken at Iowa State. (Six of the last 32 credits may be transferred to Iowa State, with prior written permission of their major department.) Iowa State University must receive a transcript of all transfer work by midterm of the term of graduation.

7. Outstanding financial obligations owed the university have been paid in full. Students who owe an outstanding obligation to the university will have a hold placed on their records and they will not receive their diploma or transcript. If students have questions about this policy, they should contact the graduation section of the Office of the Registrar, 10A Alumni Hall.

Evaluation of Academic Progress

Evaluation Procedures

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

Retention of Records

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

Examinations

Examinations are one of the most important ways an instructor assesses students' performance in a course. In order that examinations can be a useful part of the educational process, the following policies have been instituted:

1. One purpose of examinations is to help students' learning activity. Therefore, examinations shall be evaluated as soon as possible after they are given and the results shall be made available to the students.

2. All tests and examinations administered between the beginning of the term and final examination week shall be held during a regularly scheduled lecture or laboratory class period for that course. A department may request permission to administer a separately scheduled examination if all of the following criteria are met: (a) the course is multi-sectioned; (b) a common departmentally developed examination will be administered to all students in all sections at the same time; and (c) the test scores will be used as a basis for a uniform grading procedure for all sections of the course. Requests to hold separately scheduled examinations must be made to the registrar and approved by the provost in time to be announced in the *Schedule of Classes*. Whenever a separately scheduled examination is administered, a regular class meeting during that week shall be omitted. Students who are unable to take a separately scheduled examination at the scheduled time because of a course conflict or other legitimate reason must notify the instructor in advance and must be given the opportunity to be examined at another time mutually convenient for the student and the instructor; the instructor shall determine whether to administer the same examination or an alternate examination, or use an alternate assessment procedure.

3. At the end of the semester, a week is set aside for final examinations or other term evaluations, with a period normally of two hours scheduled for each course. The following policies govern the responsibilities of students and faculty members during this week:
a. Final exams in courses of two or more credits may not be given at a time other than that for which the exam is scheduled by the registrar. An instructor may not give a final exam prior to final exam week nor change the time of offering of the final examination as it appears in the final exam schedule.

Permission to change the time for which an exam is scheduled may be given only by the dean of the college. If the instructor elects not to give a final exam, the class is required to meet at the scheduled final exam period for other educational activity such as a review of the course or feedback on previous exams.

b. Final exam periods are determined according to the regularly scheduled meeting time of the class. However, certain courses are assigned special group exam times so that several sections of the same course may be tested together. If this results in conflicting group examination periods, students should inform the instructor in charge of the first of the two conflicting courses as listed on the final exam schedule within the special groups in question; that instructor is responsible for arranging a special examination or making some other adjustment.

c. The final exam for a class that regularly meets in the evening must be held at the time the class would normally meet during the final exam week. If this exam conflicts with an evening group exam, the instructor responsible for the latter must arrange a special examination for any students who have a conflict.

d. If unusual circumstances involve the need for students to change the time of their final examination, they must obtain the approval of the instructor of the course.

e. If a student has three examinations scheduled on the same calendar day and wishes to change one to another day, the instructor of the course having the smallest number of students is responsible for arranging an alternate examination time for the student unless make-up exam times are available in one of the other courses.

f. All faculty members are considered to be on duty throughout the entire final examination week and are expected to be available to students during that week for discussion of any matters pertaining to the final examination and final grade or to other aspects of the course.

Dead Week

The last week of fall and spring undergraduate classes has been designated Dead Week by the Government of the Student Body and Iowa State University. The intent is to provide students with time for review and preparation for final examinations. Therefore, no student organization registered with the Student Organization Office may hold meetings or sponsor events without the expressed permission of Program Coordinator of the Dean of Students Office. For academic programs, the last week of classes is considered to be a normal week in the semester except that in developing their syllabi faculty shall consider the following guidelines:

a. Mandatory final examinations in any course may not be given during Dead Week except for laboratory courses and for those classes meeting once a week only and for which there is no contact during the normal final exam week. Take-home final exams and small quizzes are generally acceptable. (For example, quizzes worth no more than 10 percent of the final grade and/or that cover no more than one-fourth of assigned reading material in the course could be given.)

b. Major course assignments should be assigned prior to Dead Week (major assignments include major research papers, projects, etc.). Any modifications to assignments should be made in a timely fashion to give students adequate time to complete the assignments.

c. Major course assignments should be due no later than the Friday prior to Dead Week. Exceptions include class presentations by students, semester-long projects such as a design project assignment in lieu of a final, and extensions of the deadline requested by individual students. Instructors are reminded that most students are enrolled in several

courses each semester, and widespread violation of these guidelines can cause student workloads to be excessive as students begin their preparation for final examinations. Students are reminded that their academic curriculum is their principal reason for being in college and they have a responsibility to study in a timely fashion throughout the entire semester.

The Grading System

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

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

Grades	Quality Points
A	4.00
A–	3.67
B+	3.33
B	3.00
B–	2.67
C+	2.33
C	2.00
C–	1.67
D+	1.33
D	1.00
D–	0.67
F	0.00

P—Passing mark obtained under the Pass-Not Pass system. See Index, Pass-Not Pass.

NP—Non-passing mark obtained under the Pass-Not Pass system. See *Index, Pass-Not Pass.*

S—Satisfactory completion of a course offered on a Satisfactory-Fail grading basis. May also be reported to indicate satisfactory performance in R (required-credit) courses, and in courses numbered 290, 490, 590, and 690.

T—Satisfactory performance (equivalent to a grade of C or better in courses numbered 100-499, and a grade of B or better in courses numbered 500-699) in a special examination for academic credit.

X—The course was officially dropped by the student after the first week of the term.

N—No report was submitted by the instructor. This is not a recognized grade or mark; it merely indicates the instructor has not submitted a grade and that a grade report has been requested.

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

The student and instructor must complete and sign an incomplete contract (Incomplete Mark Report form) that states the reason for the I, the requirements for resolving it, and the date by which it must be resolved, not to exceed one calendar year. The instructor then enters an I on the final grade report, attaches the form to the report, and submits both to the registrar.

If the student is not available at the end of the term to sign the Incomplete Mark Report form because of ill health or other reasons, the instructor may assign an incomplete mark and submit the form without the student's signature. The Office of the Registrar will record the incomplete mark and mail a copy of the form to the student. If the student chooses not to accept the incomplete, the student has until midterm of the following semester to contact his or her instructor and request a grade be submitted to the registrar. If the student has not contacted the instructor by midterm, the student must resolve the incomplete according to the conditions set forth in the Incomplete Mark Report form.

When a student completes the requirements specified on the Incomplete Mark Report form, the instructor submits the appropriate grade, which becomes part of the student's cumulative, but not term, grade-point average. The grade does not replace the I on the record. The I remains on the record for the applicable term.

A final course grade, once submitted to the registrar, may not be changed to an Incomplete except to correct an error at the request of the instructor and with the approval of the instructor's department head and the dean of the instructor's college. The instructor should send a card (Grade Report to the Registrar) reporting the change, and an Incomplete Mark Report form to the appropriate dean who will forward them to the registrar if the change is approved.

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

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

3. **Midterm Grades.** The registrar will collect C-, D, and F **midterm grades** and nonattendance notifications and report this information to students and their advisers using AccessPlus. In addition to returning the midterm list, the instructor is responsible for informing the class of the basis on which midterm grades have been submitted.

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

5. The cumulative grade point average is calculated by dividing the total number of quality points earned by the total number of credits in all courses attempted. Grades of S, P, NP, and T are not counted in calculating the grade point average. If a course is repeated, the cumulative grade point average is calculated according to the process described in item 6a below.

6. Repeating Courses.

a. The most recent grade for a course a student repeats will be used in computing the student's cumulative grade point average rather than the previous grade(s), up to a limit of 15 credits. (This could result in a lowered grade point average if the second grade is lower than the first, or even loss of credit if the grade is lowered to an F.) All grades will remain on the student's record.

b. Students may repeat any course for which an F grade or any passing grade except P or S was received, but they may not elect to repeat the course under the Pass-Not Pass system.

c. Beyond 15 credits of repeats, both grades will be included in computing the cumulative grade point average.

d. Courses should be repeated as soon as possible, preferably within three semesters in residence, because of changes that occur with course updating, change in course number, or revision in number of credits. Approval to repeat a course after more than three semesters have elapsed must be noted on a Designation of Repeated Course form, which can be obtained from departmental offices. This form must be signed by the head of the department offering the course and by the student's adviser, and then taken to the Office of the Registrar. This form must also be used in cases in which the course number or number of credits has changed. Deadlines for filing repeated course forms for full-semester and half-semester courses are published in the university calendar.

e. Transfer students may repeat courses at Iowa State University for which a D or F was received at another institution. They must process a designated -repeat form indicating they are repeating the course to reduce a transfer deficiency. Such repeated credits will count toward the 15-credit request limit and will affect only their transfer deficiency.

f. A student who has earned an F at Iowa State University may repeat the course at another institution and the credits earned may be applied toward graduation at Iowa State, but the grade earned will not be used in computing a cumulative grade point average.

7. Students who want to protest a grade submitted by an instructor should follow the procedures described in the section on *Appeal of Academic Grievances.*

Academic Progress

Each college has an academic standards committee that is responsible for monitoring the academic progress of all undergraduate students in that college, based on policies and minimum requirements set by the Faculty Senate Committee on Academic Standards and Admissions and ratified by the Faculty Senate. Individual college faculties may, with the approval of the Faculty Senate Committee on Academic Standards and Admissions, set additional requirements that are not lower than those established for the university. These additional requirements must be reviewed at least every third catalog by the college academic standards committee to determine if they should be continued. Requirements approved by the college academic standards committees will then be forwarded to the Faculty Senate Committee on Academic Standards and Admissions for final approval. The college committees are responsible for actions involving individual students with respect to placing students on temporary enrollment, dismissing students from the university for unsatisfactory academic progress, and reinstating students who have been dismissed. For questions concerning interpretation and application of the rules governing academic progress, students should contact the chair or secretary of their college academic standards committee in the administrative office of their college.

The university's academic standards rules are presented below. In addition to taking action based on these rules, a college academic standards committee may also place a student on temporary enrollment or dismiss a student from enrollment in the university when, in the college committee's judgment, the student's academic performance or progress toward a degree is exceptionally deficient. Likewise, a college committee may, under exceptional circumstances, exempt individual students from the application of these rules.

Students who participate in the Regent Universities Student Exchange Program, or in a similar program where the credit taken at the other school will be considered as resident credit and the grades included in the student's ISU cumulative grade point average, are subject to Iowa State University's academic standards.

Temporary Enrollment Status and Academic Dismissal

Students are placed on temporary enrollment status as a warning that their academic progress is not satisfactory and that they must improve their academic performance to avoid dismissal from the university. Students who are placed on temporary enrollment should immediately seek assistance in academic improvement from such sources as academic advisers, instructors, the Student Counseling Service, and the Academic Success Center.

Students may be admitted to Iowa State University on temporary enrollment or may subsequently be placed on temporary enrollment as a result of unsatisfactory academic performance. Students on temporary enrollment status who do not meet the minimum requirements described below will be dismissed from enrollment in the university.

Decisions regarding temporary enrollment and academic dismissal are based on the student's cumulative quality-point deficiency. The number of deficient quality-points is determined by subtracting the total number of ISU quality-points from twice the number of ISU credits attempted. If a student enters Iowa State University with a quality-point deficiency, this deficiency will be added to any deficiency accumulated at Iowa State University to determine the cumulative quality-point deficiency. Example: Assume a student has attempted 65 credit hours of coursework, and has a cumulative grade-point average of 1.80. This student needs 130 quality points (i.e., 65 credit hours x 2.00 points) in order to have a zero quality-point deficiency. The student currently has earned 117 quality points (i.e., 65 credit hours x 1.80 grade point average**). Thus, the student currently is deficient by 13 quality points (i.e., 130–117).

Assume the student must remove this 13 quality-point deficiency over the next 30 credit hours. The student would need to earn 73 quality points (i.e., 30 credit hours x 2.00 quality points = 60 quality points) in order to not add to the deficiency. Thus, a grade-point average of 2.44 (i.e., 73 quality points/30 credit hours) for the next 30 credit hours is needed to remove the deficiency.

Students who are placed, or continued, on temporary enrollment at the end of the spring semester may enroll for the summer term without being placed in jeopardy of academic dismissal from the university at the end of that summer term. However, the cumulative quality-point deficiency at the end of the summer term will be used for temporary enrollment decisions. This is true for all students enrolled in the summer term. Students considered for academic dismissal at the end of spring semester will be permitted to enroll for the summer term. The cumulative quality-point deficiency at the end of the summer term will be used to determine whether the student should be permitted to continue. The individual colleges determine if students reinstated for the spring semester will be permitted to utilize the summer term option. (Reinstated students should also see the section on Reinstatement.)

1. Students with fewer than 90 credits attempted or earned,* whichever is greater, will be placed on temporary enrollment at the end of any semester or summer term when their cumulative quality-point deficiency equals 10 or more quality points. At the end of any term in which a student is on temporary enrollment, the student will be:

a. dismissed from enrollment in the university if the cumulative quality-point deficiency has increased;

b. continued on temporary enrollment if the cumulative quality-point deficiency has not increased but remains 10 or more;

c. removed from temporary enrollment if the cumulative quality-point deficiency is now less than 10.

2. Students with 90 or more credits attempted or earned,* whichever is greater, will be placed on temporary enrollment at the end of any semester or summer term when they have any quality-point deficiency. At the end of the term in which a student is on temporary enrollment, the student will be:

a. dismissed from enrollment in the university if the cumulative quality-point deficiency has increased;

b. continued on temporary enrollment if the cumulative quality-point deficiency has not increased but remains greater than zero;

c. removed from temporary enrollment if the cumulative quality-point deficiency has been removed.

3. A student on temporary enrollment may transfer to another college within the university only with the permission of the department chair of the new department and dean of the new college. Transfer during period 3 (after the last day to drop a course) may be approved by the department chair of the new department and dean of the new college only under exceptional circumstances. The student will be subject to any additional specific academic requirements determined by the academic standards committee of the college to which the transfer is made.

4. A student who has transferred from a college while on temporary enrollment cannot transfer back unless permission is granted by the academic standards committee of the original college.

5. A student on temporary enrollment who withdraws during period 3 will not be permitted to enroll the following term, except under extenuating circumstances as judged by the college academic standards committee.

Additional Academic Progress Regulations

Colleges, departments, or programs may have special grade point requirements for admission, continuation, or graduation. These are presented in connection with statements of college and department curriculum requirements.

1. Business: In addition to the requirements listed above, students enrolled in the College of Business with 60 or more credits attempted or earned,* whichever is greater, will be placed on temporary enrollment at the end of any semester when they earn less than a 2.00 grade point average for that semester. Students placed on temporary enrollment under provisions of this requirement will be dismissed from enrollment in the College of

Business if they fail to achieve, for the following semester, at least a 2.00 semester grade point average.

Summer term grades will be combined with the student's grades for the prior term to compute a single semester grade point average to be used for temporary enrollment and academic dismissal decisions. Credit hours and quality points will be combined for the purpose of obtaining the average. When courses are repeated, both grades will be used in this computation.

Students considered for academic dismissal at the end of a spring semester under provisions of the preceding paragraphs will be permitted to enroll for the following summer session.

Students who are dismissed from the College of Business must seek admission to another college before the beginning of the following semester to stay enrolled in the university. Proof of admission to another college must be presented to the College of Business by the last business day before the beginning of the following semester. Students who fail to do so will be dismissed from the university.

2. Design: In addition to the requirements listed above, students in the College of Design who have attempted thirty (30) credits or more will be placed on temporary enrollment at the end of any semester in which their cumulative grade point average falls below 2.00. Students placed on temporary enrollment under the provisions of this requirement will be dismissed from enrollment in the college if they fail to achieve, for the following semester, at least a 2.00 grade point average for that semester.

Summer term grades will be combined with the student's grades for the prior term to compute a single semester grade point average to be used for temporary enrollment and academic dismissal decisions.

Students considered for academic dismissal at the end of a spring semester under provisions of the preceding paragraphs will be permitted to enroll for the following summer session.

Students who are dismissed from the College of Design must seek admission to another college before the beginning of the following semester to stay enrolled in the university. Proof of admission to another college must be presented to the College of Design by the last business day before the beginning of the following semester. Students who fail to do so will be dismissed from the university.

3. Engineering: In addition to the requirements listed above, students enrolled in the College of Engineering with 60 or more credits attempted or earned,* whichever is greater, will be placed on temporary enrollment at the end of any semester when they earn less than a 2.00 grade point average for that semester. Students placed on temporary enrollment under provisions of this requirement will be dismissed from enrollment in the university if they fail to achieve, for the following semester, at least a 2.00 semester grade point average.

Summer term grades will be combined with the student's grades for the prior term completed to form a single semester grade point average to be used for temporary enrollment and academic dismissal decisions. Credit hours and quality points will be combined for the purpose of obtaining the average. When courses are repeated, both grades will be used in this computation.

Students considered for academic dismissal at the end of a spring semester under provisions of the preceding paragraphs will be permitted to enroll for the following summer session.

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

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

Reinstatement

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

1. Reinstatement is not automatic. A student who has been dismissed for academic reasons should contact the Dean's Office in the college he or she wishes to enter for instructions specific to that college. The college Academic Standards Committee reviews each petition and other relevant information, and reinstatement is based upon that review. The student must identify the causes of her or his poor academic performance, and demonstrate that he or she has taken actions to avoid or eliminate these causes. The student must submit a plan for academic success.

2. A student can only be reinstated when at least one academic semester has elapsed since she or he was academically dismissed. The summer session is not a semester for the purpose of being out of school one semester.

3. A student who has been dismissed from enrollment two or more times is not eligible for reinstatement until at least two academic semesters have elapsed since his or her last academic dismissal.

4. A student who was dismissed by one college and subsequently reinstated by another college cannot transfer back unless permission is granted by the Academic Standards Committee of the original college. This procedure applies regardless of the student's current academic standing.

5. To be considered for reinstatement to the university, a student must file a reentry form and submit a petition to the Academic Standards Committee of the college in which she or he desires to enroll at least 45 days before the beginning of the semester. (A student dismissed for the second time and requesting reinstatement in the College of Liberal Arts and Sciences must submit his or her petition 70 days before the beginning of the semester.)

6. As conditions of reinstatement, a student will reenter on temporary enrollment, and must accept whatever additional requirements are stipulated by the college Academic Standards Committee. Some examples may include full- or part-time status, specified credit hours, specific courses, specific GPAs, restriction on choice of major, and required counseling. Other conditions may also be imposed.

Student Appeal

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

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

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

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

Removal of Unmet High School Requirements

In some instances, students are admitted to the university and permitted to enroll with a limited number of unmet high school requirements. Any unmet high school requirement must be removed within one year (12 months) of enrollment at Iowa State University. The following procedures apply.

1. Students may remove their unmet requirements by satisfactorily completing the necessary ISU courses. Courses taken to remove deficiencies will be used in the student's degree program as they normally would be used.

2. Students may also take coursework at another institution to remove their unmet requirements. However, students will be informed that evidence of satisfactory completion of the courses must be available to ISU officials by a specified deadline.

3. Students are required to remove their unmet requirements within one year of their enrollment at ISU, even though they may withdraw or drop out of school during the first year. The College of Liberal Arts and Sciences allows students until the end of their third year to remove unmet Foreign Language requirements.

4. The college Academic Standards Committee determines whether a student should be granted an extension due to extenuating circumstances.

5. Students will be permitted to register for each succeeding term at ISU during the year they are trying to remove unmet requirements. If the unmet requirements are not removed by the end of that year, the student's registration will be canceled and a hold placed on their record.

Academic Renewal Policy

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

1. Eligibility. To be eligible for academic renewal consideration, students must meet these requirements:

a. Students must not have enrolled at Iowa State University for five or more consecutive years.

b. Students must not have graduated from Iowa State University.

c. Students must currently be in good academic standing. (If the student was previously dismissed, he or she must be reinstated.)

2. Conditions. Academic renewal is based on the following conditions:

a. All courses and credits that were taken during the chosen terms will be removed from consideration for GPA and degree requirements. Students may not combine courses from multiple terms to comprise the semester(s) or quarter(s) dropped. Degree requirements met during the dropped terms will ordinarily have to be repeated.

b. Renewal may be applied only to academic terms completed prior to the students' extended absence.

c. All courses and grades for the chosen terms will remain on the students' academic record.

d. Designated repeats, drops and P/NP options will be reinstated for the terms dropped.

e. Students who have used all of their drop options will be given one extra drop.

f. Students may be granted only one academic renewal.

To be eligible for a degree, students must complete a minimum of 24 credit hours at Iowa State after the granting of academic renewal.

3. Procedures.

a. Students should discuss their desire to pursue academic renewal with an adviser in the college they wish to enter.

b. Students should submit a petition for academic renewal to the Office of the Registrar. Students may obtain a petition from their college office.

Satisfactory Academic Progress for Financial Aid Recipients

In order to remain eligible to receive financial aid from the student aid programs listed below, a student must meet both quantitative and qualitative academic standards as described within this policy. These standards are minimum expectations; specific aid programs may require a higher level of progress. A student not in compliance will be unable to receive aid from these programs until the deficiency has been corrected. Progress toward a degree will be reviewed each term and enforced at intervals no longer than one year. The programs affected by this policy are:

Pell Grant
Robert C. Byrd Scholarship
Supplemental Educational Opportunity Grant (SEOG)
Iowa State University Grant
College Work-Study Program (CWSP)
Perkins Loan
Health Professions Student Loan (HPSL)
Federal Direct Subsidized Loan
Federal Direct Unsubsidized Loan
Federal Direct PLUS Loan
ISU Partnership Loan
University Long-Term Loan

1. All students must meet the quality standard for continued enrollment in order to remain eligible to receive financial aid. See *Index, Academic Progress, Quality Standard*.

2. The quantity standard for full-time undergraduate students is described below:

a. Duration of eligibility. Students may receive federal and institutional aid for a maximum of six academic years or twelve semesters. Students who have not accumulated sufficient credit hours at the end of this time period to complete their course of study will not be eligible to continue to receive financial aid.

b. Annual credit hours to be earned. An undergraduate student who receives financial aid from one or more of the programs cited above must complete credit at a rate at least equal to the scale below, where the numbers in the top row indicate academic years completed, and those in the bottom row indicate credit hours required:

1	2	3	4	5	6
15	30	51	72	96	120

3. The quantity standard for all part-time students:

a. The duration of eligibility for part-time students is the same as above, but adjusted by the rate of attendance. For example, a student with a maximum duration of six years who is attending school half-time would have the duration of eligibility adjusted to twelve years.

b. Part-time students who are otherwise eligible for financial aid must maintain the academic standards or rate of completion as stated above, adjusted by the number of hours attempted at the time the financial aid was disbursed.

9 to 11 credit hours = 3/4 time
6 to 8 credit hours = 1/2 time

4. Regaining eligibility. If a student is denied financial aid because of failure to comply with the above standards, the additionally required credit must be earned at the student's own expense at Iowa State University, or the student must transfer sufficient hours taken at another institution to make up the deficiency.

5. Transfer students. A student transferring to Iowa State University for the first time will be treated as a first-term student and will not be held responsible for previous terms or credit hours taken at former institutions. If a student attends Iowa State University, transfers to another institution, and then transfers back to Iowa State, the credits earned at the other institution will be added to the student's total earned credit hours.

6. Noncredit courses. Noncredit courses may be converted to credit hours by translating weekly contact hours as defined by the Office of the Registrar.

7. Appeals. Students ineligible for financial aid as a result of this policy, or ineligible for any other reason, may appeal this decision by submitting in writing extenuating circumstances beyond their control that affected their progress to the director of the Student Financial Aid Office and/or the designated representative. Forms for this purpose are available on the Office of Student Financial Aid web site at www.iastate.edu/~fin_aid_info/. The appeal may be accompanied by a recommendation from the student's academic adviser. If this appeal is denied, a further appeal may be made to a committee composed of the chair of the University Financial Aid Committee, the chair of the University

Academic Advising Committee, and the director of Student Financial Aid. Appeals of other financial aid decisions, including loss of athletic grants-in-aid, shall also follow this procedure.

8. General Information and Definitions

a. Incompletes, repeated courses, withdrawals. A student who receives an Incomplete, repeats a course, or withdraws may continue to receive financial aid upon reentering the university as long as the student completes the required credit hours for each academic school year and maintains the minimum quality-point standards. However, the duration of eligibility will not be extended for a student who withdraws or repeats a course. (See the section Duration of Eligibility.)

b. Exceptions to the policy.
(1) Professional students. For those students enrolled in the College of Veterinary Medicine, eligibility will be based on the academic criteria of the college.
(2) Special undergraduate students. These students are eligible for Stafford only, and must maintain a minimum GPA of 2.00.

c. Academic school year. This includes the summer session and regular semesters within any 12-month period. Credits earned during the summer session will be included when totaling credit hours earned each academic year.

d. Changes in program of study. The duration of eligibility will not be extended for a student who changes from one program of study to another. (See Duration of Eligibility, in the section, Satisfactory Academic Progress for Financial Aid Recipients.)

These academic progress criteria are defined in minimal terms. If the student earns only the minimum credit hours for financial aid eligibility, the student's total eligibility for particular programs may be exhausted prior to degree completion. (See Duration of Eligibility and Credit Hour Earning Scale.) In addition, the student's college or department may require more credit hours than required by this policy.

Sources of Help with Academic Problems

If students are having trouble in a course, the following persons and places may be able to provide help:

1. The instructor of the course may be able to help the student determine the problem with the course and recommend methods for improvements.

2. The student's adviser may be able to recommend support services or remedial strategies.

3. Academic Success Center has a collection of services such as tutoring, supplemental instruction (SI), the academic success course, learning lab, disability resources, and workshops designed to help students reach their academic goals.

4. The office of the department that offers the course may have a list of persons qualified to provide tutoring services for the course. The locations of the department offices are listed in the front of the ISU Directory.

5. The Student Counseling Service provides professional counseling services for students with problems which affect academic performance. Tutoring may be arranged through Tutoring Services in the Dean of Students Office.

Scholastic Recognition

The university recognizes those students who are doing exceptionally well in several ways.

1. Dean's List. Each semester the university issues a dean's list made up of those students who have carried at least 12 hours of graded or S-F courses with a 3.50 grade-point average or above for the semester. Courses taken on a P-NP basis do not count as part of the 12-hour requirement. No dean's list is issued for summer school.

2. Annual Recognition Ceremony. In the spring the university sponsors a ceremony at which high scholarship students in all classes are recognized.

3. Graduation with Distinction. Undergraduates who have a cumulative grade point average of 3.50 or higher at the beginning of their final term are graduated "with distinction" provided they have completed 60 semester credits of coursework at Iowa State University at the time they graduate. Of these 60 credits, 50 graded credits are required. This recognition appears on the student's permanent record and diploma, and in the commencement program. Recognition for students graduating in veterinary medicine is based only on the grades earned while enrolled in that college. Candidates for the bachelor of liberal studies degree may be graduated with distinction providing that they (a) have achieved a cumulative grade point average of 3.50 or higher for all ISU credits; (b) have achieved a cumulative grade point average of 3.50 or higher for all other credits taken at the other Iowa Regent universities; and (c) have completed 45 semester credits of coursework at the three Iowa Regent universities at the time of graduation.

Academic Privileges and Opportunities

A. Credit by Examination

Academic credit may be earned by means of special examinations. The Credit by Examination (CBE) program is available to current Iowa State students as well as prospective and entering students. Students with college-level proficiency in particular areas are encouraged to investigate credit by examination early in their college careers. For more information, see Index, Credit by Examination.

B. Pass-Not Pass Grading

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

1. Undergraduate students who have earned at least 40 semester credits and who are not on temporary enrollment at the beginning of the semester are eligible. A special student must obtain approval from their academic adviser and college dean.

2. Only elective courses may be taken on a P-NP basis. In specific majors, some restrictions may apply, so students should consult with their academic adviser.

3. Except for restrictions on its own undergraduate majors, a department may not deny the availability of any of its course offerings on a P-NP basis.

4. Courses offered on a satisfactory-fail basis may not be taken P-NP.

5. Students should register for a P-NP course in the same manner and at the same time that they register for their other courses. Students should then change to P-NP by processing a schedule change form with their academic adviser's signature in the P-NP approval section of the form.

6. Students who elect to change back to a graded basis should process the change using the P-NP section of the schedule change form.

7. Changes to or from a P-NP basis must be made before the last day to drop (usually the Friday of week 10 of the term). If the change from P-NP to a graded basis is made after the first 10 class days of a semester (first five days of summer session), the course will count toward the total P-NP credits allowed.

8. Registration on a P-NP basis is not indicated on the instructor's class list. Students will receive a P if their grade is D minus or better and an NP if their grade was F.

9. Neither P (earned grade of D minus or better) nor NP (earned grade of F) is counted in calculating a student's grade point average (GPA).

10. Students who pass a course taken under the P-NP system may not repeat the course. When students have taken a course and received a grade, they may not repeat it for P-NP credit.

11. When students change their curriculum, any P credits that they have accumulated will be accepted by the new department if such credits are in courses normally accepted by the department.

12. Credits taken on a P-NP basis at another institution and transferred to Iowa State may be applied as electives in a student's degree program if the credits are otherwise acceptable in that program. The number of P-NP transfer credits that can be accepted depends on the number permitted by the institution from which the student is transferring. If a student transfers more than nine semester P-NP credits, no additional Iowa State P-NP credits can be applied to the student's degree program.

C. Auditing

To audit a course means to enroll in the course without receiving credit for it. The instructor must approve all audits and students must register for audits by day 10 of the semester. Students are assessed fees as though they were taking the course for credit, but the course does not count in determining full-time student status. Changing a course from credit to audit requires dropping the course for credit and adding it as an audit on a schedule change request form. If this occurs after day 5 of the semester, the drop will count toward the total allowable ISU drops.

Requests to audit a course will be honored only if there is space available in the course after the four-week registration period has ended. Once enrolled in a course, auditors have the same rights and privileges as any student taking the course for credit. Their names appear on the class list with a notation that they are auditing. To change the status of an audited course to a graded course, students must process the schedule change request form by day 5 of the semester. Audited courses do not appear on the student's permanent record except by special request from the student and the student's adviser with evidence showing that the student was actively involved in the course. Audited courses do not apply toward V.A. benefits.

An agreement to audit a 500 or 600 level course must be negotiated between the student and the course instructor. An audited course counts for only one credit in the graduate student's allowable course load; however, fees will be assessed for the full number of credits for the course.

D. Independent Study

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

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

Appeal of Academic Grievances

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

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

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

If the student is not satisfied with the resolution of the grievance proposed by the department chair, the student may appeal in writing to the dean of the instructor's college. (In the case of a grievance involving a Graduate College *policy* or *procedure*, an appeal of the chair's decision should be directed to the Dean of the Graduate College rather than to the dean of the instructor's college.) The dean will hear the explanations of the department chair and instructor, and should respond to the student in writing within ten class days of receipt of the written notice of the appeal. If the grievance cannot be resolved with the dean, the student may forward a written appeal to the provost, who will convene a Committee to Review Student Grievances (see below) to consider the appeal within ten class days of receipt of the written notice of the appeal. Within five class days following the convening of the committee, the provost will make a decision with regard to the grievance and will transmit this decision in writing to the grievant, the dean, the department chair, and the instructor. An appeal of the provost's decision may be made to the president of the university. The time limit specified at each level may be extended by mutual agreement of all parties concerned.

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

Information Disclosure

Iowa State University is required by law to make available to enrolled students, prospective students, and their parents certain information about the University. The information disclosure is available at the following URL: www.iastate.edu/~disclosure. Students without electronic access can obtain the information from the Office of the Registrar, 214 Alumni Hall, 515-294-1840 or from the Office of Admissions, 100 Alumni Hall, 515-294-5836. A paper copy of the information will be provided upon request.

Student Records

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

Public Information

Certain information concerning students is considered to be open to the public upon inquiry. This public information is of two types: directory information and other information not included in the ISU Directory. Directory information includes local address, telephone number, and campus e-mail address; home town, college, curriculum, year in school, and enrollment status. Other public information includes mailing address, date and place of birth, dates of attendance at Iowa State, expected date of graduation, names of advisers, awards and academic honors, Iowa State degree(s) and date(s) awarded, previous educational institutions attended, degrees received, dates of attendance, full- or part-time status, participation in officially recognized activities and sports, and weight and height of members of athletic teams.

Public information will be released by the registrar to anyone upon inquiry, unless students have requested that their information

not be released. A request to have public information withheld should be made at the Office of the Registrar, 214 Alumni Hall. If the request is granted, the registrar will notify the appropriate university offices.

It is the policy of the university to respect the privacy of students; therefore, only lists and labels containing names of students with directory information will be made available to members of the public. This directory information will be provided on a time-available basis for the cost of producing the information. Directories are also available in the bookstores for those persons needing directory information. Directory information is available on the World Wide Web using the online phonebook; and from printed directories, which may be purchased at the bookstores.

Confidential Information

With the exception of the information noted above, all student records are considered to be confidential and are open only to university personnel; to offices and agencies carrying out their accreditation and audit functions of university programs; to persons in compliance with a judicial order; to organizations conducting studies for or on behalf of educational institutions or agencies for the purpose of developing, validating, or administering predictive tests, administering student aid programs, and improving instruction; and to persons in an emergency in order to protect the health or safety of students or other persons.

The following policies govern access to student records:

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

a. Academic records: registrar
b. Admissions records: director of admissions
c. Financial aid records: director of student financial aid
d. Business records: university controller
e. Traffic and security records: director, ISU Department of Public Safety
f. Medical records: director, Thielen Student Health Center
g. Counseling records and test scores: director, Student Counseling Service
h. Actions of Academic Standards Committees: college deans
i. Disciplinary records: dean of students
j. Residence hall records: director of residence
k. Placement records: college placement officers
l. Evaluations for admission to ISU graduate or professional programs: deans or department chairs
m. Special academic programs: faculty member in charge of the program and the dean of the college.

2. The responsible official may release records to university personnel who have a legitimate need for the information. "University personnel" includes students appointed to specified committees. A list of those persons who normally have access to each type of student record is available in 214 Alumni Hall.

3. All student records are reviewed periodically. Information concerning the frequency of review and expurgation of specific records is available in 214 Alumni Hall.

4. Students have the right to review upon request any records that pertain directly to them, and may obtain a copy of the record for a fee. This provision does not apply to records to which the student has waived his or her right to review, nor does it apply to medical and counseling records.

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

6. A file containing copies of records pertinent to advising is maintained on each student for use by the student's adviser. Ordinarily this file is kept in the possession of the adviser, but for convenience it may be stored elsewhere such as in the department office. When the student changes majors, or changes advisers within the same major, the file is transferred to the new adviser. Under the university's student records policy, the student is considered to have the right of access to this file.

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

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

9. Confidential information may be released to parents by obtaining the student's written consent or by having the parent establish the student's dependency as defined by the Internal Revenue Code of 1954, section 152, by furnishing a certified copy of the parent's most recent federal income tax return.

10. Iowa high schools receive a freshman year report containing first year academic progress data of all their graduates attending Iowa State University for the purpose of evaluating and improving their instructional programs.

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

Posting Grades and Test Scores

The test scores or course grades of students may be posted in public locations to inform students of their performance provided that the information is presented in such a way as not to reveal the name or entire ID number of specific individuals.

Release of Grades

Reports of a student's grades are not routinely sent to the student's parents. Parents of students under 18 years of age may obtain grades by writing to the Office of the Registrar. The grades of other students will be sent to their parents only with written permission of the student, or by establishing dependency as outlined in item 9 under Confidential Information.

When Records May Be Withheld

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

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

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

Review and Challenge of Records

A student may challenge the accuracy of handling of records maintained by the university on grounds that the records are inaccurate, misleading, or otherwise violate the privacy or other rights of the student. The university has established the following procedures to provide an opportunity for the student to correct or delete inaccurate records, or to insert into the record a written explanation of the content.

Students who question their records should discuss the issue first with the individual staff person who established or maintains the records. Presumably most issues can be resolved at this level. If a satisfactory resolution cannot be reached, the student should submit the question to the head of the department in which the record is maintained.

The department head will discuss the issue with the staff person and the student challenging the record. If resolution cannot be

reached after meeting with the department head, the student may submit the question to the dean or director to whom the department head is responsible. The dean or director will investigate, and will respond in writing.

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

ISUCard and Identification Number

Each student is assigned a random university identification number on entry to the university. This number appears on the ISUCard that is provided to each student at the time of first registration. The ISUCard, may be required for some services and/or activities. At the time the ISUCard is issued each student also selects a personal identification number (PIN), which is required for electronic access to personal student information.

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

Social Security Number

Social security numbers are collected from prospective and current students, for administrative coordination and record identification purposes only. Although procedures have been established by the registrar for assignment of an alternative number upon request, students who wish to be employed on campus or to receive financial aid are required by law to provide their social security numbers for administrative use. The social security number is a confidential record and is maintained as such by the university in accordance with the Family Educational Rights and Privacy Act.

Policy on Student Names

Iowa Regents universities have a common policy regarding student names and name changes. The name on the student record should be the student's complete and legal name. In evaluating and processing all name change requests, the university reserves the right to require adequate and appropriate documentation as warranted.

Designators-Course Abbreviations

A E	Agricultural Engineering
A Ecl	Animal Ecology
Acct	Accounting
Advrt	Advertising
Aer E	Aerospace Engineering
Af Am	African American Studies
AFAS	Air Force Aerospace Studies
AgEdS	Agricultural Education and Studies
Agron	Agronomy
Am In	American Indian Studies
An S	Animal Science
Anthr	Anthropology
Arch	Architecture
Art	Art and Design
Art H	Art History
ArtEd	Art Education
ArtGr	Art: Graphic Design
ArtID	Art: Interior Design
ArtIS	Integrated Studio Arts
AST	Agricultural Systems Technology
Astro	Astronomy and Astrophysics
Ath	Athletics
B M E	Biomedical Engineering
B M S	Biomedical Sciences
BBMB	Biochemistry, Biophysics, and Molecular Biology
BCB	Bioinformatics and Computational Biology
Biol	Biology
Bot	Botany
BPM I	Biological/Pre-Medical Illustration
BRT	Biorenewable Resources and Technoloogy
BusAd	Business Administration
C E	Civil Engineering
C I	Curriculum Instruction
C R P	Community and Regional Planning
Ch E	Chemical Engineering
CAS	Complex Adaptive Systems
Chem	Chemistry
Chin	Chinese
CJ St	Criminal Justice Studies
Cl St	Classical Studies
CmDis	Communication Disorders
Co Ed	Counselor Education
Com S	Computer Science
ComSt	Communication Studies
Con E	Construction Engineering
Cpr E	Computer Engineering
Dance	Dance
Dsn S	Design Studies
E App	Engineering Applications
E E	Electrical Engineering
E M	Engineering Mechanics
E Sci	Engineering Science
Econ	Economics
EdAdm	Educational Administration
EEB	Ecology and Evolutionary Biology
EL PS	Educational Leadership and Policy Studies
Engl	English
Engr	Engineering
EnSci	Environmental Science
Ent	Entomology
Env S	Environmental Studies
Ex Sp	Exercise and Sport Science
FFP	Family Financial Planning
F Lng	Foreign Languages and Literatures
FCEdS	Family and Consumer Sciences Education and Studies
Fin	Finance
For	Forestry
Frnch	French
FS HN	Food Science and Human Nutrition
Gen	Genetics
Genet	Genetics—Interdisciplinary
Geol	Geology
Ger	German
Geron	Gerontology
Gr St	Graduate Studies
Greek	Greek
H P C	Historical, Philosophical, and Comparative Studies in Education
H S	Health Studies
HD FS	Human Development and Family Studies
Hg Ed	Higher Education
Hist	History
Hon	Honors
Hort	Horticulture
HRI	Hotel, Restaurant, and Institution Management
I E	Industrial Engineering
I R	Industrial Relations
I Tec	Industrial Technology
Ia LL	Iowa Lakeside Laboratory
IGS	Interdisciplinary Graduate Studies
Imbio	Immunobiology
InfAs	Information Assurance
IntSt	International Studies
Ital	Italian
Jl MC	Journalism and Mass Communication
L A	Landscape Architecture
LAS	Liberal Arts and Sciences Cross-Disciplinary Studies
Latin	Latin
Lib	Library
Ling	Linguistics
M E	Mechanical Engineering
M S	Military Science
M S E	Materials Science and Engineering
Mat E	Materials Engineering
Math	Mathematics
MCDB	Molecular, Cellular and Developmental Biology
Mgmt	Management
Micro	Microbiology
MIS	Management Information Systems
Mkt	Marketing
Mteor	Meteorology
Music	Music
NREM	Natural Resource Ecology and Management
N S	Naval Science
Neuro	Neuroscience
OLHRD	Organizational Learning and Human Resource Development
P M	Pest Management
P Phy	Plant Physiology
Perf	Performing Arts
Phil	Philosophy
Phys	Physics
Pl HP	Plant Health and Protection
Pl P	Plant Pathology
Pol S	Political Science
POM	Production/Operations Management
Port	Portuguese
Psych	Psychology
Relig	Religious Studies
ResEv	Research and Evaluation
Rus	Russian
Soc	Sociology
Sp Cm	Speech Communication
Sp Ed	Special Education
Span	Spanish
Stat	Statistics
SusAg	Sustainable Agriculture
T C	Textiles and Clothing
T SC	Technology and Social Change
Thtre	Theatre
Tox	Toxicology
Trans	Transportation
TrLog	Transportation and Logistics
U St	University Studies
V C S	Veterinary Clinical Sciences
V Med	Veterinary Medicine
V MPM	Veterinary Microbiology and Preventive Medicine
V Pth	Veterinary Pathology
VDPAM	Veterinary Diagnostic and Production Animal Medicine
W Res	Water Resources
W S	Women's Studies
Zool	Zoology

Colleges and Curricula

Undergraduate and Professional Degree Programs

The university is organized into nine colleges, including the Graduate College. Seven colleges offer undergraduate degree programs, and the College of Veterinary Medicine offers the Doctor of Veterinary Medicine degree. For a listing of the more than 100 majors offered by the Graduate College, see the summary at the end of the Graduate College section of this publication.

Iowa State University is accredited by the Commission of Institutions of Higher Education of the North Central Association of Colleges and Schools.

The main undergraduate academic programs of each college are listed below, together with the degrees awarded upon completion. In many cases certain majors, minors, options, or electives allow for increased specialization within the programs. Programs which are administered jointly by two colleges are listed within both colleges.

College of Agriculture

Agricultural Biochemistry, B.S.
Agricultural Business, B.S.
Agricultural Education, B.S.
Agricultural Studies, B.S.
Agricultural Systems Technology, B.S.
Agronomy, B.S.
Animal Ecology, B.S.
Animal Science, B.S.
Dairy Science, B.S.
Dietetics, B.S.
Entomology, B.S.
Environmental Science, B.S.
Environmental Studies, B.S.
Food Science, B.S.
Forestry, B.S.
Genetics, B.S.
Horticulture, B.S.
International Agriculture, B.S.
Microbiology, B.S.
Nutritional Science, B.S.
Pest Management, B.S.
Plant Health and Protection, B.S.
Public Service and Administration in Agriculture, B.S.
Seed Science, B.S.
Zoology, B.S.

College of Business

Accounting, B.S.
Finance, B.S.
International Business, B.S.
Management, B.S.
Management Information Systems, B.S.
Marketing, B.S.
Production/Operations Management, B.S.
Transportation and Logistics, B.S.

College of Design

Architecture, B.Arch.
Art and Design, B.A., B.F.A.
Community and Regional Planning, B.S.
Graphic Design, B.F.A.
Interior Design, B.F.A.
Landscape Architecture, B.L.A.

College of Education

Early Childhood Education, B.S.
Elementary Education, B.S.
Environmental Studies, B.S.
Health and Human Performance, B.S.
Industrial Technology, B.S.
Secondary Education (See licensure programs offered by the colleges of Agriculture, Design, Education, Family and Consumer Sciences, and Liberal Arts and Sciences.)

College of Engineering

Aerospace Engineering, B.S.
Agricultural Engineering, B.S.
Chemical Engineering, B.S.
Civil Engineering, B.S.
Computer Engineering, B.S.
Construction Engineering, B.S.
Electrical Engineering, B.S.
Industrial Engineering, B.S.
Materials Engineering, B.S.
Mechanical Engineering, B.S.

College of Family and Consumer Sciences

Apparel Merchandising, Design, and Production, B.S.
Child, Adult, and Family Services, B.S.
Dietetics, B.S.
Early Childhood Education, B.S.
Family and Consumer Sciences Education and Studies, B.S.
Family Resource Management and Consumer Sciences, B.S.
Food Science, B.S.
Hotel, Restaurant, and Institution Management, B.S.
Housing and the Near Environment, B.S.
Nutritional Science, B.S.

College of Liberal Arts and Sciences

Advertising, B.A.
Anthropology, B.A., B.S.
Applied Physics, B.S.
Biochemistry, B.S.
Biological/Pre-Medical Illustration, B.A.
Biology, B.S.
Biophysics, B.S.
Botany, B.S.
Chemistry, B.A., B.S.
Communication Studies, B.A.
Computer Science, B.S.
Earth Science, B.A., B.S.
Economics, B.S.
English, B.A., B.S.
Environmental Science, B.S.
Environmental Studies, B.A., B.S.
Foreign Languages and Literatures
    French, B.A.
    German, B.A.
    Spanish, B.A.
Genetics, B.S.
Geology, B.S.
History, B.A., B.S.
Interdisciplinary Studies, B.A., B.S.
International Studies, B.A., B.S.
Journalism and Mass Communication, B.A., B.S.
Liberal Studies, B.L.S.
Linguistics, B.A.
Mathematics, B.S.
Meteorology, B.S.
Music, B.A., B.Mus.
Performing Arts, B.A.
Philosophy, B.A.
Physics, B.S.
Political Science, B.A.
Psychology, B.A., B.S.
Religious Studies, B.A.
Russian Studies, B.A.
Sociology, B.A., B.S.
Speech Communication, B.A., B.S.
Statistics, B.S.
Technical Communication, B.S.
Women's Studies, B.A., B.S.
Zoology, B.S.

College of Veterinary Medicine

Veterinary Medicine, D.V.M.

Bachelor's Degree Requirements

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

A cumulative grade point average of at least 2.00 in all work taken at Iowa State University is required for graduation.

A student admitted as a transfer from another college or university is normally required to have a 2.00 cumulative average at the time of entrance. A student may, however, be admitted with a quality-point deficiency, but will be required to earn sufficient quality-points above a 2.00 at Iowa State to offset the quality-point deficiency at the time of entrance.

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

A student who takes work at another college or university after having been enrolled at Iowa State must submit transcripts of all work attempted to the Office of Admissions at Iowa State. This work must average a 2.00 or the deficiency of quality points will be assessed against the student. Failure to submit such transcripts will be grounds for dismissal.

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

To qualify for a bachelor's degree, a student must take a minimum of 32 credits in residence at Iowa State University. Also required is that the last 32 credits must be taken in residence, although under special circumstances, with prior written approval of the student's major department, six of the last 32 credits may be transferred and applied toward a degree at Iowa State University.

A student may receive two bachelor's degrees if he or she meets the requirements of each curriculum and earns at least 30 credits beyond the requirements of the curriculum requiring the greater number of credits. Each degree program must be approved by the appropriate department chair or head.

A student fulfilling the requirements of two separate curricula in different colleges may, in certain cases, receive a degree from one of the colleges with double majors crossing college lines. The permission of both deans must be obtained and each degree program must be approved by the appropriate department and dean.

Minors

Requirements for an undergraduate minor are specified by many departments and programs in the university; a record of completion of such requirements appears on a student's transcript. Lists of undergraduate minors offered by each college appear in the college description; minors offered by cross-disciplinary programs not administered by a single college include gerontology, and international studies. Undergraduate students in any college may elect to meet the requirements of any undergraduate minor offered in the university. Credits used to meet the minor requirements may also be used to satisfy the credit requirement for graduation and to meet credit requirements in courses numbered 300 or above. Some students may have to exceed the graduation credit requirement set by their college in order to meet the requirements of both the minor and the curriculum/major.

All minors require at least 15 credits, including at least 6 credits taken at Iowa State University in courses numbered 300 or above. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. Courses taken for a minor may not be taken on a pass-not pass basis. Specific requirements and/or restrictions are available from the department or program offering the minor.

English Proficiency Policy

Iowa State University believes that written communication is a fundamental skill of an educated person; therefore its graduates are expected to acquire reasonable competence in written communication during their educational careers. The following are designed to ensure that this competence is developed and maintained:

1. All students must earn credit in a sequence of basic composition courses (English 104 and 105) normally in the freshman year.

2. Continued development of communication skills following the freshman year is the responsibility of the student's major department. This development may be promoted by requiring and critically evaluating term papers and other written assignments as part of courses offered by the department and by encouraging students to enroll in advanced English composition courses that meet their particular needs.

3. Each department is responsible for certifying that its majors have achieved an adequate level of proficiency in written communication at the time of graduation.

English Requirement: Students Whose First language is not English

Students whose first language is not English must demonstrate ability to study in this English-speaking university. Such students—beginning as well as those who transfer from other institutions—must take an English placement test when they arrive on campus. The test is administered by the English Department and is offered at the opening of each semester.

Students whose performance on this placement examination is satisfactory will follow the regular English requirements of their major department. Students who have deficiencies will enroll in special English classes, as determined by the test results.

Library Study

Independent study and investigation through the use of books and libraries enable students to grow intellectually and professionally in college and afterward. For this reason, all students receive instruction in the use of the University Library, including practice in how to locate the published literature of their respective fields of study.

U.S. Diversity and International Perspective Requirements

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

The focus of the U.S. Diversity requirement is the multicultural society of the United States. Courses or alternative academic work used to meet the requirement address significant manifestations of human diversity and provide students with insights that enhance their understanding of diversity among people in the U.S. The focus of the International Perspectives requirement is the global community. Its objective is to promote students' understanding of cultural diversity and interdependence on a global scale. A period of immersion in a foreign culture is often a particularly effective way of meeting

these objectives, so Iowa State University encourages the use of study-abroad experiences as a means of fulfilling the International Perspectives requirement. International students, because they are "studying abroad" from their home country's perspective, are normally deemed to have met the International Perspectives requirement.

Curriculum Requirements

The curriculum requirements, both in number of credit hours and specific courses, are guidelines for the student and his or her adviser in planning an academic program. The curriculum is subject to change and because of these changes, adjustments may need to be made.

Catalog in Effect

A student may choose to graduate under the catalog in effect at the time of graduation, or one of the two immediately preceding catalogs, provided it covers a period of his or her enrollment. Full requirements of the chosen catalog must be met except that adjustments will be made in instances where courses are no longer available or where programs have been changed.

Special Programs

Honors Program

The Iowa State University Honors Program is designed for students who have demonstrated the ability and motivation to assume more than the usual responsibility for their undergraduate education. The goal of the program is to enable Honors students to gain maximum benefit from their undergraduate education. Students who graduate in the Honors Program receive the Honors designation on their transcripts and on their baccalaureate diplomas.

Special educational opportunities. Students in the Honors Program determine their educational objectives and devise an individualized program of study to meet those objectives. An honors program may include substitutions for required courses, combinations of courses from several departments to form a new major or minor, Honors courses or seminars, independent study and research, and other forms of innovation. Information about Honors courses and seminars for the current academic year can be obtained from the Honors Program Office.

Other benefits. Members of the Honors Program have 24-hour access to the Honors building as a quiet place to study, use the computers, and visit with other Honors students. Students also have off-campus opportunities such as attending Honors semesters and Wingspread conferences. Full members—those with approved honors degree programs—receive extended loan privileges at the Library, priority scheduling, and the opportunity to apply for research funds.

Eligibility. Students who have a cumulative grade-point average of at least 3.35 become eligible to apply for admission to the Honors Program during their second semester in residence and continue to be eligible for admission as long as they have at least 48 semester credits remaining before graduation. Decisions with respect to admission are made by the college Honors Program committees.

Freshman Honors Program. Entering freshmen with outstanding high school records and academic ability may be eligible to participate in the Freshman Honors Program. The Freshman Honors Program, which is designed to introduce students to an honors education, consists of special honors sections of English 105 and Library 160, a Freshman Honors Seminar, and advising by specially selected honors advisers. Students may also choose to participate in the Mentor Program, designed to introduce students to the research arena. Participants select an area of interest and are matched with faculty members conducting research in that area. Admission to the Freshman Honors Program is limited and by invitation, and is based on past academic achievement, potential, and interest in an honors education.

Further information. Further information concerning the University Honors Program and the Freshman Honors Program can be obtained from the Honors Program Office in Jischke Honors Building.

Inter-institutional Programs

Students have the opportunity to complete two years of study at another institution and the last two years at Iowa State through coordinated programs offered by the College of Family and Consumer Sciences.

Dual-degree Programs

Students who complete the first three years in certain curricula at Iowa State and who satisfactorily complete the first year in a recognized medical, dental, veterinary medical, or law curriculum may then be awarded a bachelor's degree from Iowa State. (See Index, *Preprofessional Study.)*

Iowa Lakeside Laboratory

Iowa Lakeside Laboratory is an off-campus teaching facility situated on a 140-acre campus on West Okoboji Lake in Northwest Iowa. It is run cooperatively by Iowa State University, the University of Iowa, the University of Northern Iowa, and Drake University. Each summer Iowa State University students can take up to three undergraduate and/or graduate courses in archaeology, biology, ecology, environmental science, and/or geology for credit at Lakeside (see course listings under *Iowa Lakeside Laboratory*). All Lakeside courses are small, full-immersion, field-oriented courses that run for 1-4 weeks. Lakeside also offers a variety of short courses for teachers and a series of nontechnical short courses on various aspects of the natural history of Iowa. Information about Lakeside courses as well as registration and housing information can be obtained from the Administrative Office, Iowa Lakeside Laboratory, 131 Bessey Hall.

Gulf Coast Research Laboratory

Through an affiliation with Gulf Coast Research Laboratory (GCRL) at Ocean Springs, Mississippi, Iowa State University provides opportunities for students to take courses and do research relating to marine environments during the summer. Credit taken at GCRL may be transferred back to ISU degree programs. Listings of courses taught at GCRL and research opportunities can be seen at www.coms.usm.edu/gindex.htm. Further information and application forms are available in early spring semester in 201 Bessey Hall.

The Washington Center Program

Iowa State University, in conjunction with The Washington Center, offers its students the opportunity to gain academic credit and first hand professional work experience in the governmental, nonprofit, and private sectors through a summer- or semester-long internship in the nation's capital. The Washington Center, the largest nonprofit organization of its kind, places students in a variety of internships and also offers a wide array of academic programs and seminars to complement their internship experience. Further information about the requirements can be obtained from Career Services, 0570 Beardshear Hall, 515-294-9490.

Regent Universities Student Exchange Program

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

National Student Exchange (NSE)

Iowa State University is a member of National Student Exchange. The NSE Consortium has 180 colleges and universities throughout the United States and Canada. Iowa State students with a cumulative GPA of at least 2.50 are eligible to apply. Credits earned as an NSE participant will be recorded on the students Iowa State transcript. Approval for credit in the NSE program should be sought from a students academic adviser in advance of registration. Detailed information and applications forms are available from:

National Student Exchange
2072 Student Services Building
(515) 294-6479
nse@iastate.edu
www.iastate.edu/~nse

College of Agriculture

Richard F. Ross, Dean
www.ag.iastate.edu

Departments of the College

Agricultural Education and Studies
Agricultural and Biosystems Engineering
Agronomy
Animal Science
Biochemistry, Biophysics, and Molecular Biology
Economics
Entomology
Food Science and Human Nutrition
Horticulture
Microbiology
Natural Resource Ecology and Management
Plant Pathology
Sociology
Zoology and Genetics

Students enrolled in the College of Agriculture are provided a broad-based education that includes coursework in communications; biological, physical, and social sciences; humanities; and technical subject matter. Upon graduation students find diverse career opportunities because of the well balanced education they have received as undergraduates. Opportunities for graduates include production agriculture, business and industry, public agencies, education, biological and environmental sciences, value-added processing, natural resource management, rural development, animal and human health professions, and graduate studies.

High School Preparation

Requirements for students entering from high school or transferring with less than 24 college credits into the College of Agriculture include four years of English; three years of mathematics which must include one year each of algebra, geometry, and advanced algebra; three years of science which must include one year each of biology and chemistry, or biology and physics, or chemistry and physics; and two years of social studies. No foreign language is required for admission to the College of Agriculture.

Majors in the College of Agriculture

A student has many majors from which to choose. Each major is unique but there are courses common to many. This is helpful to students in that they may transfer from one agriculture major to another before the second year with little, if any, loss of credits. Options and areas of specialization further define the majors and required coursework within some majors. In all cases, majors are designed to help students succeed in their chosen professions. Majors in agriculture are:

Primary Majors

Agricultural Biochemistry
Agricultural Business
Agricultural Education
Agricultural Studies
Agricultural Systems Technology
Agronomy
Animal Ecology
Animal Science
Emerging Global Diseases*
Dairy Science
Dietetics
Entomology
Environmental Science
Food Science
Forestry
Genetics
Horticulture
Microbiology
Nutritional Science
Plant Health and Protection
Public Service and Administration in Agriculture
Zoology

Secondary Majors

Environmental Studies
International Agriculture
Pest Management
Seed Science

A secondary major must be taken in conjunction with a primary major.

Minors

Agricultural Biochemistry
Agricultural Education and Studies
Agricultural Systems Technology
Agronomy
Animal Ecology
Animal Science
Entomology
Entrepreneurial Studies*
Environmental Science
Environmental Studies
Food Safety*
Food Science
Forestry
Genetics
Horticulture
International Agriculture
Microbiology
Nutrition
Pest Management
Plant Health and Protection
Zoology

*The College of Agriculture participates in these interdepartmental minors.

See statement on minors in the *Colleges and Curricula* section of this catalog.

Special Programs

General Agriculture

General Agriculture is a starting place for students who wish to pursue careers in agriculture but who are unsure of which majors to choose. The Agriculture Student Services Office provides advising for general agriculture students until they select their majors.

Preveterinary Medicine

Students in the College of Agriculture may complete the requirements for admission to the College of Veterinary Medicine by enrolling in any major within the college. Because a solid foundation in the sciences is basic to the program in veterinary medicine, those majors that emphasize the sciences are usually more compatible with preveterinary medicine (see College of Veterinary Medicine section of this catalog for specific admissions requirements). Students who are undecided about choice of major may enroll in general preveterinary studies (Gen PV). These students will also enroll in an orientation course, which describes the various college majors. A Gen PV student has up to 1.5 semesters to select a major. Preveterinary medicine students also have an opportunity, with careful planning, to complete the requirements for a bachelor of science degree in an individual curriculum within the College of Agriculture after admission to the College of Veterinary Medicine. This may be done by completing the prescribed course of study established by an individual major. Students also may meet degree requirements of an individual major through the College of Agriculture Honors Program. Further details are available from an academic adviser or from members of the College of Agriculture Honors Committee.

Honors Program

The College of Agriculture Honors Program provides an opportunity for students of high ability to maximize their educational experience by individualizing their program of study. (See statement on *Honors Program in the Colleges and Curricula* section of this catalog). For more information, contact the chair of the College of Agriculture Honors Committee, or your department Honors contact person.

Off-Campus Programs

Coursework leading to a master of agriculture degree in professional agriculture and a master of science degree in agronomy are offered to students who choose to study off-campus; see *Extended and Continuing Education* for further information.

Study Abroad and International Travel Opportunities

Agriculture is being transformed into a highly interconnected global system; decisions made in one agricultural sector have profound impacts worldwide. It is important for students to develop an understanding and appreciation for the global system and the central role that U.S. agriculture plays in providing a safe and predictable food supply for a growing world population. The College of Agriculture provides study abroad and international travel opportunities in several locations around the world. For additional information, contact the Office of International Agriculture Programs in the College of Agriculture.

Internships and Cooperative Education Programs

Practical work experience can provide a unique learning opportunity that complements academic coursework. This experience is provided through internships or cooperative education programs. For additional information, contact a departmental adviser or internship coordinator.

College of Agriculture Core Curriculum and Electives

All curricula in the College of Agriculture lead to a bachelor of science degree. Each major has specific degree requirements for graduation. These include the College of Agriculture's core curriculum.

Students pursuing a primary major in another college and taking a second major in the College of Agriculture must fulfill the core curriculum requirements of the College of Agriculture and all the requirements of the second major. The College of Agriculture core curriculum follows.

Minimum Credits	Subject Area
9.5	Interpersonal and public communication skills 6 credits of English composition with grades of C or better; 3 credits of speech fundamentals with grades of C or better; 0.5 credit in Lib 160
17	Mathematical, physical, and life sciences 3 credits of mathematics; 3 credits of statistics; 5 credits of physical science (e.g., chemistry, geological and atmospheric sciences, physics); 6 credits of life science (e.g., biochemistry, biology, botany, ecology, genetics, microbiology, physiology, zoology).
15	Humanities, ethics and social sciences 3 credits of ethics from an approved list; 3 credits of humanities; 3 credits of social sciences; 3 credits of U.S. diversity from an approved list; 3 credits of international perspectives from an approved list.

The College of Agriculture is committed to enhancing student proficiency in four areas:

1) ability to write, discuss and present subject matter within the major (communications), 2) ability to consider many dimensions of a problem and develop a solution (problem-solving), 3) ability to use computers for computation, document processing and communications, and 4) ability to analyze issues related to human impact on natural resources and the environment.

Courses required by each major, courses within the College of Agriculture's core curriculum or free elective courses are used to develop these proficiencies. The specific requirements are:

Communications: Equivalent to 3 credits from one or more courses. Communication activities are incorporated into designated courses within each major field. The requirement is fulfilled by taking one or more of these communication-intensive courses.

Problem-solving: Equivalent to 3 credits from one or more courses. Problem-solving activities (disciplinary and multidisciplinary) are incorporated into designated courses within each major field. The problem-solving requirement is fulfilled by taking one or more of these problem-solving-intensive courses.

Computer proficiency: All College of Agriculture students must demonstrate computer proficiency according to procedures established by each department.

Environmental issues: Equivalent to 3 credits from one or more courses. Students are strongly encouraged to select course work in this area which will give them an appreciation of both ecological and human/societal dimensions of the environment.

Electives

Students use electives to broaden their education or to strengthen an area of specialization. Electives may be used to meet the requirements for a double major (see statement on double majors in this catalog). Those who wish to change their major, or who decide to graduate with a double major, must be enrolled for the last two semesters in the curriculum in which they expect to graduate. Students in ROTC may apply ROTC credits toward elective requirements.

Advising

Each student in the College of Agriculture works closely with an academic adviser who is associated with the major in which the student is enrolled.

All entering students and their parents are strongly encouraged to participate in the summer orientation program in which they will have the opportunity to meet and work with academic advisers in planning their first semester schedule of classes.

The advisers also assist students in making personal adjustments to university life, offer suggestions on academic and co-curricular choices, and provide information on career choices. Advisers make a special effort to adjust course schedules in accordance with students' interests and capabilities.

A student may wish to prepare for admission to a professional program such as law, medicine, or veterinary medicine while pursuing a bachelor of science degree in the College of Agriculture. This may be accomplished through several majors; however, it is recommended that the student work closely with an academic adviser.

Each department prepares a guide to help students chart their long-term programs and to specify the exact requirements for graduation. Visit the college web site www.ag.iastate.edu.

Graduate Study

Graduate study in agriculture is conducted through the Graduate College. Details are found in the Graduate College section of this catalog.

Various departments in the College of Agriculture also participate in the following graduate-level interdepartmental offerings:

Ecology and Evolutionary Biology
Genetics
Immunobiology
Molecular, Cellular, and Developmental Biology
Neuroscience
Plant Physiology
Professional Agriculture (off-campus)
Technology and Social Change (interdepartmental minor)
Toxicology
Water Resources

For details, consult the Graduate College section of this catalog.

Curriculum in Agricultural Biochemistry

Administered by the Department of Biochemistry, Biophysics and Molecular Biology.

Cr.	Degree Requirements
9.5	Interpersonal and public communication skills Engl 104, 105; Sp Cm 212; Lib 160
62-63	Mathematical, physical, and life sciences Math 165, 166, 265 or 266; Phys 221, 222; Chem 177, 177L, 178, 210 or 211, 211L, 321, 322, 322L, 331, 331L, 332; Biol 201,202, 201L or 202L, 301, 302
15	Humanities, ethics, and social science 3 cr. in ethics from an approved list; 3 cr. in humanities; 3 cr. in social sciences; 3 cr. in U.S. diversity from an approved list; 3 cr. in international perspectives from an approved list
9	Agricultural sciences 9 cr. from an approved list available in the department. Two courses with environmental awareness emphasis will be chosen from an approved list.
11-13	Agricultural biochemistry BBMB 101, 102; 404, 405 or 501, 502; 411. Students wishing research experience in agricultural biochemistry are encouraged to enroll in BBMB 499
21.5-22.5	**Electives**
128	**Total credits**

Typical Program for the First Year

Cr.	Fall
4	General Chemistry—Chem 177M
1	Laboratory in General Chemistry—177N
4	Calculus I—Math 165
3	First-Year Composition—Engl 104
3	Principles of Biology—Biol 201
1	Principles of Biology Laboratory—Biol 201L
1	Introduction to Biochemical Activities—BBMB 101
Cr.	**Spring**
3	General Chemistry—Chem 178
4	Calculus II—Math 166
3	First-Year Composition—Engl 105
3	Principles of Biology—Biol 202
1	Principles of Biology Laboratory—Biol 202L
1	Introduction to Biochemistry—BBMB 102

Curriculum in Agricultural Business

Administered by the Department of Economics. Students majoring in Agricultural Business often choose elective coursework leading to minors in the College of Business or in the College of Agriculture, or emphasizing specific areas within agricultural business such as finance, management, commodity analysis, research, agricultural sales and marketing, environmental economics, farm and ranch operations, international economics, agricultural extension, or government service.

Cr.	Degree Requirements
12.5	Interpersonal and public communication skills Lib 160, Engl 104, 105 Engl 302 or Engl 309 or Engl 314 Sp Cm 212 or AgEds 311
17-18	Mathematical and computer science Math 165, 166 or Math 140 (or 150), 160; Stat 226, 326 Com S 103
4-5	Physical Sciences Chem 163-163L or Phys 111
6	Life and Environmental Sciences Biol 109 or 201 A Ecl 120 or Biol 123 or other credits that meet the environmental intensive requirement
12	Humanities, ethics and social science Courses in individual areas below may overlap but the total credits taken must equal 12 or more: Ethics International perspectives U.S. diversity Humanities Social science other than economics
12	Business Acct 284, 285; Fin 301 One of the following: Mgmt 310, 370, Mkt 340, MIS 330, POM 320, TrLog 360
3	Agricultural sciences electives
32-34	Economics and Agricultural Economics Econ 101, 101L, 102, 110, 235, 301, 302 or 353, 335, 492 Nine credits of the following: Econ 401, 402, 415, 430, 431 or 432, 437, 451, 455, 460, 466, 470, 472, 480 Five additional credits of Economics at the 300 level or higher
26-28	Free electives
128	Total credits

Typical Program for the First Year

Cr.	Fall
4	Microeconomics—Econ 101, 101L
R	Orientation in Economics/ Agricultural Business—Econ 110
3	Agricultural Science Course
3-4	Mathematics I —Math 165 or 140 (or 150)
3	First-Year Composition I—Engl 104
0.5	Library Instruction — Lib 160
3	Environmental Biology —Biol 123
Cr.	**Spring**
4	Computer Applications — ComS 103
3	Intro. to Agricultural Markets—Econ 235 or Financial Accounting—Acct 284
3-4	Mathematics II—Math 166 or 160
3	First-Year Composition II—Engl 105
3	Macroeconomics—Econ 102

Curriculum in Agricultural Education

Administered by the Department of Agricultural Education and Studies. Students majoring in Agricultural Education choose between two options: Teacher Certification or Communications.

Teacher Certification Option

Cr.	Degree Requirements
9.5	Interpersonal and public communication skills Engl 104, 105, Lib 160, AgEds 311 (3 cr.); communications intensive requirement.
18-19	Mathematical, physical, and life sciences Chem 163, 163L or 177, 177L; Stat 104; Biol 201, 201L; Biol 202, 202L or BMBB 221; Math 104 or 150
18	Humanities, ethics, and social sciences Psych 230; C I 333 and 406; American history elective (3 cr.); from approved lists: 3 cr. in ethics; 3 cr. in international perspectives; problem-solving intensive requirement
1	Physical education Elective selected from PE, dance, health, and/or safety
35	Agricultural sciences and economics Agron 114 and 154; An S 114 and 114L, electives (3 cr.); AST 210; Hort 221; Econ 101, 235 and 330; Acct 284; 6 credits in courses 300-level or above to be chosen from agricultural systems technology, animal science, agronomy, agricultural economics, forestry, or horticulture; environmental intensive requirement
31.5	Professional credits AgEds 110A, 211A, 310, 401, 402, 416, 417 (12 Cr.); C I 201, 204, 415, 426.
14-15	Electives

Communications Option

Cr.	Degree Requirements
9.5	Interpersonal and public communication skills— Engl 104, 105, Lib 160, AgEds 311, communication intensive requirement
23-24	Mathematical, physical, and life sciences— Chem 163, 163L or 177, 177L; Biol 201, 202; BMBB 221 or Phys 106; life science elective (3 cr.); demonstration or computer proficiency; Math 104 or 150; Stat 104; environmental intensive requirement
18	Humanities, ethics, and social sciences— Econ 101 or 102; psychology elective (3 cr.); ethics elective (3 cr.); international perspectives elective (3 cr.); U.S. diversity elective (3 cr.); humanities elective (3 cr.), problem-solving intensive requirement.
32	Agricultural sciences and economics— 10 credits in a selected area of agricultural sciences and econom ics including 6 credits at the 300-400 level; 6 cr. each in two additional areas of agricultural sciences and economics; agricul tural sciences and economics electives (10 cr.)
32.5	Professional communications— AgEds 110A, 211, 215, 315, 412 (6 cr.); select 21 cr. from Jl MC 101, 321, 342, 347, Engl 205, 309, 310, 314, 415, 416, Mgmt 370, 371, Sp Cm 110, 212, 312, 323, 327, ComSt 102, 214, 310, 314, 317
12-13	Electives
128	Total credits

Typical Program for the First Year

Cr.	Fall
0.5	Orientation--AgEds 110A
3	First-Year Composition—Engl 104
3	Probability and Matrices—Math 104 or Discrete Mathematics for Business and Social Sciences -- Math 150
3	Principles of Micro Economics—Econ 101
3	Principles of Biology I--Biol 201
1	Principles of Biology Laboratory -- Biol 201L
2	Survey of the Animal Industry--An S 114
1	Working with Animals--An S 114L
0.5	Library Instruction—Lib 160

Cr.	Spring
3	First-Year Composition—Engl 105
3	Principles of Agronomy—Agron 114
3	Introduction to Instructional Technology—C I 201
3	Introduction to Agricultural Markets--Econ 235
3	Principles of Biology II—Biol 202
1	Principles of Biology Laboratory--Biol 202L

Curriculum in Agricultural Studies

Administered by the Department of Agricultural Education and Studies. Students are encouraged to develop one or more areas of concentration in agricultural sciences and economics.

Cr.	Degree Requirements
12.5	Interpersonal and public communication skills Engl 104, 105; written communica tions elective (3 cr.); speech elective (3 cr.); Lib 160; communications intensive requirement.
20	Mathematical, physical, and life sciences Chem 163, 163L or 177, 177L; Math 104 or 150; Stat 104; Biol 109 or 201; life science elective (6 cr.); demonstration of computer proficiency; environmental intensive requirement.
18	Humanities, ethics, and social sciences Econ 101; humanities electives (3 cr.); AgEdS 315; from approved lists: 3 cr. in ethics; 3 cr. in international perspectives; 3 cr. in U.S. diversity; problem-solving intensive requirement.
42.5	Agricultural sciences and economics AgEdS 110B, 215, 450; Agron 114, 154, 212; An S 114 and 114L, electives (6 cr.); Econ 235, 330; ENT electives (2 cr.); 300-400 level agricultural sciences and economics electives (9 cr.); electives from the College of Agriculture (2 cr.).
Other required courses	
3	Acct 284
32	Electives
128	Total credits

Typical Program for the First Year

Cr.	Fall
0.5	Orientation—AgEdS 110B
3	Survey of the Animal Industry—An S 114 and 114L
3	Introduction to Probability and Matrices—Math 104 or Discrete Mathematics—Math 150
3	First-Year Composition—Engl 104
3	Social science elective
3	Introductory Biology—Biol 109
0.5	Library Instruction—Lib 160
Cr.	**Spring**
3	Principles of Agronomy—Agron 114
3	Principles of Microeconomics—Econ 101
3	Life science elective
3	Humanities elective
3	First-Year Composition—Engl 105

Preveterinary Studies

Preparation for admission to veterinary medicine may be accomplished through the agricultural studies curriculum.

Curriculum in Agricultural Systems Technology

Administered by the Department of Agricultural and Biosystems Engineering. A minor in agricultural systems technology is available; the requirements appear under Agricultural Systems Technology, Courses and Programs.

Systems Technology and Management Option

Cr.	Degree Requirements
12.5	Interpersonal and public communication skills Engl 104, 105; Sp Cm 212 or AgEdS 311; Engl 302 or 309 or 314; Lib 160
28-30	Mathematical, physical, and life sciences Math 140 and 142, or 160, or 165; Stat 104; Chem 163, 163L; Phys 106 or 111; AST 115, 215; Biol 109; A E 271 or 272; Biol 123 or BBMB 221 or A Ecl 120
15	Humanities, ethics, and social sciences Econ 101; from approved lists: humanities elective (3 cr.); 3 cr. in ethics, 3 cr.in international perspectives; and 3 cr. of U.S. diversity
6	Agricultural sciences Select from department approved list
30	Agricultural systems technology AST 110, 210, 324, 330, 360, 373, 403 and 496 plus an additional 11 credits of AST courses at the 300 level or above
6	Other required courses Acct 284; Econ 330 or Mgmt 370 or Econ 336
18	Areas of specialization Production Agriculture: Credits selected from department-approved list of agricultural science courses Agribusiness Management: Credits selected from department-approved list Grain Operations: Acct 285; AST 362; Econ 135; Mkt 340; a minimum of 6 credits from the following: An S 319; Econ 301, 332, 335; Ent 376; Mgmt 371; TrLog 360, 460 Applied Technology: Select credits from department-approved list for specialization in one of these areas: seed technology, soil and water conservation, food process ing, safety, or precision agriculture. Other areas may be created with departmental approval.
11-13	Free electives
128.5	Total credits

Environmental Systems Technology Option

Cr.	Degree Requirements
12.5	Interpersonal and public communication skills Engl 104, 105; Sp Cm 212 or AgEdS 311; Engl 302 or 309 or 314; Lib 160
40-42	Mathematical, physical, and life sciences Math 140 and 142, or 160, or 165; Stat 104; Chem 163, 163L, 164, 231, 231L; Phys 106 or 111; AST 115, 215; A E 271 or 272; Biol 201, 201L, 202, 202L; Micro 201, 201L
15	Humanities, ethics, and social sciences Econ 101; Hist 472; from approved lists: 3 cr. in ethics, 3 cr. in international perspectives; and 3 cr. of U.S. diversity
12	Agronomic sciences Select a minimum of 12 credits from Agron 114, 154, 206, 260, 317, 354, 356, 360, 485
14	Environmental Sciences Select a minimum of 14 credits from A Ecl 410, 513; Biol 312; Bot 330, 487, 500, 564; Env S 123, 324, EnSci 401, 402, 404; NREM 407
6	Environmental Studies Select a minimum of 6 credits from: Env S 201, 293, 340, 380, 382, 450, 482, 491
22	Agricultural systems technology AST 110, 120, 210, 324, 326, 333, 403, 425, 475 or 476, 496.
5-7	Free electives
128.5	Total credits

Mechanical Systems Option

Cr.	Degree Requirements
12.5	Interpersonal and public communication skills Engl 104, 105; Engl 302 or 309 or 314; Sp Cm 212 or AgEdS 311; Lib 160
28-31	Mathematical, physical, and life sciences Stat 104 or 101; Math 140 and 142, or 160, or 165; Chem 163, 163L; Phys 106 or 111; AST 115, 215; A E 271 or 272; Biol 109; Biol 123 or AST 120
15	Humanities, ethics, and social sciences Econ 101; from approved lists: humanities elective (3 cr.); 3 cr. in ethics, 3 cr. in international perspec tives; and 3 cr. of U.S. diversity
6	Agronomic sciences Agron 114, 154
30	Agricultural systems technology AST 110, 210, 330, 333, 335, 337, 360, 403, 435, 460, 496, plus an additional 3 credits of AST courses at the 300 level or above.
24	Areas of specialization **Management**: Acct 284; Econ 336; Mgmt 370; Mkt 340; a minimum of 12 credits from the following: Acct 215, 285, 316; I Tec 231, 244, 360; Mgmt 371; MIS 330; Mkt 442, 446, 447 **Precision Agriculture:** Credits selected from departmental-approved list. **Technology**: Math 166, E M 274, 324, 327; Phys 112; a minimum of 9 credits from the following: E M 378, 417; I Tec 231, 244, 360; Mat E 362, 362L, Stat 401
10-13	Free electives
128.5	Total credits

Typical Program for the First Year

Cr.	Fall
1	Experiencing Agricultural Systems Technology—AST 110
3	Fundamentals of Algebra—Math 140
3	First-Year Composition—Engl 104
5	General Chemistry—Chem 163, 163L
3	Agricultural science elective
Cr.	**Spring**
3	Technology Problems with Computational Laboratory—AST 115
3	Introductory Biology—Biol 109 or Principles of Biology—Biol 201
3	First-Year Composition—Engl 105
3	Trigonometry and Analytic Geometry—Math142
3	Agricultural science elective
0.5	Library Instruction—Lib 160

Curriculum in Agronomy

Students majoring in agronomy study crop science, soil science, and agricultural meteorology in one of three options: (1) general agronomy, (2) environmental science, (3) science. A minimum of 15 credits for the agronomy major and 9 credits for the agronomy minor must be earned at Iowa State.

General Agronomy Option

Cr.	Degree Requirements
12.5	Interpersonal and public communication skills Engl 104, 105; Lib 160; Sp Cm 212 or AgEdS 311; Engl 302, 309, or 314
6	Mathematical sciences Math 140; Stat 104; demonstration of computer proficiency
16	Physical sciences Chem 163, 163L, 231, 231L, Geol 100; Phys 106
16	Biological sciences Biol 201, 201L, 202, 202L; Agron 320; select two additional courses from Biol 312; BBMB 301; Ent 376; Micro 201, or Pl P 407
15	Humanities, ethics, and social science 3 cr. each in ethics, U.S. diversity, international perspectives, humanities, and social sciences (from approved list)
6	Economics and business Econ 101; one course from the following: Acct 284, Econ 102, 235, 330, 336, Mgmt 370, Mkt 340
33	Agronomic sciences Agron 105, 110, 114, 154, 206, 210, 230, 306, 310, 354, 354L, 356 or 392, 410, and 492 and 9 cr. of electives (no more than 2 cr. total from Agron 331, 370, 490, 491, and 496 allowed to meet the 9 cr. requirement; Agron 320 may be used only as a biological science by Agronomy majors)
23.5	Free electives
128	Total credits

Environmental Science Option

Cr.	Degree Requirements
12.5	Interpersonal and public communication skills Engl 104, 105; Lib 160; Sp Cm 212 or AgEdS 311; 3 cr. elective from Engl 302, 309, or 314
7	Mathematical sciences Math 181 or 160; Stat 101 or 104; demonstration of computer proficiency
17	Physical sciences Chem 163, 163L, 231, 231L; Geol 100, 100L; Phys 111
13	Biological sciences Biol 201, 201L, 202, 202L; Micro 201; 3 cr. from the following: A Ecl 410, Agron 320, Biol 312, BBMB 301, Ent 376, Pl P 407
15	Humanities, ethics, and social science 3 cr. each in ethics, U.S. diversity, international perspectives, humanities, and social sciences (from approved list)
6	Economics and business Econ 101; Env S 380
30	Agronomic sciences Agron 105, 110, 114, 154, 206, 210, 260, 310, 356 or 360, 410, 473, 485, 492 and 4 cr. of electives (no more than 2 cr. total from Agron 331, 370, 490, 491, and 496 allowed to meet the 4 cr. require ment) (A minimum of 15 cr. in agronomy must be earned at Iowa State.)
9	Environmental sciences Select 9 credits from Bot 340; NREM 407; Env S 201, 293, 324, 330, 425, 450, 491; EnSci 401, 402, 404; AST 425, 475
18.5	Free electives
128	Total credits

Science Option

The science option is recommended for individuals who want a stronger basic science orientation. See an agronomy adviser for specific recommendations.

Typical Program for the First Year

Cr.	Fall
R	Orientation in Agronomy—Agron 110
3	Principles of Agronomy—Agron 114
3	College Algebra—Math 140
3	First-Year Composition—Engl 104
4	Principles of Biology I—Biol 201 and 201L
3	The Earth—Geol 100
Cr.	**Spring**
3	Introduction to Meteorology—Agron 206
5	General Chemistry—Chem 163 and 163L
3	First-Year Composition—Engl 105
0.5	Library Instruction—Lib 160
3	Principles of Microeconomics—Econ 101
3	Humanties elective-from approved list

Curriculum in Animal Ecology

Cr.	Degree Requirements
15.5	Interpersonal and public communication skills Engl 104 and 105; Sp Cm 212; Lib 160; two additional 3-cr. courses in written or oral communication from an approved list; and communications-intensive requirement
11-14	Mathematical sciences Math 140 and 142, or 149; 160 or 165 or 181; Stat 101 or 104
16	Physical sciences Chem 163, 163L, 164 (or 177, 177L, 178); 231, 231L; Phys 106
19	Biological sciences A Ecl 211, 310, 312; Biol 201, 201L, 202, 202L; NREM 110, 120
15	Humanities, ethics, and social science 3 cr. in humanities; 3 cr. in social sciences; from approved lists: 3 cr. in ethics, 3 cr. in U.S. diversity, and 3 cr. in international perspectives; and environmental-intensive and problem-solving intensive require ments
R	Practical experience requirement (NREM 104)

Students majoring in Animal Ecology are required to choose one of the following options by the end of their sophomore year: Aquaculture, Ecology, Fisheries and Aquatic Sciences, Interpretation of Natural Resources, Preveterinary and Wildlife Care, or Wildlife.

Options

Cr.	
27	Aquaculture A Ecl 321, 410, 410L, 411, 442; An S 319; Biol 301 or Gen 320; one course from Acct 284, Econ 101, Mkt 340; remaining credits to complete 27 total from approved list.
30	Ecology A Ecl 410, 410L, 413; Biol 303; Bot 484; Biol 301 or Gen 320; one course from A Ecl 425, 515, Bot 306, 356, 505, Ent 370; one course from Agron 154, 206, Geol 100, 101; one course from Com S 207, Math 166, 182, Stat 401; remaining credits to complete 30 total from approved lists.
27	Fisheries and Aquatic Sciences A Ecl 321, 361, 410, 410L, 411, 440; remaining credits to complete 27 total from approved list.
27	Interpretation of Natural Resources A Ecl 330, 430; Bot 306, Ent 370; one course from Bot 356, and 484; three courses from A Ecl 361, 362, 363, 364; one course from Agron 154, 206, Astro 120, Geol 100, 101; 5 credits from approved list.
26	Preveterinary andWildlife Care A Ecl 330; An S 214, 336; NREM 460; one course from BMS 415 and 416, Zool 155, 320, 322, 454; one course from An S 331, 352, Biol 301, Gen 320, Zool 334 and 334L; two courses from A Ecl 361, 362, 363, 364; one course from A Ecl 442, An S 319, AST 373, Micro 201 and 201L, Zool 311; 3 credits of A Ecl coursework at 300 level or above; remaining credits to complete 26 total from approved lists
30	Wildlife A Ecl 350, 451; 6 credits from management group list; nine credits from ecology/biology group list; one course from Bot 306, 356, Agron 317; one course from Econ 101, 102, Pol S 215; additional credits from management, ecology/biology, plant taxonomy group lists to complete 30 total credits
18.5-25.5	Free electives
128	Total Credits

Typical Program for the First Year

Cr.	Fall
4	Principles of Biology—Biol 201, 201L
R	Orientation in Natural Resouce Ecology and Management—NREM 110
3	First-Year Composition—Engl 104
3	College Algebra—Math 140
5	General Chemistry—Chem 163, 163L
Cr.	**Spring**
4	Principles of Biology—Biol 202, 202L
3	Introduction to Renewable Resources—NREM 120
3	First-Year Composition—Engl 105
0.5	Library Instruction—Lib 160
3	Trigonometry and Analytic Geometry—Math 142
3	General Chemistry - Chem 164

Preveterinary Studies

Preparation for admission to veterinary medicine may be accomplished through the animal ecology curriculum. The Preveterinary and Wildlife Care option has been designed for this purpose.

Curriculum in Animal Science

For a minor a minimum of 16 credits in animal science must be earned at Iowa State from a list maintained in the department.

Cr.	Degree Requirements
12.5	Interpersonal and public communication skills Engl 104, 105, 302 or 314; Sp Cm 212; Lib 160; and communi cations-intensive requirement*
6-8	Mathematical sciences Math 150; Stat 101 or 104 or 227
8	Physical sciences Chem 177, 177L; BBMB 221 or Chem 231or Chem 331
13-14	Biological sciences Biol 201, 201L; 202, 202L or B M S 329; Biol 301 or Gen 320; 3 credits Microbiology, including laboratory; and an environmental-intensive requirement
15	Personal development, human relations, and global awareness a minimum of: 3 credits in humanities; 3 cr. in social sciences; from approved lists : 3 cr. in ethics, 3 cr. in international awareness, 3 credits in U.S. multicultural awareness; and problem solving-intensive requirement
29-31	Animal science An S 110; 114, 114L; 211; 214; 214L, 311; 411; one course from: 216, 224, 250, 270; 319; 331; 352; one course from 313, 336, 337, 345, 360; two courses from: 415, 419, 423, 424, 425, 426, 429, 434, 451, 470, FS HN 405, 410. A minimum of 15 credits in this category must be earned from courses taught in the Animal Science department at ISU.
3-7	Business Com S 103 or proficiency exam or AST 115 one course from department list
31.5-40.5	Free electives
128	Total credits

Typical Program for the First Year

Cr.	Fall
R	Orientation in Animal Science—An S 110
2	Survey of the Animal Industry—An S 114
1	Working with Animals—An S 114L
3	Principles of Biology—Biol 201
1	Principles of Biology Lab—Biol 201L
3	First-Year Composition—Engl 104
0.5	Library Instruction—Lib 160
3	Mathematics—Math 150
3	Elective
Cr.	**Spring**
4	General Chemistry—Chem 177
1	General Chemistry Lab—Chem 177L
3	First-Year Composition—Engl 105
3	Introduction to Statistics—Stat 104
3	Humanities elective
3	Elective

Preveterinary Studies

Preparation for admission to veterinary medicine may be accomplished through the animal science curriculum.

Curriculum in Dairy Science

Cr.	Degree Requirements
9.5	Interpersonal and public communication skills Engl 104, 105; Sp Cm 212 or AgEds 311; Lib 160; and communications intensive requirement
9-13	Mathematical and business sciences AST 115 or Com S 103 or proficiency exam; Econ 101; Math 150; Stat (3 cr.)
8	Physical sciences Chem 177, 177L; BBMB 221 or Chem 231 or 331
10-11	Biological sciences Biol 201, 201L; Biol 301 or Gen 320; Micro 201 and 201L or FS HN 273; and environmental-intensive requirement
15	Personal development, human relations, and global awareness 3 cr. in humanities; 3 cr. in social sciences; from approved lists: 3 cr. in ethics, 3 cr. in international awareness, 3 cr. in U.S. multicultural awareness; and problem solving-intensive requirement
30	Professional dairy science An S 110, 114, 114L, 211, 214, 214L, 311, 319, 331, 337, 352, 411, 434, plus a minimum of 6 credits from list maintained in department. A minimum of 15 credits in this category must be earned from courses taught in the Animal Science department at ISU.
41.5-46.5	Free electives
128	Total Credits

Typical Program for the First Year

Cr.	Fall
R	Orientation in Dairy Science—An S 110
3	Survey or the Animal Industry—An S 114, 114L
3	Principles of Biology—Biol 201
1	Principles of Biology Lab—Biol 201L
3	First-Year Composition—Engl 104
0.5	Library Instruction—Lib 160
3	Mathematics—Math 150
3	Elective
Cr.	**Spring**
3	AST 115
4	General Chemistry—Chem 177
1	General Chemistry Lab—Chem 177L
3	First-Year Composition—Engl 105
3	Introduction to Statistics—Stat 104
3	Elective

Preveterinary Studies

Preparation for admission to veterinary medicine may be accomplished through the dairy science curriculum.

Curriculum in Dietetics

Administered by the Department of Food Science and Human Nutrition.

The student is prepared for admission to dietetic internship programs and other professional experience programs approved/accredited by The American Dietetic Association. Courses included have been approved as meeting the academic requirements of the American Dietetic Association. There is a $30 fee for a statement of verification of completion of the approved program.

Cr.	Degree Requirements*
9.5	Interpersonal and public communication skills Engl 104, 105; Lib 160; ComSt 214 or Sp Cm 212
34-35	Mathematical, physical, and life sciences 3 cr college-level math; Stat 101 or 104; Chem 163, 163L, 231, 231L; BBMB 301; Biol 201, 202; Micro 201; Zool 255, 256; 2 credits in laboratory: BBMB 311 or Zool 255L and 256L
11	Humanities and social science Env S 201; Psych 101; select additional credits with at least 3 cr. in humanities.
3	Ethics
40	Food science and human nutrition FS HN 110, 167, 203, 214, 261, 340, 360, 361, 362, 403, 411, 461, 463, 464, 466, 480
11	Management HRI 380, 380L, 391, 392
9-10	Free electives
120.5	Total credits

*Additional requirement: Students must fulfill international perspectives, U.S. diversity, and ethics requirements by selecting coursework from approved lists. These courses may be used to fulfill other area requirements.

Typical Program for the First Year

Cr.	Fall
5	General Chemistry— Chem 163, 163L
3	Principles of Biology— Biol 201
3	First-Year Composition—Engl 104
3	Intro to Psychology— Psych 101
1	Orientation— FS HN 110
Cr.	**Spring**
3	Principles of Biology—Biol 202
3	First-Year Composition—Engl 105
3	Human Nutrition— FS HN 167
3	College Level Math
0.5	Library— Lib 160
3	Elective

Curriculum in Entomology

Cr.	Degree Requirements
12.5	Interpersonal and public communication skills Engl 104, 105, 314; Sp Cm 212; Lib 160; and communications-intensive requirement
3	Mathematical and physical sciences Stat 104
14	Life sciences Biol 201, 201L, 202, 202L, 312; Micro 302
15	Humanities, ethics, and social science Econ 101; 3 cr. in humanities; from approved lists: 3 cr. in ethics; 3 cr. in international perspectives; 3 cr. in U.S. diversity; and environmental-intensive requirement; and problem solving-intensive requirement
19	Entomology Ent 110, 201, 211, 370, 374, 376; Ent 490E or P M 491; Ent electives; for students entering entomology with one year or more of college-level biological sciences courses, Ent 201 and 211 are waived, and the group requirement reduced to 16 cr.

Students majoring in Entomology are required to choose one of the following options by the end of their sophomore year; Agricultural and Horticultural Insect Management, or Insect Biology.

Agricultural and Horticultural Insect Management Option

Cr.	Degree Requirements
5	Mathematics Math 140, 141
16	Physical Sciences Chem 163, 163L, 164, 231, 231L; Phys 106
6	Biological Sciences BBMB 301; Bot 320
12	Agricultural Sciences Agron 114 or Hort 221; Agron 154 or 155, 317; Pl HP 407
5	Entomology Ent 283, 375
6	Social Sciences Acct 215; Econ 135
14.5	Free electives

Insect Biology Option

Cr.	Degree Requirements
4	Mathematics Math 181
28	Physical Sciences Chem 177, 177L, 178, 178L, 211, 211L, 331, 331L, 332; Phys 111, 112
17-18	Biological Sciences Biol 301, 301L, 302, 302L, 303; Bot 320 or Zool 355; Zool 405
14.5-15.5	Free electives

Typical Program for the First Year

Cr.	Fall
3	First-Year Composition—Engl 104
3	Principles of Biology—Biol 201
1	Laboratory in Principles of Biology—Biol 201L
4	General Chemistry—Chem 163 or 177
1	Laboratory in General Chemistry—Chem 163L or 177L
4	Fundamentals of Algebra for Science and Higher Mathematics—Math 140 or Calculus and Differential Equations—Math 181
R	Orientation in Entomology—Ent 110
Cr.	**Spring**
3	First-Year Composition—Engl 105
3	General Chemistry—Chem 164, or 178, 178L
4	Principles of Biology—Biol 202, 202L
1	Introduction to Insects—Ent 201
2	Insects and Society—Ent 211
0.5	Library Instruction—Lib 160

Preveterinary Studies

Preparation for admission to veterinary medicine may be accomplished through the entomology curriculum.

Curriculum in Environmental Science

Cr.	Degree Requirements
9.5	Communication Engl 104, 105; Lib 160; speech elective (3 cr.)
11	Mathematical sciences Math 165 and 166 or 181 and 182; Stat 104; proficiency in computer use
19	Physical sciences Chem 177, 177L, 178, 178L; 231, 231L or 331, 331L; Geol 201; 3 credits soils from an approved list; Phys 111, 112
7	Biological sciences Biol 201, 201L and 202
15	Humanities, ethics, and social science 3 cr. ethics, 3 cr. U.S. diversity, 3 cr. of international perspectives, 3 cr. of humanities, and 3 cr. of social sciences. All courses must be approved.
29	Environmental science EnSci 295, 330, 402, 403, 404, 495 and 12 additional credits of approved EnSci coursework
34	Free electives
124.5	Total credits

Typical Program for the First Year

Cr.	Fall
3	Princ. Biology—Biol 201
1	Princ. Biology Lab Biol —201L
4	Gen Chem —Chem 177
1	Gen Chem Lab —Chem 177L
4	Calc. Life Sci. —Math 181
3	First Year Comp — Engl 104
16	Total
Cr.	**Spring**
3	Princ. Biology II—Biol 202
4	Gen Chem II — Chem 178
1	Gen Chem II Lab –Chem 178L
4	Calc. Life Sci II. —Math 182
3	First Year Comp. —Engl 105
.5	Library Instruction —Lib 160
15.5	Total

Curriculum in Food Science

Administered by the Department of Food Science and Human Nutrition.

Food Science and Technology Option

Cr.	Degree Requirements*
9.5	Interpersonal and public communication skills Engl 104, 105; Lib 160; ComSt 214 or Sp Cm 212
47-48	Mathematical, physical, and life sciences Math 165, 166 or 181, 182; Stat 101 or 104; Chem 177, 177L, 178, 331, 331L, 332; Phys 111, 112; BBMB 301; Biol 201, 202; Micro 302, 302L
11	Humanities and social science Env S 201; select additional credits with at least 3 cr. in humanities and 3 cr. in social science.
3	Ethics
39	Food science and human nutrition FS HN 110, 167, 203, 311, 351, 403, 405, 406, 410, 412, 420, 421, 471, 472, 480
10-11	Free electives
120.5	Total credits

*Additional requirement: Students must fulfill international perspectives, U.S. diversity, and ethics requirements by selecting coursework from approved lists. These courses may be used to fulfill other area requirements.

Typical Program for the First Year

Cr.	Fall
5	General Chemistry—Chem 177, 177L
3	Principles of Biology —Biol 201
3	First-Year Composition —Engl 104
4	Calculus I —Math 165 or 181
1	Orientation —FS HN 110
Cr.	**Spring**
3	General Chemistry—Chem 178
3	Principles of Biology —Biol 202
3	First-Year Composition —Engl 105
4	Calculus II —Math 166 or 182
1	Contemporary Issues in FS HN —FS HN 203
0.5	Library —Lib 160

Food Science and Industry Option

Cr.	Degree Requirements*
12.5	Interpersonal and public communication skills Engl 104, 105; Lib 160; ComSt 214 or Sp Cm 212; Jl MC 205, 220, or 347
35-37	Mathematical, physical, and life sciences Math 160; Stat 101 or 104; Chem 163, 163L, 164, 231, 231L; Phys 106; BBMB 301; Biol 201,202; Micro 201, 201L or 302, 302L
11	Humanities and social science Env S 201; Econ 101; select additional credits with at least 3 cr. humanities
6	Business Select 6 from Acct 215, 284, 285; Econ 301, 320, 322; Mgmt 310, 370, 371, 414, 472; MIS 330; Mkt 340, 447, 448
3	Ethics
42	Food science and human nutrition FS HN 110, 167, 203, 272, 311, 351, 403, 405, 406, 410, 412, 420, 421, 471, 472, 480
9-11	Free electives
120.5	Total credits

*Additional requirement: Students must fulfill international perspectives, U.S. diversity, and ethics requirements by selecting coursework from approved lists. These courses may be used to fulfill other area requirements.

Typical Program for the First Year

Cr.	Fall
5	General Chemistry—Chem 163, 163L
3	Principles of Biology —Biol 201
3	First-Year Composition —Engl 104
3	Humanities or Social Science elective
1	Orientation —FS HN 110
Cr.	**Spring**
3	Intro to Human Nutrition—FS HN 167
3	Principles of Biology —Biol 202
3	First-Year Composition —Engl 105
3-4	Math 151 or 160
0.5	Library Lib —160
3	Elective

Consumer Food Science Option

Cr.	Degree Requirements*
18.5	Interpersonal and public communication skills Engl 104, 105; Jl MC 205, 220, 347; Lib 160; ComSt 214 or Sp Cm 212
38-39	Mathematical, physical, and life sciences 3 cr. college-level math; Stat 101 or 104; Chem 163, 163L, 231, 231L; Phys 106; BBMB 301; Biol 201,202; Micro 201, 201L or 302, 302L; Zool 255, 256
14	Humanities and social science Econ 101; Env S 201; Mkt 340, 447; 3 cr. of humanities
3	Ethics
38	Food science and human nutrition FS HN 110, 167, 203, 214, 261,

272, 311, 403, 405, 406, 411, 412, 420, 480
8-9 Free electives
120.5 Total credits

*Additional requirement: Students must fulfill international perspectives, U.S. diversity, and ethics requirements by selecting coursework from approved lists. These courses may be used to fulfil other area requirements.

Typical Program for the First Year

Cr.	Fall
5	General Chemistry—Chem 163, 163L
3	Principles of Biology —Biol 201
3	First-Year Composition —Engl 104
1	Orientation —FS HN 110
3	Elective
Cr.	**Spring**
3	Principles of Biology —Biol 202
3	First-Year Composition —Engl 105
3	Math for Business and Social Sciences —Math 150 or alternate
3	Introduction to Human Nutrition—FS HN 167
0.5	Library —Lib 160
3-4	Stat 101 or 104

Curriculum in Food Science and Technology-B.S./M.S.

Administered by the Department of Food Science and Human Nutrition.

Undergraduate Program:

Cr.	Degree Requirements*
9.5	Interpersonal and public communications skills Engl 104, 105; Lib 160; ComSt 214 or Sp Cm 212
47-51	Mathematical, physical, and life sciences Math 165 and 166 or 181 and 182; Stat 101 or 104; Chem 177, 177L, 178, 331, 331L, 332; Phys 111, 112; BBMB 404 and 405 or 420; Biol 201, 202; Micro 302, 302L
14	Humanities and social science Env S 201; select additional credits with at least 3 cr. of humanities and 3 cr. in social science
3	Ethics
39	Food science and human nutrition FS HN 110, 167, 203, 311, 351, 403, 405, 406, 410, 412, 420, 421, 471, 472, 480
4-8	Electives
120.5	Total credits

*Additional requirement: Students must fulfill international perspectives, U.S. diveristy, and ethics requirements by selecting coursework from approved lists. These courses may be used to fulfill other area requirements.

Graduate Program:

Cr.	Degree Requirements
30	Graduate-level coursework including research

Typical Program for the First Year

Cr.	Fall
5	General Chemistry—Chem 177, 177L
3	Principles of Biology —Biol 201
3	First-Year Composition — Engl 104
4	Calculus I —Math 165 or 181
1	Orientation —FS HN 110
Cr.	**Spring**
3	General Chemistry—Chem 178
3	Principles of Biology — Biol 202
3	First-Year Composition — Engl 105
4	Calculus II —Math 166, 182
1	Contemporary Issues in FS HN — FS HN 203
0.5	Library —Lib 160

Curriculum in Forestry

Cr.	Degree Requirements
12.5	Interpersonal and public communication skills Engl 104, 105, 314; Lib 160; Sp Cm 212
25	Mathematical, physical, and life sciences Math 140, 150, 151; Stat 101; Chem 163, 163L; Biol 201, 201L; Agron 154
15	Humanities, ethics, and social science 3 cr. in humanities; Econ 101; 3 cr. in ethics from approved list; and 3 cr. in U.S. diversity and 3 cr. in international perspectives
28	Forestry courses For 201, 202, 203, 204, 205, 206, 302, 451, 454; NREM 104, 110, 120

Students majoring in forestry are required to choose one of the following options at the end of their sophomore year: forest ecosystem management or wood products or urban and community forestry or natural resource conservation.

Options

Cr.	
26	Wood products For 280, 452, 453, 481, 483, 485, 486, 487
34	Forest ecosystem management Bot 356; For 280, 342, 452, 453; NREM 301, 345; Pl P 416; 6 credits from approved multiple use courses (see department for list)
39	Urban and Community Forestry Bot 356; For 280, 452, 475, 476; Hort 344; Mgmt 370; Pl P 416; Soc 310, 464; C R P 253; 3 credits from approved multiple use courses (see department for list)
35	Natural Resource Conservation A Ecl 330; Biol 202, 202L, 312; Bot 340, 356; For 453; NREM 301, 407; Soc 130 or 134; 6 credits from approved directed electives list (see department for list)
8.5-21.5	Free electives
128	Total credits

Typical Program for the First Year

Cr.	Fall
3	First-Year Composition I—Engl 104
R	Orientation in Natural Resource Ecology and Management—NREM 110
3	Fundamentals of Algebra—Math 140
3	Principles of Biology I—Biol 201
1	Principles of Biology Laboratory I—Biol 201L
3	Introduction to Renewable Resources—NREM 120
3	Principles of Microeconomics—Econ 101
16	
Cr.	**Spring**
3	Foundations of Soil Science—Agron 154
0.5	Library —Lib 160
3	First-Year Composition II—Engl 105
4	General Chemistry I —Chem 163
1	General Chemistry Lab I—Chem 163L
4	Wood Anatomy and Properties—For 280 or U.S. Diversity/ International Perspectives
14.5 or 15.5	

Curriculum in Genetics

Administered by the Department of Zoology and Genetics.

Cr.	Degree Requirements
12.5	Communications Engl 104, 105; an advanced English writing course (Engl 302-316); oral communication (AgEdS 311, Sp Cm 212; Lib 160
11	Math Must include at least one course from both calculus and statistics chosen from Math 160, 165, 166, 181, 182; Stat 101 or 104, 401, 402, 403
3	Computer Studies Three credits in computer science or computer applications chosen from an approved list. See department for list.
31	Physical sciences Chem 177, 177L, 178, 178L (or 211), 331, 331L, 332, 332L; BBMB 404 or 420; Chem 211 or 321 or BBMB 405 or 411; Physics 111, 112 or 221, 222
23	Biological sciences Biol 201, 201L, 202, 202L, 301, 301L, 302, 302L; Micro 302; Biol 303
15	Humanities, ethics, and social sciences 15 credits including at least 3 cr. each in the humanities, social sciences, ethics, international perspectives and U.S. diversity chosen from an approved list. The environment-intensive and problem solving-intensive college requirements can be satisfied by selection of appropriate courses. See department for lists.
9.5	Genetics Gen 110, 410, 411, 460 or 462, 491
9	Support electives Choose 9 credits from approved list. See department for list. Biol (A Ecl) 312 must be included in the program
Electives	Additional electives sufficient to equal the 128 credits required for graduation.
128	Total credits

Typical Program for the First Year

Cr.	Fall
5	General Chemistry—Chem 177,177L
3	First-Year Composition—Engl 104
4	Calculus—Math 165 or 181
4	Principles of Biology—Biol 201, 201L
0.5	Orientation and Career Opportunities—Gen 110
0.5	Library Instruction—Lib 160
Cr.	**Spring**
4	General Chemistry—Chem 178,178L
3	First-Year Composition—Engl 105
4	Calculus—Math 161 or 166 or 182
4	Principles of Biology—Biol 202,202L

Curriculum in Horticulture

Students majoring in horticulture will select an option in which to specialize prior to reaching junior standing and will fulfill the requirements described below under Specialization Options. A minor is available. The requirements appear under *Horticulture, Courses and Programs*.

Cr.	Degree Requirements
12.5	Interpersonal and Public Communication Skills Engl 104, 105, 302 or 314; Lib 160; Sp Cm 212 or AgEdS 311; and a communications-intensive requirement (see department for procedure)
6-9	Mathematical sciences Math 140 or 150 or 165 or 181; and Stat 101 or 104 or 227 or 401
13	Physical sciences Chem 163, 163L; or 177, 177L; and 231, 231L, or 331, 331L; and one course from the following group: Chem 164, 164L; 178, 178L; or Phys 106 or 111. A student must take either (1) Chem 163/163L and Chem 231/231L series or (2) Chem 177/177L and 178/178L series and Chem 331/331L.
19-20	Biological sciences Biol 201, 202; select 13-14 credits from the following group: Bot 320, 306, 484; Biol 312; Agron 230; Agron 260; Agron 317; Agron 354; Ent 370 or 376; Ent 375; Bot 404; Pl P 407; For 416; Pl HP 391; Biol 201L; Biol 202L; Gen 320 or Biol 301, 301L; Biol 302, 302L
15	Humanities, ethics, and social sciences 3 credit course from each of the following areas: humanities, ethics, social science, U. S. diversity, and international perspectives; see department for procedure in meeting problem-solving, environmental-intensive, and communication-intensive requirements.
3	Soil science Agron 154 or 155
30	Horticultural sciences Hort 110, 221; select a minimum of 26 credits from the following group: Hort 233, 241,253, 282, 283, 320, 321, 322, 332, 338, 341, 342, 344, 345, 346, 351, 351L, 391, 421, 422, 423, 424, 425, 434, 435, 442, 444, 445, 451, 452, 453, 461, 471, 475, 490, 496, 511, 551, 552. Transfer students may transfer up to 10 credits of 200-and 300-courses in the horticultural sciences area.
	Specialized Options (a minor in an approved area of study may be substituted for the specialized option with permission of student's advisor)
12	Environmental horticulture option: Hort 424 must be among the courses that fulfill the horticultural sciences requirement. Biol 312 and 9 or more credits from the following group: AST 324, 425, Agron 260, Bot 304, 364, Ent 375, Env S 293, 330, 382, 491
12	Greenhouse production and management option: Hort 233, 322, 332, 422, 434, and 435 must be among the courses that fulfill the Horticultural Sciences requirement. Acct 284; and 9 or more credits from the following group: Econ 101, 102; Acct 215, 285; AST 358; Com S 103, 107; Mkt 340; Ent 375; Mkt 442, 446, 447
12	Fruit and vegetable production and management option: Hort 422, 461, and 471 must be among the courses that fulfill the Horticultural Sciences requirement. Acct 284; and 9 or more credits from the following group: FS HN 272, 471, 472, 403, 405; Econ 101, 102, 330; Acct 215, 285; AST 358 or Com S 103 or 107; Mgmt 370; Mkt 340, 442, 446, 447
20	Horticultural communications and public education: Students in this option must take Engl 314 under Interpersonal and Public Communications Skills and a minimum of 20 credits from the following group: Engl 220, 303,305; ComSt 102, 214, 317; Sp Cm 312, 313, AgEds 310, 311, 401; Jl MC 220
12	Nursery crops production and landscape management option: Hort 241, 322, 341, 342, 421, and 442 must be among the courses that fulfill the Horticultural Sciences requirement. Acct 284; and 9 or more credits from the following group: Acct 215, 285; AST 358; Agron 206; Com S 103 or 107; Econ 101, 102, 330; Mgmt 370; Mkt 340, 442, 446, 447
15	Public garden management and administration option: Those who choose this option must take Bot 306, Ent 375 or Ent 376, Pl P 407 or Pl HP 391, Hort 233, 241, 253, 282, 283, 322, 345, 445, and at least 1 credit of Hort 391. Other recommended courses are Hort 332, 341, 342, 344, 346, 347, 351 and 351L. The student must then select a minimum of 15credits from the following: Acct 284; Engl 303, 309; JLMC 220; Mgmt 471; AgEdS 311; Sp Cm 312, 313. Up to 6 credits from the list below may be substituted for any of the 15 above credits. Acct 215, 285, 316; AgEdS 402; AST 358; Com S 214, Engl 313, 415, 416; Fin 301; Mgmt 370, 371.
12	Science option: Those who choose the Science Option must take Bot 320 for the biological sciences requirement. Math 165 or 181 for the mathematical sciences requirement; Chem 177, 177L, 178, 178L, 331, 331L, 332, 332L, Phys 111 and 112 for the physical sciences requirement. BBMB 301 or 404, Math 166 or 182; and 5 or more credits from the following group: BBMB 311, 404, 405, 411; Bot 303; Chem 210 or 211, 316, 321, 322, 322L; Com S 107 or 205; Gen 410, 411; Biol 301, 301L, 302, 302L
12	Turfgrass management option: Hort 351, 351L, 451, 452, 453, 551 should be among the courses that fulfill the Horticultural Sciences requirement. Acct 284 and 9 or more credits from the following group: Acct 285; AST 324, 326, 358; Agron 206, 260, 356, 459; Com S 103 or 107; HRI 287, 288, 289; Mgmt 370; Pl HP 206, 391; Ent 375
14-18	Electives
128.5	Total credits

An official minor will be accepted in place of a specialized option with the permission of the student's adviser.

Typical Program for the First Year

Cr.	Fall
3	Humanities or Free Elective
5	General Chemistry—Chem 163, 163L or 177, 177L
3	First-Year Composition—Engl 104 or 105
1	Orientation in Horticulture—Hort 110
0.5	Library Instruction—Lib 160
3	Fundamentals of Algebra for Science and Higher Mathematics—Math 140
Cr.	**Spring**
3	General Biology—Biol 201
4	General Chemistry—Chem 164, 164L, 177, 177L (or Phys 106 or 111)
3	Humanities or social science from an approved list
3	First year composition—Engl 105 or Soils for Horticultural Scientists—Agron 155
3	Elective

Curriculum in International Agriculture

Administered by an Interdepartmental Committee. International agriculture can be taken only as a secondary major in conjunction with a primary major in the College of Agriculture. A minor is available to interested students regardless of their major.

Cr.	Degree Requirements
	(Additional prerequisites may be required for some courses.)
12.5	Interpersonal and public communication skills Engl 104, 105; Sp Cm 212 or AgEdS 311; Lib 160; electives (3 cr.) select from Engl 302 or 314, or Jl MC 205; and communications-intensive requirement (See primary major department for procedure to meet core requirements.)
19	Mathematics, physical, and life sciences Math 150, Chem 163, 163L, or Chem 177, 177L, math or physical science electives select from BBMB, Chem, Com S, Math, Phys, or Stat(5 cr.); biological sciences electives select from Biol, Bot, Gen, Micro, Pl HP or Zool (6 cr.) and demonstration of computer proficiency (See primary major department.)
15	Humanities, ethics, and social sciences Soc 130 or 134, or Econ 101; Anthr 201; 3 cr. in ethics; 3 cr. in U.S. diversity; 3 cr. in International perspectives; environmental-intensive requirement; and problem solving-intensive requirement (See primary major department for intensive requirements.)
15	International Agriculture Internship in International Agriculture or Study Abroad Program or Foreign Language (6cr.) Select courses with international agriculture focus in any major in the College of Agriculture (9 cr.)
66.5	Primary major requirements and free electives
128	Total credits

Program for the First Year

Because international agriculture is a secondary major, the courses taken by the student during the first year will vary, depending on the primary major (see typical program for the primary major).

Curriculum in Microbiology

www.micro.iastate.edu
Administered by the Department of Microbiology.

Cr.	Degree Requirements
12.5	Interpersonal and public communication skills Engl 104, 105; Engl 302 or Engl 309 or Engl 314; Sp Cm 212; Lib 160
10-12	Mathematical sciences Stat 101 or 104 required; 2 semesters of math with at least one semester of calculus
26-29	Physical sciences Chemistry—Chem 177, 177L, 178 Organic Chemistry: Chem 331, 331L, 332. Biochemistry—BBMB 404 and 405 (recommended) or 301 or 420 Physics: 8 credits from Phys 111, 112, 221, 222.
16	Biological sciences Biol 201, 201L, 202, 202L, and 301, 301L, 302, 302L.
15	Humanities, ethics, and social sciences Minimum of 3 credits each in courses in humanities and social sciences. Also, 3 credits each in ethics, international perspectives, and U.S. diversity courses selected from approved lists.
27	Microbiology Required: Micro 110, 302, 310, 402, 404, 430, 450. Required labs - Micro 302L, 310L, 440. A minimum of 6 credits of microbiology lecture courses at a 300-level and above.
16-21	Electives
128	Total credits

Typical Program for the First Year

Cr.	Fall
4	General Chemistry—Chem 177
1	Laboratory in General Chemistry—Chem 177L
3	First-Year Composition—Engl 104
3	Principles of Biology—Biol 201
1	Laboratory in General Biology—Biol 201L
3	Humanities, ethics, or social science
0.5	Library 160
R	Orientation in Microbiology—Micro 110
Cr.	**Spring**
3	General Chemistry—Chem 178
3	First-Year Composition—Engl 105
3	Principles of Biology—Biol 202
1	Laboratory in General Biology—Biol 202L
3	Biology of Microorganisms—Micro 302
3-4	Mathematics

Preveterinary Studies

Preparation for admission to veterinary medicine may be accomplished through the microbiology curriculum.

Curriculum in Nutritional Science

Administered by the Department of Food Science and Human Nutrition.

Cr.	Degree Requirements*
9.5	Interpersonal and public communication skills Engl 104, 105; Lib 160; ComSt 214 or Sp Cm 212
54-59	Mathematical, physical, and life sciences 4 cr. calculus (2 semesters preferred); Stat 101 or 104; Chem 177, 177L, 178; 331, 331L, 332, 332L; Phys 111, 112; Biol 201, 201L, 202, 202L, 301, 302; Micro 302, 302L; Zool 355
11	Humanities and social science Env S 201; select additional credits with at least 3 cr. of humanities and 3 cr. in social science
3	Ethics
29-30	Food science and human nutrition FS HN 110, 203, 214, or 311; 261, 360, 362, 463 or 466 or 565; 480; select at least 11 additional credits from FS HN 361, 403, 412, 419 or 519, 463, 464, 466, 490C, 553, 554, 562, 565, 575
8-14	Free electives
120.5	Total credits

*Additional requirement: Students must fulfill international perspectives, U.S. diversity, and ethics requirements by selecting coursework from approved lists. These courses may be used to fulfill other area requirements.

Typical Program for the First Year

Cr.	Fall
5	General Chemistry—Chem 177, 177L
4	Principles of Biology—Biol 201, 201L
3	First-Year Composition—Engl 104
4	Calculus
1	Orientation—FS HN 110
Cr.	**Spring**
4	Principles of Biology—Biol 202, 202L
3	First-Year Composition—Engl 105
3-4	Calculus or Elective
3	General Chemistry—Chem 178
0.5	Library—Lib 160
1	Contemporary Issues in FS HN—FS HN 203

Curriculum in Nutrition—B.S./M.S.

Administered by the Department of Food Science and Human Nutrition.

Undergraduate Program:

Cr.	Degree Requirements*
9.5	Interpersonal and public communication skills Engl 104, 105, Lib 160, ComSt 214 or Sp Cm 212
51-58	Mathematical, physical, and life sciences 4 credits in calculus (2 semesters preferred), Stat 104 or 101; Chem 177, 177L, 178, 331, 331L, 332, 332L; Phys 111, 112; BBMB 404 and 405 or 420; Biol 201, 201L, 202, 202L; Micro 302, 302L; Zool 355
12	Humanities and social science Env S 201; select additional credits with at least 3 cr. of humanities and 3 cr. in social science
3	Ethics

29-30 **Food science and human nutrition**
FS HN 110, 203, 214, or 311; 261, 360, 362, 463 or 466 or 565; 480; select at least 11 additional credits from FS HN 361, 403, 412, 419 or 519, 463, 464, 466, 490C, 553, 554, 562, 565, 575
8-16 **Electives**
120.5 **Total credits**

*Additional requirement: Students must fulfill international perspectives, U.S. diversity, and ethics requirements by selecting coursework from approved lists. These courses may be used to fulfill other area requirements.

Graduate Program:

Cr.	Degree Requirements
30	Graduate-level coursework including research

See department for graduate requirements.

Typical Program for the First Year

Cr.	Fall
5	General Chemistry—Chem 177, 177L
4	Principles of Biology—Biol 201, 201L
3	First-Year Composition—Engl 104
4	Calculus
1	Orientation—FS HN 110
Cr.	**Spring**
4	Principles of Biology—Biol 202, 202L
3	First-Year Composition—Engl 105
3-4	Calculus or Elective
3	General Chemistry—Chem 178
0.5	Library—Lib 160
1	Contemporary Issues in FS HN—FS HN 203

Curriculum in Pest Management

Administered by the departments of Agronomy, Animal Ecology, Entomology, Forestry, Horticulture, and Plant Pathology. Must be taken as a secondary major in conjunction with a primary major. Students with primary majors in other than the sponsoring departments also are encouraged to enroll in the pest management program. Additionally, a minor in pest management is available; requirements appear under *Pest Management, Courses and Programs.*

Cr.	Degree Requirements
12.5	**Interpersonal and public communication skills** Engl 104, 105 and a minimum of 3 cr. in speech fundamentals with grades of C or better; Lib 160; electives and a communication-intensive requirement
6	**Mathematical sciences** Stat 104; 3 cr. in mathematics, statistics or computer science; students must demonstrate computer proficiency according to procedures established by their primary major
9	**Physical sciences** Chem 163, 163L, 231, 231L
16-17	**Biological sciences** Biol 201, 201L, 202, 202L; Gen 320; any 2 of the following: BMBB 301; Biol 303, 312; Bot 320, 484; Ent 370; Micro 201, 302
15	**Humanities, ethics, and social science** 3 cr. economics or marketing; 3 cr. humanities; 3 cr. international perspectives; 3 cr. U.S. diversity; 3 cr. ethics; and environmental-intensive requirement; and problem solving-intensive requirement
9-10	**Agricultural sciences** Agron 114 or For 301 or Hort 221; Agron 154 or 155; Agron 206
18-22	**Pest management** P M 283, 317, 376, 491, 499; P M 407 or P M 416; A Ecl 120 or 130; electives (any one course from approved list) An approved list of elective courses may be obtained from the pest management adviser in participating departments.
36.5-42.5	**Primary major requirements and free electives**
128	**Total credits**

Typical Program for the First Year

Because pest management is a secondary major, the courses taken by the student during the first year will vary, depending on the primary major (see typical program for the primary major). It is recommended, however, that the following courses be included early in the program:

Cr.	
2-3	Principles of Crop Production—Agron 114 or Forest Ecology—For 301 or Principles of Horticulture—Hort 221 or Wildlife and Agriculture—A Ecl 130
6	Principles of Biology—Biol 201, 202

Curriculum in Plant Health and Protection

Administered by the Departments of Agronomy, Entomology, Forestry, Horticulture, and Plant Pathology. A minor in plant health and protection is available; the requirements appear under Plant Health and Protection, Courses and Programs.

Cr.	Degree Requirements
12.5	**Interpersonal and public communication skills** Engl 104, 105, 302 or 314; Lib 160; Sp Cm 212 or AgEdS 311
6-10	**Mathematical sciences** Math 140; Stat 104; Com S 103 or demonstration of computer proficiency
12-13	**Physical sciences** Chem 163, 163L, 231, 231L; Phys 106 or Chem 164
19-20	**Biological sciences** Biol 201, 201L, 202, 202L; Biol 301 or Agron 320; Bot 320 or Agron 230 or Hort 321; 6 cr. from the following: Micro 201 or 302, 201L or 302L; BBMB 301; Biol 302, 303, 312; Bot 404, 406; Env S 201
15	**Humanities, ethics, and social science** Econ 101; 3 credits in humanities; from approved lists: 3 cr. in ethics, 3 cr. international perspectives; 3 credits in U.S. diversity.
17	**Agricultural sciences** Agron 114 or Hort 221; Agron 154 or 155; Agron 206; 8 cr. from the following: Agron 260, 338, 356, 421, 450, 485; Ent 283, 375; For 475; Hort 322, 332, 424, 425; Pl P 452, 477
20-21	**Plant health and protection** Pl HP 110, 206, 391, 392, 498; Agron 317; Hort 320/320L or Agron 354/354L; Ent 376; Pl P 407 or 416; and environmental-intensive requirement, communication-intensive requirement, problem solving-intensive requirement
19.5-26.5	**Free electives**
128	**Total credits**

Typical Program for the First Year

Cr.	Fall
3	First-Year Composition—Engl 104
3	College Algebra—Math140
4	Principles of Biology—Biol 201, 201L
4	General Chemistry—Chem 163
1	Laboratory in General Chemistry—Chem 163L
0.5	Library Instruction—Lib 160
R	Orientation in Plant Health and Protection—Pl HP 110
Cr.	**Spring**
3	First-Year Composition—Engl 105
4	Principles of Biology—Biol 201, 201L
3	Humanities requirement
3	Fundamentals of Agronomy or Principles of Horticulture—Agron 114 or Hort 221
3	Plant Health Biology—Pl HP 206

Curriculum in Public Service and Administration in Agriculture

Administered by the Department of Sociology.

Cr.	Degree Requirements
12.5	**Interpersonal and public communication skills** Engl 104, 105; Jl MC 205; Sp Cm 212; Lib 160; communication-intensive requirement
18	**Mathematical, physical and life sciences** Math 150; Stat 101; electives in physical sciences (5 cr.); Biol 109; electives in biological sciences (3 cr.) (To fulfill the College's environmental intensive requirement, students are encouraged to choose Environmental Science 120 or 123 as the elective in the biological sciences; demonstration of computer proficiency) (see Sociology Department for requirements).

12	Humanities, ethics, and social sciences Humanities elective (3 cr.); from approved lists: 3 cr. in ethics; 3 cr. in U.S. diversity; 3 credits in international perspectives. The 3-credit College of Agriculture requirement in the social sciences is included as part of the Public Service and Administration Core as are the environmental-intensive requirement and problem solving-intensive requirement.
46	Public service and administration core **Economics**: 101, 102, 344, 336, 451 **Political science:** 215, 310, 371, 475, and 484 **Sociology**: 110, 130, 325, 415, 420 or 380, and 464
9	Agricultural sciences
15	Required area of concentration
15.5	Free electives
128	Total credits

Typical Program for the First Year

Cr.	Fall
3	First-Year Composition—Engl 104
3	Introductory Biology—Biol 109
3	Mathematics for Business and Social Sciences I—Math 150
3	Rural Institutions and Organizations—Soc 130
3	Principles of Microeconomics—Econ 101
R	Orientation to Public Service and Administration in Agriculture—Soc 110
Cr.	**Spring**
3	First-Year Composition—Engl 105
3	Principles of Macroeconomics—Econ 102
3	American Government: Institutions and Policies—Pol S 215
3	Fundamentals of Speech Communication—Sp Cm 212
3	Agricultural Science
0.5	Library Instruction—Lib 160

Curriculum in Seed Science

Administered by the Departments of Agricultural and Biosystems Engineering, Agronomy, Horticulture, and Plant Pathology. Must be taken as a secondary major in conjunction with a primary major. The seed science program is designed for students with career interests in one or more aspects of the seed industry. Areas of study include: seed production, conditioning, pathology, physiology, quality control, and marketing, as well as seed plant designs.

Cr.	Degree Requirements
12.5	Interpersonal and public communication skills Engl 104, 105; Sp Cm 212 or AgEdS 311; Lib 160; Engl 302 or 309 or 314 or Sp Cm 312; and a communications-intensive requirement (see department of primary major for procedures)
38	Mathematical, physical, and life sciences Math 140 or 150; Stat 101or 104; Chem 163, 163L; BBMB 221 or Chem 231, 231L; Phys 106 or 111, or Chem 164, 164L; Biol 201, 201L; Biol 202, 202L; Ent 376; Gen 320 or Biol 301; Agron 317; Pl P 407; and demonstration of computer proficiency (see department of primary major for procedures)
15	Humanities, ethics, and social science 3 cr. each of humanities, social sciences, ethics (from an approved list), U.S. diversity (from an approved list), and international perspectives (from an approved list); environmental intensive requirement (see department of primary major for procedures); and problem-solving intensive requirement (see department of primary major for procedures)
21	Agricultural sciences Agron 114 or Hort 221; Agron 154, 206, 354; Agron or Hort electives (6 cr.); AST electives (3 cr.)
9	Economics and business Econ 101, 235; and one course from the following group: Acct 284; Econ 102, 330, 336; Mgmt 370; Mkt 340
10	Seed science Agron 338, 421, 491, and 2 cr. of Agron, Hort, or AST electives at the 300-400 level
22.5	Primary major requirements and free electives
128	Total credits

Typical Program for the First Year

Because seed science is a secondary major, the courses taken by the student during the first year will vary, depending on the primary major (see typical program for the primary major).

Curriculum in Zoology

Administered by the Department of Zoology and Genetics.

Cr.	Degree Requirements
12.5	Communications Engl 104, 105; an advanced English writing course (Engl 302-316); oral communication (AgEdS 311, Sp Cm 212); Lib 160
11	Math Must include at least one course from both calculus and statistics chosen from Math 160, 165, 166, 181, 182; Stat 101 or 104, 401, 402, 403
3	Computer studies 3 credits in computer science or computer applications chosen from an approved list. See department for list.
24	Physical sciences Chem 177, 177L, 178, 178L (or 211), or 163, 163L, 164, 164L; 231, 232 or 331, 331L, 332; 332L, or BBMB 404 or 420; Phys 111, 112 or 221, 222
16	Biological sciences Biol 201, 201L; 202, 202L; 301, 301L, 302, 302L
15	Humanities, ethics, and social sciences 15 credits including at least 3 cr. in humanities, social sciences, ethics, international perspectives and U.S diversity chosen from an approved list. The environmental-intensive and problem solving-intensive college requirements can be satisfied by selection of appropriate courses. See department for lists.
21.5	Zoology Zool 110, 355; 17 credits in zoology numbered 300 or above, 7 of which must be numbered 400 or above. Two of the elective courses must include a laboratory.
6	Agricultural sciences Choose 6 credits from any lecture or lab course numbered 300 or above taught by the following departments: Animal Ecology, Animal Science, or Entomology. Biol (A Ecl) 312 must be included in the program.
Electives	Additional electives sufficient to equal the 128 credits required for graduation.
128	Total credits

Typical Program for the First Year

Cr.	Fall
0.5	Opportunities in Zoology—Zool 110
3	First-Year Composition—Engl 104
4	General Chemistry—Chem 177
1	Laboratory in General Chemistry—Chem 177L
4	Calculus—Math 165 or 181
3	General Biology—Biol 201
1	Laboratory in General Biology—Biol 201L
0.5	Library Instruction—Lib 160
Cr.	**Spring**
3	First-Year Composition —Engl 105
3	General Chemistry —Chem 178
1	Laboratory in General Chemistry —Chem 178L
4	Calculus —Math 161 or 166 or 182
3	General Biology —Biol 202
1	Laboratory in General Biology —Biol 202L

College of Business

Departments of the College

Accounting
Finance
Logistics, Operations and Management
Information Systems
Management
Marketing

Objectives of the Curricula in Business

The instructional objective of the College of Business is to provide a high quality professional education in business. Such an education should provide the student with: (1) an appreciation of the evolution of the profession and an awareness of the ethical, global, technological, economic, political and social forces shaping its future; (2) an understanding of the major functional areas of business with the opportunity for specialization for a career in business; (3) an ability to recognize and appreciate the affect of diversity in the work place; (4) an opportunity for advanced study.

A comprehensive education in business includes a broad foundation in the liberal arts, courses in the major functional areas of business activity, proficiency in analytical methods, and the ability to identify problems and arrive at logical solutions. In addition, a professional education is designed to inspire students to assume business and community leadership.

The curricula in business are accredited by the International Association for Management Education (AACSB), the national business accrediting agency.

Organization of Curricula

The undergraduate curricula in business are divided into two phases: a general education (pre-business) program and a professional program. The pre-business requirements provide a broad foundation in the liberal arts. The professional program includes two parts: (1) the business core which provides a common body of knowledge in all the functional areas in business, and (2) a major curriculum. The seven major curricula offered for the degree bachelor of science (B.S.) are accounting, finance, management, management information systems, marketing, production/operations management, and transportation and logistics. The College also offers a secondary major in international business. An opportunity to take elective courses is also a part of the curricula.

Bachelor of Science

The bachelor of science (B.S.) degree offers a high quality professional education in business. It prepares students for professional careers in specialized functions of business and government. Candidates for this degree must satisfy the requirements established by the College of Business and also the requirements for individual majors specified by the departments of the College. All candidates for the B.S. degree are required to complete one of the following majors: accounting, finance, management, management information systems, marketing, production/operations management or transportation and logistics.

Required High School Preparation

Students entering the pre-business curriculum must present evidence of the following high school preparation:
a. Four (4) years of English/Language Arts, emphasizing writing, speaking, and reading as well as an understanding and appreciation of literature.
b. Three (3) years of mathematics, including one year each of algebra, geometry, and advanced algebra.
c. Three (3) years of science, including one year each of courses from two of the following fields: biology, chemistry, and physics;
d. Two (2) years of social studies.

Admission Standards to Professional Programs

All new entering students are enrolled in a pre-business curriculum. To enter the professional program in the College of Business, students must complete a minimum of 30 credits including Engl 104, Engl 105 and the following foundation courses or their equivalents: Math 150, Com S 103, Econ 101, Stat 226, Acct 284. Any unmet high school requirements and Engl 101 courses must also be complete. See *Curriculum in Business.*

In addition, all students (except Management Information Systems students) must achieve an Iowa State University cumulative grade point of 2.5 or a grade-point average of 2.5 in the foundation courses. Management Information Systems students must achieve a 2.75 grade point average in one of these areas. Admission into the professional program is a prerequisite for pre-business students to gain admission into upper-level business classes. Students that have not achieved guaranteed admission may be considered on a case-by-case basis.

Students who meet the following four requirements qualify for early admission to the professional program: Eligibility to apply for the Honors Program, completion of any unmet high school requirements, completion of any required Engl 101 courses, and declaration of a specific major. Students who meet these criteria must initiate the application for admission to the professional program.

If using the foundation courses for admission to the Professional Program, both transfer grades and Iowa State University grades are used to compute the grade point average. If foundation courses are taken at Iowa State University they must be repeated at Iowa State University. With the exception of Acct 285 and MIS 330, pre-business students do not have access to business core classes. To facilitate registration, students may be conditionally admitted during the semester in which they complete the admission requirements.

Admission requirements are subject to change. Applications and the current requirements for admission to the College of Business are available from the Undergraduate Programs Office or on the web at www.bus.iastate.edu/undergrad/ in the College of Business.

Academic Standards and Graduation Requirements

Policies for students enrolled in the College of Business may be obtained from the Undergraduate Programs Office or on the web at www.bus.iastate.edu/undergrad/ in the College of Business. Students are responsible for knowing and adhering to these College of Business policies as well as the university regulations found in this catalog. The following policies are in effect for students graduating from a professional curriculum in business with a B.S. degree under the 2003-2005 catalog: (1) A minimum of 124.5 semester credits are required. (2) At least 50 percent of the required business credits must be earned at Iowa State. All 300 level and higher business credits must be earned at a four-year college. (3) At least 50% of the 124.5 credits required for graduation must consist of general education (non-business credits). (4) A minimum of 12 credits of the last 32 credits earned in residence must be applied to the business core and/or the major. (5) The major departments reserve the right to determine the appropriate section of the degree program to which transfer credits will be assigned. (6) Students must achieve English proficiency by earning a grade at C or better in two of the three required English courses. (7) A student must earn a grade of C or higher in a minimum of 30 credits applied to the business core and the major. (8) A student must earn at least 42 credits of 300 level and higher coursework from a four-year institution. (9) Business majors may not take business courses Pass-Not Pass (P/NP). (10) General education courses may not be taken P/NP. (11) No more than 9 elective credits may be taken P/NP.

Curriculum in Business

Leading to the degree bachelor of science with a major in accounting, finance, management, management information systems, marketing, production/operations management or transportation and logistics. The College also offers a secondary major in international business. Total credits required: 124.5

Pre-business Curriculum

Cr.	
16.5	Foundation Courses
3	Math 150[1, 2]
4	Com S 103[2]
3	Econ 101
5	Stat 226 [2]
3	Acct 284
0.5	BusAd 101
12	Communications
3	Engl 104
3	Engl 105
3	Engl 302
3	Sp Cm 212
9.5	Supporting courses
3	Acct 215
3	Math 151[1,2]
3	Econ 102
0.5	Lib 160
24	General Education Requirements
6	Global/International Perspectives[3]
9	Humanities
3	Phil 230
3	History course(s)[3] Select from approved list[3]
3	Natural science[3]
3	Select from approved list[3]
6	Behavioral science[3]
U.S. Diversity Course[4]	

[1]Students not adequately prepared in mathematics may have to take remedial courses in addition to courses listed above. Remedial mathematics courses may not be used to satisfy credit requirements for graduation in the business curricula.

[2]Substitutions can be made. See the Undergraduate Programs Office in the College of Business. Stat 326 is a prerequisite for certain required courses in accounting and finance.

[3]Approved list of courses is available from the Undergraduate Programs Office or on the web at www.bus.iastate.edu/undergrad/ in the College of Business.

[4]Courses for this requirement may also be used to fulfill other curriculum requirements or electives and therefore credits are not included in the sum needed.

Professional Program

Cr.	
24	Business Core
3	Acct 285
3	Fin 301
3	Mgmt 370
3	Mgmt 478
3	MIS 330
3	Mkt 340
3	POM 320
3	TrLog 360
18-21	Business Major

Select one:

18	Accounting
18	Acct 383, 384, 386, 387, 485, 497
21	Finance
6	Fin 310, 320
12	Select from Fin 330, 361, 380, 415, 424, 425, 445, 462, 472 of which six credits must be at the 400 level.
3	Select from Acct 383, 384, 386, 387, 488 or any 400 level Acct; or any Fin course listed above.
18	Management
3	Mgmt 371
3	Mgmt 377
3	Mgmt 414
3	Mgmt 471
6	Select from department-approved list
18	Management Information Systems
15	Com S 201, MIS 331, 432, 433, 435
3	Select from department-approved list
18	Marketing
9	Mkt 443, 444, 447
6	Select from Mkt 343, 410, 442, 446, 448, 449
3	Select from department-approved list
18	Production/Operations Management
9	POM 420, 422, 424
9	Select from department-approved list
18	Transportation and Logistics
6	TrLog 460, 461
12	Select four of the following courses, two of which must be TrLog courses: TrLog 462, 463, 466, 468, 469, POM 420, 422, 424, or MIS 434.
17.5-20.5	Elective Courses
8	Non-business electives. Select from departments outside Business. No Econ, Stat, or Bus Tech credits may be used.
9.5-12.5	Select courses to broaden or complement the requirements (see adviser).

CPA Note: See *Accounting Curriculum* for information on the additional requirements for students who wish to be candidates for the CPA exam.

Advising System

Students in the pre-business curriculum in the College of Business will be advised by a pre-business adviser. The adviser assists students to develop an academic program, access pertinent university resources and meet their educational objectives. Following admission to the professional program students will be assigned a faculty adviser. The faculty adviser assists students in understanding the requirements of the major, career paths in the majors and in choosing electives to complement the major. In addition to the faculty adviser, professional program advisers in the Undergraduate Programs Office are available to assist students in program planning, registration and to review graduation requirements.

The college offers an orientation program each summer for new entering students. All students and family members are encouraged to attend the orientation session. During orientation the adviser and the student prepare an appropriate schedule and the student registers for courses. Placement examinations may be required in mathematics and English to assist in placing students in the appropriate level of courses if this cannot be determined by ACT/SAT scores, high school preparation classes or transfer courses.

Honors

Entering freshmen who meet one of the following criteria, and have a minimum English ACT of 24, will be invited to apply for membership in the Freshman Honors Program: earned an ACT composite of 30, or ranked in the top 5% of their high school classes; or selected as a National Merit or National Achievement finalist.

Enrolled students who have completed 12 graded credits at Iowa State University and earned a 3.35 can be admitted either as associate or full members of the Honors Program. To qualify for full membership, students must have declared a major, developed a program of study, and have a minimum of 48 credits remaining before graduation.

Pre-business students in the College of Business may apply for associate membership in the honors program; students may apply for full membership after admission to the professional program. Special advisers will assist honors students in developing an appropriate program of study.

Internships

Credit and non-credit internships in business may be approved for College of Business students in all majors including pre-business. Credit hours and requirements vary. Arrangements must be made in the College prior to the beginning of the internship. An internship adviser will assist students in making these arrangements.

Double Majors

Undergraduates with a major in the College of Business may complete another major in the College of Business. Those desiring a second major outside the college should refer to the catalog section of the appropriate college and department for the second major requirements.

Undergraduates with a primary major outside the College of Business wanting a second major in business must meet the admission requirements for the professional program as well as complete the following requirements: the business core courses, the major specialization, Econ 102, Acct 215 and Math 151.

All students pursuing double majors or double degrees within the College of Business are required to have 15 credits of coursework in each major that is not used in the other major.

Curriculum Changes

Iowa State University students wishing to change their curriculum to the College of Business must attend a curriculum change meeting. See *Changing Curriculum or Major* for more details on this process. Students on temporary enrollment will not be allowed to change curriculum to the College of Business during period three. See *Making Schedule Changes*.

International Business Secondary Major

A student in the College of Business may earn a secondary major in International Business. The requirements for this major include 12 credits in international business courses, one year of the same university-level foreign language (minimum 6 credits) and an approved international experience (minimum 3 months). Students who pursue this secondary major will be required to complete the requirements for a primary major in Business. Fifteen of the 18 credits required for the International Business major may not be used for the primary major.

Minor

The College of Business offers a structured minor in general business to students outside the College. Requirements for the minor are Acct 285, Fin 301, Mgmt 370, MIS 330, Mkt 340, POM 320, and TrLog 360. The minor must include at least 6 credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher. Students wishing to earn a minor in business must meet the admissions requirements of the College of Business professional program (see admission standards to professional programs). All requirements and prerequisites for the requirement must be taken for a grade.

Students with a major in the College of Business may qualify for a minor specialization in one of the college's departments by taking at least 15 credit hours in the minor specialization, nine hours of which may not be used to satisfy any other department, college, or university requirement. The minor must include at least 6 credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher. Students with declared majors have priority over students with declared minors in courses with space constraints.
Students with a major outside the College of Business are eligible for a general business minor only—not a specialization in a business department.

Entrepreneurial Studies Cross-Disciplinary Minor

The College of Business participates in a cross-disciplinary minor in Entrepreneurial Studies. This minor is only available to business and non-business majors. Requirements for the minor include Mgmt 310, 313, and 9 credits from an approved list. The approved list is available in the Undergraduate Programs Office in the College of Business and on the web at www.iastate.edu/majors_minors/entreprenstudy.htm. The minor must include at least 6 credits in courses numbered 300 or above taken at Iowa State University.

Nondegree Seeking Students

Students who wish to take courses in the College of Business, but are not seeking an undergraduate degree, should apply to the college as nondegree seeking students. Nondegree seeking students are eligible to take up to 9 credits in 300-level and above business courses without meeting the college's admission requirements. Students who desire to take more than 9 credits, however, must meet the College's professional program admission requirements and have approval of a department chair. Nondegree seeking students must meet all course prerequisites.

Upper Division Courses for Students Outside the College

Students from outside the College of Business are eligible to take up to 9 credits of 300-level and above business courses without meeting the college's admission requirements, as long as they meet course prerequisites. Students who desire to take more than 9 credits, however, must meet the college's professional program admission requirements.

Graduate Study

Four programs are offered at the graduate level: a master of business administration (M.B.A.) program, a master of accounting (M.Acc.), a master of science (M.S.) in business, and a master of science in information systems (M.S.I.S.). These programs are intended to meet three sets of educational objectives.

The M.B.A. is the professional management education program for those pursuing careers in business. The purpose of this professional program is to provide professional business education by preparing students to understand the impact of technology on business organizations in a global environment. The M.B.A. program consists of a 48-credit curriculum leading to a nonthesis, noncreative component master of business administration. Students may pursue a specialization in accounting, agribusiness, finance, human resource management, information systems, manufacturing and quality or marketing.

The masters of accounting (M.Acc.) is a 32-hour degree. The program requires 15 hours of graduate accounting courses, at least 9 hours of nonaccounting graduate electives, a communications course and an international course from an approved list, and a 2-hour creative component. The M.Acc. is appropriate for any student wanting to pursue a variety of accounting careers. Additionally, the program is designed to help interested candidates meet the 150-hour education requirement for CPA certification in Iowa.

The masters of science in information systems (M.S.I.S.) is a 32 credit (minimum) curriculum designed around three inter-related areas - Foundation, IS, and electives. All students are expected to be familiar with basic computing skills before they enter the program. The M.S.I.S. will educate students on applying IS theory and concepts to modern IS development through classes that enable them to learn and use the latest software in application projects. Students graduating from the program will have advanced technical and managerial skills to develop and manage information systems projects.

The M.S. program, consisting of 30 minimum credits, is oriented toward further business specialization at the master's level for students with undergraduate degrees or academic backgrounds in business. The program is intended to serve those students who desire specialized study of an area within business. Students in the program must complete a thesis. This program is also a suitable vehicle for students planning to pursue a Ph.D. in business.

Double degree programs are offered with architecture (M.Arch./M.B.A.), community and regional planning (M.B.A./M.C.R.P), and statistics (M.B.A./M.S.-Statistics). Various departments in the College of Business participate in the following graduate level interdepartmental offerings: Industrial Relations (interdepartmental program), Information Assurance (interdepartmental program) andTransportation (interdepartmental major). The College of Business also offers a business administration minor to students with majors outside the college.

College of Design

Mark C. Engelbrecht, Dean
Kate Schwennsen, Associate Dean
Timothy O. Borich, Associate Dean

Departments of the College

Architecture
Art and Design
Community and Regional Planning
Landscape Architecture

The College of Design is among a small, elite number of comprehensive design schools offering outstanding opportunities for both disciplinary and interdisciplinary education.

The College of Design strives to provide each student with a broad educational background and preparation in a specific environmental design or art discipline. Each program is designed to develop knowledge and appreciation of the physical and cultural environment, to stimulate creative thinking and analysis, and to prepare students for participation in a wide variety of careers.

The college's undergraduate curricula are structured along three areas: general education, general design education, and discipline-specific education. General education and general design education are composed to insure that students receive a well-rounded undergraduate education and exposure to allied design disciplines. The intense, discipline-specific course sequences focus on developing students' ability and knowledge in their major. Within the major area, students advance creative and professional skills through classroom and studio work, critiques of student projects, discussion with professional practitioners, and field studies.

The college's programs also encompass many opportunities for individualized study and extracurricular activities such as visiting lectures and symposia, workshops, gallery exhibits, practicum and internship programs, field trips, and international study programs.

Graduates of the college are employed in private firms, government, industry, and education, or are self-employed as designers or artists. Opportunities for graduates include careers as architects, landscape architects, community and regional planners, graphic designers, interior designers, studio artists, arts administrators, art educators, and environmental designers.

The College's world wide web site includes additional information:
www.design.iastate.edu

Undergraduate Curricula

Majors

Architecture
Art and Design
Community and Regional Planning
Graphic Design
Interior Design
Landscape Architecture

Secondary Majors

Environmental Studies*
International Studies*
Transportation*

Minors

Design Studies
Entrepreneurial Studies*
Environmental Studies*
Gerontology*
International Studies*
Technology and Social Change*

*The College of Design participates in these interdepartmental secondary majors and minors.

Graduate Curricula

The College of Design offers graduate study in the areas shown below. Graduate study is conducted through the Graduate College. Details are found in the Graduate College section of this catalog.

Majors

Architecture
Architectural Studies
Art and Design
Art Education
Community and Regional Planning
Graphic Design
Integrated Visual Arts
Interior Design
Landscape Architecture
Transportation Planning*

Double Degree Programs

Architecture/Community and Regional Planning
Community and Regional Planning/Landscape Architecture
Architecture/Business
Community and Regional Planning/Public Administration

Minors

Gerontology*

*The College of Design participates in these interdepartmental graduate programs.

High School Preparation

Courses in fine arts and design that develop visualization and freehand drawing abilities are highly recommended though not required for entrance. Students planning to enroll in an academic program of the College of Design must complete the following high school course requirements: 4 years of English to develop communication skills, critical reading and writing ability, including coursework in composition and literature, and, up to 1 year of speech and/or journalism; 3 years of mathematics to develop problem solving skills, including 1 year each of algebra, geometry, and advanced algebra; 3 years of science, including at least two of the following: 1 year of biology, 1 year of chemistry, or 1 year of physics; 2 years of social studies, including at least 1 year of U.S. history and 1 semester of U.S. government.

Special Requirements

Students admitted into the departments of Architecture and Landscape Architecture are enrolled in preprofessional programs. Admission into the professional programs requires a separate application after completing the preprofessional program, depends on available resources, and is subject to review by faculty committee. Applicants must complete a specified core of courses and are reviewed on the basis of a portfolio of original work, scholastic performance, and a written essay.

Students enrolled in all curricula in the Department of Art and Design must complete a set of basic course requirements before entering a specific program of study. Admission into the graphic design and interior design programs depends on available resources and is subject to review by a faculty committee. Applicants are reviewed on the basis of a portfolio of original work, scholastic performance, and a written composition.

Advising

Each student receives personal assistance from an academic adviser within the student's curriculum area. Students enrolled in the college's preprofessional programs are advised by professional advisers. Once admitted to professional programs, students are assigned to faculty advisers. Advisers help students develop a program of study, access pertinent university resources, as well as provide information on career choice.

The college's career services office works with students to develop their career goals as well as prepare and search for employment.

Honors Program

The College of Design participates in the Honors Program which provides opportunities for outstanding students to individualize their programs of study. See *Index, Honors Program*.

Requirements in the College of Design

All students in the College of Design are expected to meet the following requirements of the college.

General Education

Minimum Credits.	
6	Biological sciences, physical sciences and mathematics Includes courses in the fields of agronomy, astronomy and astrophysics, biology, botany, chemistry, civil engineering, computer science, geology, mathematics, physics, statistics, and zoology.
9.5	Communications Engl 104*, 105*, Lib 160. Includes courses in the fields of English (composition), and speech communication (interpersonal and rhetorical).
6	Humanities Includes courses in the fields of classical studies, English (literature), foreign languages, history, philosophy, religious studies, as well as history/theory/literature courses in dance, music, theater, journalism, African American studies, American Indian studies, environmental studies, Latino/a studies, women's studies, and university studies.
6	Social sciences Includes courses in the fields of African American studies, American Indian studies, anthropology, economics, environmental studies, geography, human development and family studies, Latino/a studies, political science, psychology, sociology, and women's studies.
9	Selected from the above areas. Six credits must be at the 300 level or above.
36.5	Minimum credits

See departmental curricula for specific course requirements within the general education areas.

General Design Education

Cr.	
3	History requirement: A history course in the College of Design but outside the student's curriculum area.
6-9	Options in studio, history, theory, criticism, and methods At least two studio, history, theory, criticism, and/or methods courses in the College of Design but outside the student's curriculum area.
9-12	Total credits (at least 3 credits must be at the 300 level or above)

*To meet requirements for graduation, a minimum grade of C– must be received.

Minor in Design Studies

The undergraduate minor in Design Studies is constructed to facilitate design awareness among interested students and to provide a vehicle for interdisciplinary study within the College of Design. This minor is open to all undergraduate students at Iowa State University.

This minor requires fifteen credits of course work: three credits of history selected from College of Design course offerings and twelve additional credits selected from College of Design course offerings.

At least six of the fifteen credits must be taken at Iowa State University in courses numbered 300 or above. At least nine of the fifteen credits must not be used to meet any other college or university requirements except the credit requirement for graduation.

Students enrolled in the College of Design may not use courses in their major to satisfy this minor.

Curriculum in Architecture

The department offers undergraduate and graduate degree programs:

A 140-credit undergraduate professional program, preceded by a 29.5-credit preprofessional program, leading to the bachelor of architecture degree.

A three-part 100-credit program leading to the master of architecture. Applicants holding B.S. or B.A. degrees in architecture or environmental design are given advanced standing in this program. For applicants holding professional degrees in architecture (B.Arch. or M.Arch.), a 30-credit post-professional course of study is available.

A 30-credit graduate program leading to the degree master of science in architectural studies, a research oriented degree.

For more complete graduate program descriptions see Graduate Study under Architecture in the Courses and Programs section.

Students are advised to seek faculty counsel regarding a career in architecture. In the United States, most state registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit US professional degree programs in architecture, recognizes two types of degrees: the Bachelor of Architecture and the Master of Architecture. A program may be granted a six-year, three-year, or two-year term of accreditation, depending on its degree of conformance with established educational standards.

Masters degree programs may consist of a pre-professional undergraduate degree and a professional graduate degree, which, when earned sequentially, comprise an accredited professional education. However, the pre-professional degree is not, by itself, recognized as an accredited degree.

Preprofessional Program

First Year

Cr.	Fall/Spring
4	Arch 102
3	Arch 182
6	Engl 104/105
3	Math 142
4	Physics 111
6	Social sciences/humanities options*
3	Elective
0.5	Lib 160
29.5	

Professional Program

Second Year

Cr.	Fall
6	Arch 201
2	Arch 230
3	Arch 221
4	Arch 240
3	Social science/humanity option*
18	

Cr.	Spring
6	Arch 202
2	Arch 232
3	Arch 222
4	Arch 242
3	Social science/humanity option*
18	

Third Year

Cr.	Fall
6	Arch 301
3	Arch 357
3	Arch 344
3	Arch 271
3	Elective*†
18	

Cr.	Spring
6	Arch 302
3	Arch 372
3	Arch 346
3	Arch 448
3	Arch 458
18	

Fourth Year

Cr.	Fall/Spring
6	Arch 401
3	Arch 482
3	Arch HTC 582 option*
3	Communication option*
3	Elective*†
6	Arch 402**
3	Professional option*†
3	Arch HTC option*
6	Electives*†
36	

Fifth Year

Cr.	Fall
6	Arch 403
2	Arch 485
3	Professional option*†
3	College option*
3	Elective*
17	

Cr.	Spring
6	Arch 404**
3	College option*
3	Professional option*†
3	Elective*
15	

*Choose from a faculty approved list of courses.

**May be substituted by Dsn S 446 (Interdisciplinary Design Studio).

†Three credits of professional options or electives must satisfy the College of Design studio, theory requirement.

Curriculum in Art and Design—B.F.A.

Leading to the degree bachelor of fine arts degree. Total credits required: 120.5.

This curriculum offers two concentrations for the student: visual communications and studio research.

Admission into the art and design B.F.A. curriculum is subject to completion of a minimum of 24.5 credits including Art 108,109, 110, 130, Art H 181, Engl 104 and 105, Lib 160, 6 credits in general education coursework, and 15 credits in recommended studio coursework. A portfolio review will take place at the end of the second year to guide the student into the appropriate BFA concentration.

Transfer students with studio credits from other colleges and universities must present for departmental review a portfolio of work done in those courses in order to have the credits apply toward studio requirements. Students are advised to present this portfolio of work upon admission and prior to registration for classes.

Cr.	Degree Requirements
36.5	General education
6 min.	Biological and physical sciences and mathematics Select from Astro 120, 150, Biol 109, 123, 201, 202, Bot 102, 202, Chem 160, 163, 163L, Com S 103, 107, Geol 100, 101, Gen 260, Math 104 or 150, 105, 140, 141, 151, Mteor 206, Phys 101, 106, Stat 101, 104, Zool 155, 258, or any higher level course in these disciplines for which these courses are prerequisite
9.5 min.	Communications
6	Engl 104 and 105
3	Select from CmDis 286, ComSt 101, 102, Sp Cm 212
0.5	Lib 160
6 min.	Humanities Select from Af Am 201, 252, Am In 310, Cl St–all courses, Dance 270, 360, Engl 201, 230, 231, 237, 335, 340, 346, 347, 348, 353, 354, 360, 361, 362, 363, 364, 373, 374, 375, 376, 377, 378, 379, 384, 389, F Lng 101, 102, 110, 201, 202, 301, 302, Hist—all courses, Music 102, 103, 104, 383, 384, 472, Phil—all courses, Relig— all courses, T C 354, 355, Thtre 106, 110, 252, 465, 466, W S 336, 340, 345, 377, 422
6 min.	Social sciences Select from Anthr 201, 202, 306, Econ 101, 102, Pol S 215, 230, 241, 251, Psych 101, 230, Soc 130 or 134, or any higher level course in these disciplines for which these courses are prerequisite, or select from Am In 210, Env S 201, 223, HD FS 102, 239, 276, 283, 349, 367, 370, 373, 377, 378, 380, 395, Jl MC 101, 205, 320, 453, 474, 476, W S 201, 301, 321, 323, 327, 346, 350, 385, 386, 401
9 min.	Selected from the above areas and/or from CmDis 275, 286, ComSt 101, 102, 214, 310, 311, 314, 317, 318, Engl 205, 219, 220, 302, 303, 304, 305, 306, 309, 310, 314, 315, 316, Fin 351, 357, Mgmt 370, Mkt 340, Sp Cm 212, 305, 312, 321, 322, 323, 325, 327. Six credits must be at the 300 level or above.
6 min.	General design education*
3	History of Design—Art H 181**
3	Select from Dsn S 129, or other approved course from Arch, Art H, C R P or L A.
24	Art and design core
6	Visual Foundations I and II—Art 108, 109
R	Orientation to Art and Design—Art 110
6	Drawing I and II—Art 130, 230
6	History of Art I and II—Art H 280, 281
6	Art history selections (300 level or above)

*The general design education requirement of 6 credits will be fulfilled within the studio requirement of the individual concentration.

**Transfer students with more than 60 credits must substitute another design studies course to meet this requirement.

Visual Communications Concentration

(Note: Portfolio review at end of second year)

6	Visual Communications Foundation ArtIS 301—Foundations of Visual Literacy ArtIS 310—Sources of Visual Design
9	ISA Studio Exploratory Select three (3) courses from the following ArtIS offerings: ArtIS 202—Calligraphy, ArtIS 220—Wood Design, ArtIS 222—Ceramics I, ArtIS 229—Design Through Photography I, ArtIS 233—Watercolor Painting, ArtIS 238—Painting I, ArtIS 304—Papermaking, ArtIS 305—Mixed Media, ArtIS 308—Computer Aided Art and Design, ArtIS 326—Introduction to Illustration, ArtIS 330—Life Drawing, ArtIS 343—Fiber Forms, ArtIS 344—Weaving, ArtIS 345—Fiber and Fabric Design, ArtIS 346—Resist and Dyes Fabric Design, ArtIS 347—Printed Fabric Design, ArtIS 356—Relief Printmaking, ArtIS 357—Monotype, ArtIS 358—Lithography, ArtIS 359—Intaglio
18	Visual Communications Career Focus Approved program of study. At least 6 credits must be at or above 300 level.
3	Art 497—Internship
3	Select from Art History or Studio
2	Art 499 FBA Seminar and Exhibition
13	Electives
120.5	Total credits

Studio Research Concentration

(Note: Portfolio review at end of second year)

15	Introduction to Studio Concentration Select five (5) courses from the following ArtIS offerings: ArtIS 202—Calligraphy, ArtIS 220—Wood Design, ArtIS 222—Ceramics I, ArtIS 227—Jewelry & Decorative Metalsmithing I, ArtIS 229—Design Through Photography I, ArtIS 233—Watercolor Painting, ArtIS 238—Painting I, ArtIS 304—Papermaking, ArtIS 305—Mixed Media, ArtIS 308—Computer Aided Art and Design, Art IS 326—Introduction to Illustration, ArtIS 330—Life Drawing, ArtIS 343—Fiber Forms, ArtIS 344—Weaving, ArtIS 345—Fiber and Fabric Design, Artl 346—Resist and Dyes Fabric Design, ArtIS 347—Printed Fabric Design, ArtIS 356—Relief Printmaking, ArtIS 357—Monotype, ArtIS 358—Lithography, ArtIS 359—Intaglio
24	Studio options Select from a combination of two and three dimensional studio courses, ArtIS 300-400 level. Recommended: Art 497 Internship.
3	Art History Select from Art H 300-400 level courses
2	Art 499 BFA Seminar and Exhibition
10	Electives
120.5	Total credits

Curriculum in Art and Design—B.A.

Leading to the degree bachelor of arts degree. Total credits required: 120.5.

This curriculum offers two concentrations: Art and Culture, and Art and Design History and Theory. Both concentrations are combined with an applied career minor or approved program.

Admission into the art and design B.A. curriculum is subject to completion of a minimum of 24.5 credits including Art 108, 109, 110, 130, Engl 104 and 105, Lib 160, 3 credit selected general design education course, and 6 credits in general education coursework.

Transfer students with studio credits from other colleges and universities must present for department review a portfolio of work done in these courses in order to have the credits apply toward studio requirements. Students are advised to present this portfolio of work upon admission and prior to registration for classes.

Cr.	Degree Requirements
36.5	General education
6 min.	Biological and physical sciences and mathematics Select from Astro 120, 150, Biol 109, 123, 201, 202, Bot 102, 202, Chem 160, 163, 163L, Com S 103, 107, Geol 100, 101, Gen 260, Math 104 or 150, 105, 140, 141, 151, Mteor 206, Phys 101, 106, Stat 101, 104, Zool 155, 258, or any higher level course in these disciplines for which these courses are prerequisite
9.5 min.	Communications
6	Engl 104 and 105
3	Select from CmDis 286, ComSt 101, 102, Sp Cm 212
0.5	Lib 160
6 min.	Humanities Select from Af Am 201, 252, Am In 310, Cl St – all courses, Dance 270, 360, Engl 201, 230, 231, 237, 335, 340, 346, 347, 348, 353, 354, 360, 361, 362, 363, 364, 373, 374, 375, 376, 377, 378, 379, 384, 389, F Lng 101, 102, 110, 201, 202, 301, 302, Hist—all courses, Music 102, 103, 104, 383, 384, Phil— all courses, Relig— all courses, T C 354, 355, Thtre 106, 110, 252, 465, 466, W S 336, 340, 345, 377, 422
6 min.	Social sciences Select from Anthr 201, 202, 306, Econ 101, 102, Pol S 215, 230, 241, 251, Psych 101, 230, Soc 130 or 134, or any higher level course in these disciplines for which these courses are prerequisite, or select from Am In 210, Env S 201, 223, HD FS 102, 239, 276, 283, 349, 367, 370, 373, 377, 378, 380, 395, Jl MC 101, 205, 320, 453, 474, 476, W S 201, 301, 321, 323, 327, 346, 350, 385, 386, 401
9 min.	Selected from the above areas and/or from CmDis 275, 286, ComSt 101, 102, 214, 310, 311, 314, 317, 318, Engl 205, 219, 220, 302, 303, 304, 305, 306, 309, 310, 314, 315, 316, Fin 361, 371, L A 271, Mgmt 370, Mkt 340, Sp Cm 212, 305, 312, 321, 322, 323, 325, 327. Six credits must be at the 300 level or above.
6 min.	General design education**
3	Select a history course from Arch, Art H, Dsn S, or L A.
3	Select from Art H 181, 426, 446, or other approved design studies course
21	Art and design core
6	Visual Foundations I and II—Art 108, 109
R	Orientation to Art and Design—Art 110
3	Drawing I—Art 130
6	History of Art I and II—Art H 280, 281
6	Art history selections (300 level or above)
	Art and Culture Concentration
12	Art and Design Options*** Select from all 200-level courses in Art, ArtIS, graphic design, and interior design, or approved list of courses in architecture, landscape architecture, community and regional planning, and textiles and clothing
30	Applied minor* or approved program of study (at least 6 credits 300 or above courses). See department for specific curriculum sheets with course information.
15	Electives ***
120.5	Total credits
	History and Theory Concentration
15	Art and Design Options Select 12 credits from Art H 300-400 level courses, graphic design history. or interior design history courses; 3 credits Art 498 (Museum/Gallery Internship)
30	Applied minor* or approved program of study (at least 6 credits must be foreign language courses). See department for specific curriculum sheets with course information.
12	Electives***
120.5	Total credits

*A second major or minor must be approved by the department offering the program of study. See university guidelines for structuring and declaring a second major and/or minor. Credit hours not applied toward a formal second major or minor must be used in a coherent program approved by the Department of Art and Design. Approval for these 30 credits must be documented in writing following completion of 75 credits and before completion of 100 credits toward the B.A. degree.

**The general design education studio, history, theory and criticism courses requirement of 6 credits will be fulfilled within the art and design options or within the approved program.

***No more than four courses at the 200 level or above in ArtIS, graphic design, and interior design may be used to fulfill requirements or electives for the BA in Art and Design.

Curriculum in Community and Regional Planning

Leading to the degree bachelor of science. Total credits required: 128.5.

Areas of specialization include: land use and transportation, community design and development, rural and environmental planning. Students can also work with their advisors to design their own areas of specialization.

Cr.	Degree Requirements
12.5	Communications Engl 104, 105; and 309 or 314; Lib 160; Sp Cm 212
9	Humanities
11	Mathematics Stat 101; Math; Com S 103
6	Natural sciences
18	Social sciences Econ 101 or 102; Pol S 215; Soc 134; options
9	Design core LA 103; General design education,** or from approved options
3	Engineering and transportation options C E 350
37	Community and regional planning core C R P 253, 272, 274, 383, 432, 492; options
14	Planning related specialty
9	Electives
128.5	Total credits

**See College of Design requirements.

Curriculum in Graphic Design

Administered by the Department of Art and Design. Leading to the bachelor of fine arts degree. Total credits required for graduation: 123.5. Curriculum is planned for students preparing to enter the professional field of graphic design.

Consideration for admission into the graphic design curriculum requires completion of at least one year of study at ISU. Admission is based on department resources and will be determined by overall cumulative gradepoint average following completion of 23 credits including the following courses: Art 108, 109, 110, 130, ArtGr 177, Art H 181, Engl 104 or 105, and 6 credits of general education. A portfolio review also will be a significant factor in the admission review process.

On admission to the program, the faculty strongly recommend the purchase of a laptop

computer and software. Specifications for the laptop computer and software are available at www.design.iastate.edu under the "Students" link.

Transfer students with studio credits from other colleges and universities must present for departmental review a portfolio of work done in these courses in order to have the credits apply toward studio requirements. Students are advised to present this portfolio of work upon admission and prior to registration for classes.

Cr.	Degree Requirements
39.5	General education
6 min.	Biological and physical sciences and mathematics Select from Astro 120, 150, Biol 109, 123, 201, 202, Bot 102, 202, Chem 160, 163, 163L, Com S 103, 107, Geol 100, 101, Gen 260, Math 104 or 150, 105, 140, 141, 151, Mteor 206, Stat 101, 104, Phys 101, 106, Zool 155, 258, or any higher level course in these disciplines for which these courses are prerequisite
9.5 min.	Communications
6	Engl 104 and 105
3	Select from CmDis 286, ComSt 101, 102, Sp Cm 212
0.5	Lib 160
6 min.	Humanities Select from Af Am 201, 252, Am In 310, Cl St – all courses, Dance 270, 360, Engl 201, 230, 231, 237, 335, 340, 346, 347, 348, 353, 354, 360, 361, 362, 363, 364, 373, 374, 375, 376, 377, 378, 379, 384, 389, F Lng 101, 102, 110, 201, 202, 301, 302, Hist—all courses, Music 102, 103, 104, 383, 384, 472, Phil—all courses, Relig – all courses, T C 354, 355, Thtre 106, 110, 252, 465, 466, W S 336, 340, 345, 422
6 min.	Social sciences Select from Anthr 201, 202, 306, Econ 101, 102, Pol S 215, 230, 241, 251, Psych 101, 230, Soc 130 or 134, or any higher level course in these disciplines for which these courses are prerequisite, or select from Am In 210, Env S 201, 223, HD FS 102, 239, 276, 283, 349, 367, 370, 373, 377, 378, 380, 395, JI MC 101, 205, 320, 453, 474, 476, W S 201, 301, 321, 323, 327, 346, 350, 385, 386, 401
12 min.	Selected from the above areas and/or from CmDis 275, 286, ComSt 101, 102, 214, 310, 311, 314, 317, 318, Engl 205, 219, 220, 302, 303, 304, 305, 306, 309, 310, 314, 315, 316, Fin 361, 371, Mgmt 370, Mkt 340, Sp Cm 212, 305, 312, 321, 322, 323, 325, 327. Six to nine credits must be at the 300 level or above.
12 min.	General design education
3	History of Design—Art H 181*
3	Select a history course from Arch, Art H, Dsn S, or L A.
6	Studio Options: Select from ArtIS, ArtID, L A, Arch or other approved studio course.
18	Art and design core
6	Visual Foundations I and II—Art 108, 109
R	Orientation to Art and Design—Art 110
6	Drawing I and II—Art 130, 230
6	History of Art I and II—Art H 280, 281
50	Graphic design concentration
2	Introduction to Graphic Design—ArtGr 177
3	Design Through Photography—ArtIS 229
6	Graphic Design Studio I and II—ArtGr 270, 271
4	Graphic Technology I and II—ArtGr 275, 276
1	Graphic Design Internship Seminar—ArtGr 277
6	Graphic Design Studio III and IV—ArtGr 370, 371
6	Graphic Design History/Theory/Criticism I and II, ArtGr 387, 388
2	Graphic Design Materials and Processes—ArtGr 372
6	Graphic Design Studio V and VI—ArtGr 470, 471
2	Graphic Design Professional Presentation—ArtGr 472
3	Graphic Design Professional Practices—ArtGr 481
6	Select three 2-credit options from approved program list. One option will be taken with ArtGr 370, 371, 470
3	Select from: Art and Design in Europe—Art 495G Graphic Design Internship—ArtGr 480 Art and Design Field Study—Art 496G
4	Electives
123.5	Total credits

*Transfer students with more than 60 credits must substitute another design studies course to meet this requirement.

Curriculum in Interior Design

Administered by the Department of Art and Design. Leading to the bachelor of fine arts degree. Total credits required for graduation: 127.5. Curriculum is planned for students preparing to enter the professional field of interior design.

Admission is based on department resources and will be determined by rank order, based on three factors: A. Overall cumulative gradepoint average following completion of 27 credits including the following courses: Art 108, 109, 110, 130, ArtID 160, 160S, Art H 181, Engl 104 or 105, and 6 credits of general education; B. A written composition and; C. Portfolio review.

Transfer students with studio credits from other colleges and universities must present for departmental review a portfolio of work done in these courses in order to have the credits apply toward studio requirements. Students are advised to present this portfolio of work upon admission and prior to registration for classes. Admission of transfer students is contigent on available places in the program.

Cr.	Degree Requirements
36.5	General education total
6	Biological and physical sciences and mathematics Math 104 or 105 or 140 or 150. Select from Astro 120, 150, Biol 109, 123, 201, 202, Bot 102, 202, Chem 160, 163, 163L, Com S 103, 107, Geol 100, 101, Gen 260, Math 104 or 150, 105, 140, 141, 151, Mteor 206, Phys 101, 106, Stat 101, 104, Zool 155, 258, or any higher level course in these disciplines for which these courses are prerequisite
9.5	Communications Engl 104 and 105 Lib 160 Select from CmDis 286, ComSt 101, 102, Sp Cm 212
6	Humanities Select from Af Am 201, 252, Am In 310, Cl St – all courses, Dance 270, 360, Engl 201, 230, 231, 237, 335, 340, 346, 347, 348, 353, 354, 360, 361, 362, 363, 364, 373, 374, 375, 376, 377, 378, 379, 384, 389, F Lng 101, 102, 110, 201, 202, 301, 302, Hist—all courses, Music 102, 103, 104, 383, 384, 472, Phil —all courses, Relig – all courses, T C 354, 355, Thtre 106, 110, 252, 465, 466, W S 336, 340, 345, 377, 422
6	Social sciences Select from Anthr 201, 202, 306, Econ 101, 102, Pol S 215, 230, 241, 251, Psych 101, 230, Soc 130 or 134, or any higher level course in these disciplines for which these courses are prerequisite, or select from Am In 210, Env S 201, 223, HD FS 102, 239, 276, 283, 349, 367, 370, 373, 377, 378, 380, 395, JI MC 101, 205, 320, 453, 474, 476, W S 201, 301, 321, 323, 327, 346, 350, 385, 386, 401
9	Select from the above areas and/or CmDis 275, 286, ComSt 101, 102, 214, 310, 311, 314, 317, 318, Engl 205, 219, 220, 302, 303, 304, 305, 306, 309, 310, 314, 315, 316, Fin 361, 371, Mgmt 370, Mkt 340, Sp Cm 212, 305, 312, 321, 322, 323, 325, 327. Six credits must be at the 300 level or above.
6	General design education
3	History of Design—Art H 181**
3	Select a history course from Arch, Art H, DsnS, or L A.
12	Art and design core
6	Visual Foundations I and II—Art 108, 109
R	Orientation to Art and Design—Art 110
3	Drawing I—Art 130,
3	Select an ArtIS studio
70	Interior design concentration

6	Interior Design Foundations—ArtID 160, Art 160S
7	Graphic Communication for Interior Designers I, II, and III—ArtID 261, 262, 263
3	Textile Fundamentals—T C 204
8	Interior Design Studio I and II, ArtID 265, 267
4	Materials and Assemblies I—Arch 240 or Interior Systems I—ArtID 350
8	Interior Systems II, III, and IV—Art ID 351, 352, 453
R	Sophomore Field Study—ArtID 259
6	Interior Design History/Theory/Criticism I and II—ArtID 355, 356
R	Junior Field Study—ArtID 359
8	Interior Design Studio III and IV—ArtID 365, 367
1	Interior Design Internship Seminar—ArtID 369
R	Senior Field Study—ArtID 459
3	Interior Design Internship—ArtID 460
2	Interior Design Professional Practices—ArtID 461
8	Interior Design Studio V and VI—Art ID 465, 467
3	Select Arch, ArtID, ArtIS, CRP, DsnS, LA course or Mgmt 370 or Mkt 340
3	Current issues in Interior Design—ArtID 464
3	Electives
127.5	Total credits

**Transfer students with more than 60 credits must substitute another design history course to meet this requirement.

Curriculum in Landscape Architecture

The department offers a 5-year curriculum, requiring 149.5 credits, leading to the degree bachelor of landscape architecture. These credits are distributed between a one-year preprofessional program of 32.5 credits and a 4-year professional program of 117 credits.

Admission into the professional program depends upon available resources and is subject to the approval of a faculty committee at the completion of the preprofessional program. Applicants must complete a specified core of courses and are reviewed on the basis of a portfolio of original work, scholastic performance, and a written essay.

Preprofessional Program

First Year

Cr.	Fall
4	Landscape Architectural Design and Visualization I—LA 101
3	Introduction to Landscape Architecture—L A 141
3	First-Year Composition—Engl 104
3	Algebra—Math 140
3	Environmental Biology—Env S 123
16	
Cr.	**Spring**
4	Landscape Architectural Design and Visualization II—LA 102
3	Design option1
2	Trigonometry—Math 141
3	Soils for Urban Use—Agron 156
3	First Year Composition II—Engl 105
0.5	Library Instruction—Lib 160
15.5	

Professional Program

Second Year

Cr.	Fall
6	Midwestern Landscape Studies—L A 201
2	Investigating Landscape Form, Process and Details—LA 281
3	Native Plants of the Midwest—LA 221
3	Cultural Landscape Studies—LA 272
14	
Cr.	**Spring**
6	Site Planning and Design I—L A 202
3	Landscape Architectural History: prehistory to 1900—L A 273
3	The Social and Behavioral Landscape—L A 274
3	Literature option[1]
3	Elective
18	

Third Year

Cr.	Fall
6	Site Planning and Design II—L A 301
3	Introduced Plants of the Midwest—L A 321
3	Craft Design option[1]
3	Landscape Architectural History: 1900 to present—L A 371
3	Elective
18	
Cr.	**Spring**
6	Regional Landscape Design—L A 302
1	Contemporary Landscape Architecture—LA 341
2	Shaping the Land—L A 381
3	Environmental Law—Env S 491
3	Environmental Sociology—Env S 382
3	Elective
18	

Fourth Year

Cr.	Fall
6	Urban Landscape Design—L A 402
2	Landscape Construction—L A 481
3	Environmental Ethics—Env S 334
1	Landscape Architecture Professional Internship, Study Abroad, National Exchange Seminar—L A 450
3	Communication option[1]
15	
Cr.	**Spring**
R	Landscape Architecture Professional Internship, Study Abroad, National Exchange—L A 451

Fifth Year

Cr.	Fall
6	Community Landscape Design—L A 401
3	Professional Practice—L A 441
2	Advanced Landscape Construction—L A 482
2	Optional Senior Thesis Preparation Tutorial (prerequisite for senior thesis)—L A 403
4	Elective
17	
Cr.	**Spring**
6	Advanced Landscape Architectural Design Options—L A 404 or Senior Thesis—L A 405
3	Topical Studies in Landscape Architecture—L A 478
3	History option[1]
3	Electives
3	Design Option[1]
18	
149.5	Total credits

[1]Select from department approved list.
At least two elective courses must be from an L A professional elective list approved by the department.

Graduate students pursuing the M.L.A. may concurrently enroll in the undergraduate program to earn the B.L.A. The actual courses required will vary according to each student's landscape architectural skill level upon admission as determined by a faculty committee. For more information, students should contact the department office.

College of Education

www.educ.iastate.edu/homepage.htm
Walter Gmelch, Dean
Jackie Blount, Associate Dean
Roger Smith, Associate Dean

Departments of the College

Curriculum and Instruction
www.educ.iastate.edu/ci/
Educational Leadership and Policy Studies
www.educ.iastate.edu/elps/
Health and Human Performance
www.educ.iastate.edu/hhp/
Industrial Education and Technology
www.educ.iastate.edu/iedt/

Mission

The mission of the College of Education is to optimize human potential and performance within a pluralistic and global society. To achieve this mission requires the study, practice, and integration of learning, teaching, discovery, and engagement with practitioners in the field. In these ways, the College of Education prepares exemplary professionals for leadership roles in education, health promotion institutions, business and industry and other human development agencies. The College seeks to ensure excellence in its services and programs and to develop selective areas for national and international prominence.

Building on our land-grant heritage, the College of Education is a leading teaching, learning, and research college focused on optimizing human potential and performance, serving the people of Iowa, and contributing to the national and international scholarly communiity.

The College of Education is a diverse college guiding students as they prepare to work with people in different organizations. Degree programs include teacher education, preparation for professions in health and physical activity, manufacturing and safety in industry, and professional programs at the graduate level. The College of Education, in conjunction with other colleges, offers licensure programs for early childhood education, elementary, secondary, and community college teaching; school principals and superintendents, as well as school media specialists, special education and school counseling.

In addition, certification programs also exist for students in the Department of Health and Human Performance and the Industrial Technology program.

A person who is to work effectively with people needs broad personal and professional knowledge and understanding. The College of Education strives to provide each student with a sound general education as well as preparation in an area of specialization.

Recommended High School Preparation

Recommended preparation for students entering most departments of the College of Education should include 4 years of English (including speech) with emphasis in composition and communication skills; 3 years each of mathematics and natural sciences, and 3 years of social science and/or humanities. In addition, students interested in Elementary Education or Early Childhood Education are advised to complete three or more years of high school study in one foreign language.

Advising System

Each student in the College of Education works closely with an academic advisor who is associated with the curriculum in which the student is majoring. Advisors assist students in developing academic programs and in adjusting to university life. They also provide information and guidance about career choices. Advisors attempt to adjust each student's schedule of course work in accordance with the student's interests and capabilities.

The college offers an orientation program during the summer for students planning to enter in the fall. Incoming students are encouraged to attend the orientation session so that academic assessments can be made and appropriate classes may be scheduled for the following term.

Curricula and Special Programs in the College of Education

Early Childhood Education—(Administered jointly by the Department of Curriculum and Instruction in the College of Education and the Department of Human Development and Family Studies in the College of Family and Consumer Sciences.)

Elementary Education.
Health and Human Performance—Options: Physical Education Licensure, Health/Fitness Management, Athletic Training, Sport Management, Exercise Science, Community and Public Health.
Industrial Technology—Options: Manufacturing, Occupational Safety.
Secondary Education. The College of Education provides secondary education licensure programs in conjunction with subject matter areas of agriculture, art (master's program only), biology, chemistry, earth sciences, English, foreign languages, general sciences, health, family and consumer sciences education, mathematics, music, physical science, and physics. See *Index, Teacher Education.*

The College of Education offers coaching and health endorsements to students who want to add additional teaching areas to their primary licensure program.

The Departments of Educational Leadership and Policy Studies and Curriculum and Instruction offer work for the degrees master of science, master of education, and doctor of philosophy with a major in education. They also offer minor work to students majoring in other fields of study. In the Department of Educational Leadership and Policy Studies, students may complete the Ph.D. with a major in education and a specialization in educational leadership. At the master's level, students may specialize in counselor education; educational administration; higher education; organizational learning and human resource development; and research and evaluation. Details are found in the graduate section of this catalog.

Minors

Athletic Coaching
Dance
Educational Computing
Industrial Technology

Graduate Curricula

Graduate study in the College of Education is conducted through the Graduate College. Details are found in the Graduate College section of this bulletin. www,grad-college.iastate.edu.

Honors Program

The College of Education Honors Program provides an opportunity for students with a 3.35 grade point average or higher to complete their course of study in the University Honors Program. For more details, contact the academic advisor, the College Honors Committee, or s*ee Index, Honors Program.*

International Studies (secondary major only)

The International Studies Program is an interdisciplinary program which may be taken only as a second major. Students pursuing a second major in international studies must complete the International Studies Program as described in this catalog (see *Index, International Studies).*

The General Education Requirement

Students in the College of Education are required to complete a program in general education which is integrated with their professional training and extends through the undergraduate curriculum.

The general education program emphasizes intellectual growth and personal development as contrasted with specific vocational preparation. It is recognized that many contributions to general education may be made by courses which have other primary objectives.

The program aims to stimulate a desire for learning and intellectual endeavor, develop understanding and appreciation for the physical and cultural world, encourage independent thinking and analysis, increase competence in all aspects of communication, and create an understanding of individuals as social, psychological, and physical beings.

The student is expected to complete studies in five groups in general education. Areas represented below are not departmental titles. In some cases, courses relating to a given area may be found in several different departments. Credits listed are minimum requirements.

Cr.	
9	I. Biological sciences, physical sciences, and mathematics
9	II. Social sciences
6	III. Humanities
9	IV. Communication skills
1	V. Health, Dance, Exercise and Sport Science
34	
8	Additional credits in above areas
42	

This total will include Engl 104 and 105, Lib 160, and credits used to satisfy University requirements in the areas of U.S. Diversity and International Perspectives.

Teacher Education and Licensure

All students who are recommended by Iowa State University for teacher licensure must meet the requirements of the teacher education program and be recommended by the College of Education.

Each student will be enrolled in the department in which he or she plans to major and must meet the graduation requirements of that department and the college in which it is located.

For details concerning the professional teacher education requirements and the areas of specialization requirements, see Teacher Education, Courses and Programs. Information disclosure for students and employees is available at www.iastate.edu/~disclosure/.

Curriculum in Early Childhood Education

The curriculum in early childhood education is planned for students preparing to teach young children and work with their families. This program leads to careers in working with young children who are typically developing and those with special needs from birth through age eight. Graduates in this curriculum may teach in early childhood (preschool and primary) classrooms or home based programs, with emphasis on inclusive services; graduates may be employed by either public or private agencies including schools. This curriculum has been approved by the Iowa Department of Education and meets requirements for the early childhood education unified teacher license, which permits individuals to teach general and special education for children from birth through age eight. The program is jointly administered by the Department of Curriculum and Instruction within the College of Education and the Department of Human Development and Family Studies within the College of Family and Consumer Sciences.

For details concerning the professional teacher education requirements and admission to the undergraduate teacher education program, see *Teacher Education, Courses and Programs.*

English Proficiency
In order to meet graduation requirements, all students must earn a C (2.0) or better in Engl 104 and Engl 105.

U.S. Diversity and International Perspectives
In order to meet graduation requirements, all students must complete 3 credits of course work in U.S. Diversity and 3 credits in International Perspectives. See department advising office for approved lists of courses.

Foreign Language Requirement
Early childhood education majors must satisfy a graduation requirement equivalent to the first year of university-level study in one foreign language (normally, completion of a two-semester sequence in any one foreign language). The requirement may be met by completion of three or more years of high school study in one foreign language.

Students who have completed three or more years of French, German, or Spanish in high school may not receive graded credit for 101-102 in those languages; test-out credit (T credit) may be obtained by passing an appropriate examination or by completing an advanced sequence (200-level or higher) in that language. If these students choose to take 101-102 on a remedial basis, they will be graded S-F.

Total credits required: 129.5

Cr.	
41.5	General education
9.5	Communications and Library Engl 104 (3), 105 (3), Lib 160 (0.5), Select 3 credits from communications options list. (3)
12	Natural sciences and Mathematical Disciplines Biological sciences (3), Math 195 (3), physical sciences (3), FS HN 167
9	Social sciences American history or American government (3), options (6)
9	Humanities Select 9 credits from department approved list
2	Health, safety H S 105 (2)
12	Human development and family studies HD FS 102 (3), 220 (3), 221 (3); select 3 credits from HD FS 349, 395, 445, 449, 460
76	Professional education
15	Professional education core C I 201 (3), 204 (3), 333 (3), 406 (3); Sp Ed 250 (3)
R	Orientation (R)
21	Preprimary: Inclusive HD FS 240 (3), 340 (4), 343 (4), 345 (3), 455 (4), 456 (3)
21	Primary: Inclusive C I 245 (2), 268 (1), 367 (4), or 377 (4), 433 (2), or 443 (3), 438 (2), or 448 (3) (must meet prerequisites),439 (2), or 449 (3), 468F (1), 468G (1), 468I (1); Sp Ed 355 (2), 368 (1), 455 (2)
3	Elective from department approved list.
16	Student teaching: Preprimary and Primary (Inclusive) Sp Ed 415 (8) and HD FS 417B (8) or C I 416A (8) or 416D and HD FS 417C (8)

Curriculum in Elementary Education

The curriculum in elementary education is planned for students preparing to teach in grades kindergarten through six. For additional information, see *Index, Elementary Education.*

Teaching endorsements in areas closely related to elementary education, including a special education endorsement in multi-categorical resource teaching, are available for elementary education majors. See *Teacher Education, Courses and Programs*, for information about specific endorsements.

Additional teaching endorsements, available at the graduate level to individuals who hold a valid Iowa teaching license, include the following: K-6 foreign language, reading, special education (behavior disorders, learning disabilities, multicategorical resource, and multicategorical self-contained).

English Proficiency
In order to meet graduation requirements, all students must have a C (2.0) or better for each of Engl 104 and Engl 105.

U.S. Diversity and International Perspectives
In order to meet graduation requirements, all students must complete 3 credits of course work in U.S. Diversity and 3 credits in International Perspectives. See department for approved lists of courses.

Foreign Language Requirement
Elementary education majors must satisfy a graduation requirement equivalent to the first year of university-level study in one foreign language (normally, completion of a two-semester sequence in any one foreign language). The requirement may be met by completion of three or more years of high school study in one foreign language. Students who have completed three or more years of French, German, or Spanish in high school may not receive graded credit for 101-102 in those languages; test-out credit (T credit) may be obtained by passing an appropriate examination or by completing an advanced sequence (200-level or higher) in that language. If these students choose to take 101-102 on a remedical basis, they will be graded S-F.

Total credits required: 128.5.

Cr.	
46.5	General Education*
9.5	Communication skills Engl 104 (3), 105 (3); Lib 160 (0.5); Select from ComSt 102 (3), 218 (3), 317 (3), Sp Cm 212 (3), 312 (3), 313 (3), 322 (3), 327 (3)
9	Social sciences Psych 230 (3), American history/ American government (3), options (3)
9	Humanities Select 9 credits from department approved list
1	Health, dance, exercise sport science, safety options (1)
9	Mathematics Math 195 (3), 196 (3); Select from 140 (3), 142 (3) 160 (3), 165 (4), 180 (3), 297 (3).
9	Biological/Physical Sciences Biological sciences (3) select from Anthr 202 (3); Biol 109 (3), 123 (3), 201 (3); Bot 102 (2), 202 (2), Zool 155 (3), 156 (2), 258 (3) Physical sciences (3) select from Astro 120 (3), 150 (3); Chem 160 (3), 163 (4), 164 (4); Geol 100 (3), 100L (1), 101 (3); L A S 111 (4); Mteor 206 (3); Phys 101 (3), 106 (4)
18	Area of specialization (Requires 24 credits. A minimum of 15 credits may not be used to meet other requirements.)
67	Professional education
24	Required courses C I 201 (3), 204 (3), 250 (3), 245 (2), 268 (1), 332 (3), 406 (3); HD FS 226 (3), 240 (3) or Engl 394 (3)
21	Required methods C I 377 (4), 468A (1), 378 (4), 468B (1), 448 (3), 468C (1), 449 (3), 468D (1), 443 (3)
6	Related Methods Select from H S 275 (3); ArtEd 211 (3); Music 265 (3); Ex Sp 284 (3)
16	Student teaching C I 416A (8) or 416D (8), 416B (8) or 416E (8), Sp Ed 416 (special education students only)
R	Orientation (required) First year—115; sophomore—215; transfer—315

*Refer to departmental curriculum sheet, available from adviser, for specific course requirements.

Curriculum in Health and Human Performance

The curriculum in Health and Human Performance is designed for students preparing to enter professional areas related to the health, exercise or sport science fields. Students majoring in Health and Human Performance may select one of six options: Athletic Training, Community and Public Health, Exercise Science, Health/Fitness Management, Physical Education Licensure, or Sport Management.

Minors in dance, and athletic coaching are available; the requirements appear under *Health and Human Performance, Courses and Programs.*

A major in Performing Arts with a dance emphasis is available; the requirements appear under *Curriculum in Performing Arts in Theatre.*

English Proficiency
In order to meet graduation requirements, all students must earn an average of C (2.0) or better in Engl 104 and 105, with neither grade being lower than a C-. Students not meeting this condition must earn a C or better in an advanced writing course (select from Engl 220, 302, 309, or 314).

U.S. Diversity and International Perspectives
In order to meet graduation requirements, all students must complete 3 credits of course work in U.S. Diversity and 3 credits in International Perspectives. See university approved list.*

Total credits required: 124 (46 credits in courses numbered 300 or above).

Cr.	
42 (min)	General Education
9 (min)	Physical and Life Sciences Basic Human Physiology and Anatomy—Select from
5	Zool 155 and 156 (lab) OR
8	Zool 255, 255L, 256, and Zool 256L
3	Introduction to Human Nutrition—FS HN 167
6 (min)	Mathematics and Computer Sciences
2-3	Mathematics/Statistics—select from Math 104, 140, 141, 142, 150, 165 OR Stat 101, 104, 227
3-4	Computer Science choice
9 (min)	Social Sciences
6 (min)	Humanities
12.5	Communication Skills
6	Freshman Composition—Engl 104, 105
3	Fundamentals of Public Speaking—Sp Cm 212
0.5	Library instruction—Lib 160
3	Business Communication—Engl 302, 314, or Sp Cm 312
17	Core requirements
	Basic Core (It is strongly suggested that these 3 courses be taken concurrently)
3	Personal and Consumer Health—H S 110
3	Fields and Disciplines in HHP—Ex Sp 255
2	Concepts of Physical Fitness—Ex Sp 258
	Advanced Core (H S 110, Ex Sp 255, Ex Sp 258 are prerequisties for all these courses; students must have completed three of these courses with at least one from each sub-discipline; some courses have unique prerequisites which can be taken as part of General Education coursework)
	Biological Basis of Physical Activity and Health Promotion
3	Biomechanics - Ex Sp 355 (prereq Phys 106 or 111)
3	Physiology of Exercise—Ex Sp 358 (prereq Zool 255, 255L, 256, 256L)
3	Human Diseases—H S 350 (prereq H S 110)
	Behavioral Basis of Physical Activity and Health Promotion
3	Sociology of Sport and Physical Activity—Ex Sp 360 (prereq Soc 134 and one of Stat 101, 104, 227 or Ex Sp 470)
3	Sport Psychology—Ex Sp 365 prereq Psych 101 or Psych 230) OR Exercise Psychology—Ex Sp 366 (prereq Psych 101 or Psych 230)
3	Motor Control and Learning Across the Lifespan—Ex Sp 372 (prereqs Psych 101 or Psych 230; and Zool 255)
3	Consumer and Public Health—H S 310 (prereq H S 110)

Option 1. Physical Education Licensure

This option is designed for students seeking a license to teach physical education K-12. Students interested in preparing to coach must earn additional credits in: Ex Sp 220 and 315. Note: when making general education course selections, teacher licensure students must choose C I 201, Psych 230, a natural science and a U.S. history or political science course.

	Professional education requirements
3	Foundations of American Education—C I 204
R	Senior Seminar—C I 415
3	Multicultural Gender Fair Education—C I 406
8	Supervised Student Teaching in Physical Education in the Secondary School—Ex Sp 417
8	Supervised Student Teaching in Physical Education in the Elementary School—Ex Sp 418
	Physical education professional theory
2	Leadership Techniques for Fitness Programs—Ex Sp 259
3	Elementary and Pre-school Movement Education—Ex Sp 275
0.5-1	Directed Field Experience in Elementary School Physical Education—Ex Sp 280
0.5-1	Directed Field Experience in Physical Education—Ex Sp 281
3	Teaching Physical Education—Ex Sp 375
3	Adapted Physical Education—Ex Sp 395
3	Evaluation in Physical Education—Ex Sp 470
3	Physical Education Curriculum Design and Program Organization—Ex Sp 475
	Physical education professional activity and related courses
2	First Aid and Emergency Care—H S 105
1	Aquatics—Ex Sp 230
1	Tumbling and Gymnastics Skills—Ex Sp 231

1 Fundamentals of Self-defense—Ex Sp 237
1 Fundamentals of Outdoor and Adventure Activities—Ex Sp 238
1 Team Sport - Ex Sp 232 or 233
1 Individual Sport—Ex Sp 235 or 236
2 Dance—Dance 211

Electives to equal 124 total credits
The following five courses must also be taken; three can fulfill the ADVANCED CORE requirement: Ex Sp 355, 358, 360, 365 or 366, and 372.

Option 2. Health/Fitness Management

This option prepares students for careers in the physical fitness/health field. It is designed for those who wish to prepare for professional roles as exercise specialists or program directors in corporate fitness programs, health clubs, cardiac rehabilitation programs, or other public and private agencies providing physical fitness activities.

2 Basic Athletic Training—Ex Sp 220
2 Leadership Techniques for Fitness Programs—Ex Sp 259
3 Management of Health-Fitness Programs and Facilities - Ex Sp 345
3 Worksite Health Promotion—H S 380
R Search Strategies for Field Experiences and Employment—Ex Sp 385
4 Principles of Fitness Assessment and Exercise Prescription—Ex Sp 458
1 Internship in Exercise Leadership —Ex Sp 459
3 Medical Aspects of Exercise—Ex Sp 462
8-16 Internship in Sport and Exercise Science—Ex Sp 485A
3 Principles of Organization and Management—Mgmt 370

Elective to equal 124 credits
The following courses are required: they can be taken as part of the General Education requirements:

2-3 Mathematics - select from Math 140, 141, 142, 150, 165
3-5 Statistics - select from Stat 101, 104, 227
3 Principles of Macroeconomics—Econ 101
4 Phys 106 or 111

The following five courses must also be taken: three can fulfill the ADVANCED CORE requirement: Ex Sp 355, 358, 366, 372 and H S 350.

Option 3. Athletic Training

The CAAHEP accredited athletic training option prepares students for the NATABOC certification examination or for graduate work in athletic training. Admission to the athletic training option is competitive and based on available department resources and will be determined on the basis of grades in foundation courses and other performance factors. Technical standards can be found on the athletic training website. Details are available from the Health and Human Performance Advising Office or the Athletic Training Education Program Director.

3 Basic Athletic Training for Athletic Trainers—Ex Sp 222
1 Athletic Training Clinical Practicum—Ex Sp 221
1 Introduction to Taping, Bracing, and Equipment Fitting - Ex Sp 219
3 Evaluation of Athletic Injuries I—Ex Sp 224
1 Athletic Training Clinical Practicum—Ex Sp 225
3 Evaluation of Athletic Injuries II—Ex Sp 226
1 Athletic Training Clinical Practicum—Ex Sp 227
2 Therapeutic Modalities for Athletic Trainers—Ex Sp 323
1 Athletic Training Clinical Practicum—Ex Sp 324
3 Rehabilitation of Athletic Injuries—Ex Sp 326
1 Athletic Training Practicum—Ex Sp 327
3 Organization and Administration of Athletic Training—Ex Sp 425
3 Medical Concerns for the Athletic Trainer - Ex Sp 450
R Search Strategies for Field Experiences and Employment—Ex Sp 385
3 Legal Aspects of Sport—Ex Sp 445
4 Principles of Fitness Assessment and Exercise Prescription—Ex Sp 458
R Review of Athletic Training Competencies—Ex Sp 489
2 Instructor's First Aid and CPR—H S 305
4 General Chemistry—Chem 163
1 Laboratory in General Chemistry—Chem 163L
4 Physics 106 or 111
3 Drug Education—H S 215

Elective to equal 124 total credits
The following courses are required; they can be taken as part of the General Education requirements:

4 Phys 106 or 111
3 Human Anatomy and Physiology I—Zool 255
1 Human Anatomy and Physiology I Laboratory—Zool 255L
3 Human Anatomy and Physiology II—Zool 256
1 Human Anatomy and Physiology II Laboratory—Zool 256L
3-5 Statistics - Stat 101, 104, 227
2-3 Mathematics—select from Math 140, 141, 142, 150, 165

The following six courses must also be taken; three can fulfill the ADVANCED CORE requirement: Ex Sp 355, 358, 360, 365, 372 and H S 350.

Option 4. Sport Management

The sport management option prepares students for a variety of sport specialist and leadership positions in amateur and professional sport organizations, health and sport clubs, community recreation centers, resorts, voluntary agencies such as YM/YWCA's, industry, and other public and private agencies involving sports instruction, recreational sports activities, and sport/fitness management.

3 Principles of Sport Management—Ex Sp 270
3 Sport Marketing—Ex Sp 350
3 Sport Facility and Event Management—Ex Sp 352
R Search Strategies for Field Experiences and Employment—Ex Sp 385
3 Sport Business and Finance—Ex Sp 435
3 Legal Aspects of Sport—Ex Sp 445
3 Principles of Marketing—Mkt 340
3 Organization and Theory—Mgmt 370
3 Organizational Behavior—Mgmt 371
3 Financial Accounting—Acct 284
3 Principles of Public Relations—Jl MC 220 or Principles of Advertising—Jl MC 230
3 Principles of Macroeconomics—Econ 102
8-16 Internship in Sport and Exercise Science—Ex Sp 485C

Electives to equal 124 total credits
The following must be taken as part of the General Education requirement:

3 Principles of Microeconomics—Econ 101
3-5 Statistics - select from Stat 101, 104, 227
3 Math 104, 140, 141, 142, 150, or 165

From the Advanced Core requirements the students must select:

3 Sociology of Sport and Physical Activity - Ex Sp 360

Option 5. Exercise Science

The Exercise Science option is designed for students interested in an interdisciplinary approach to the study of human movement. By combining exercise science with another area of study to support an individualized program, this option is suitable for students interested in graduate study or who are preparing for advanced study leading to careers in medicine, physical therapy, or other allied health programs.

R	Search Strategies for Field Experience and Employment—Ex Sp 385
6	Two 300-400 level Ex Sp courses
26	Meet the requirements of a specialization area in a related field (area and program must be approved by the Department of Health and Human Performance).

Electives to equal 124 total credits
A statistics course and one of Math 140, 141, 142, or 165 must be selected in the General Education requirements. Phys 111 must be taken as the prerequisite for Ex Sp 355.

The following five courses must also be taken; three can fulfill the ADVANCED CORE requirement: Ex Sp 355, 358, 360, 365 or 366, and 372.

Option 6. Community and Public Health

This option emphasizes health promotion and disease prevention and prepares students for professional involvement in community health agencies which incorporate health services and the educational process. Students will be prepared for employment in state and public health agencies, volunteer health agencies, hospitals (patient education), and industry (health and wellness programs). Graduates are eligible to take the National Certified Health Education Specialist (CHES) exam which recognizes qualified specialists in the diversified field of health education.

3	First Aid and Emergency Care—H S 105
3	Drug Education—H S 215
3	Foundations of Health—H S 260
3	Health Promotion in the Community and Workplace—H S 380
R	Search Strategies for Field Experiences and Employment—H S 385
3	Administration of School Health—H S 390
3	Community Health Program Development—H S 430
2	General Microbiology—Micro 201
1	Intro Micro Lab—Micro 201L
3	Human Sexuality—HD FS 276
3	Aging and the Family—HD FS 377
3	Principles of Accident Prevention—I Tec 270
5	General Chemistry with lab—Chem 163 and 163L
4	Principles of Biology with lab—Biol 201 and 201L
3	Principles of Marketing—Mkt 340
3	Principles of Public Relations—Jl MC 220 or Publicity Methods—Jl MC 205
3-4	Select from Engl 309, Engl 313, HD FS 395, HD FS 449 or Jl MC 342/342L
10-16	Directed Field Experience—Ex Sp 485

Electives to equal 124 total credits
The following courses must also be taken. They can fulfill either General Education or Core requirements for the HHP major:

4	Basic Human Physiology and Anatomy—Zool 155 and 156
3	Statistics - Stat 101, 104, 227
3	Priniciples of Microeconomics—Econ 101
3	Psych 230 or HD FS 102 (under Social Science choice)
3	Community and Public Health—H S 310
3	Human Diseases—H S 350
3	Exercise Psychology—Ex Sp 366

Curriculum in Industrial Technology

The industrial technology curriculum prepares students for professional positions that emphasize technical management in industry, business, or government. The Bachelor of Science degree program stresses computer applications, technical management, production processes and product quality.

The curriculum has been designed to assist students to develop a comprehensive understanding of the interaction of people, planning, machines, tools, equipment, safety and production processes, in manufacturing settings. Extensive laboratory experiences are incorporated into most courses.

The program seeks to develop problem solving abilities and creativity to assist graduates in meeting technical requirements, human expectations, and regulatory requirements in contemporary manufacturing settings.

Students majoring in industrial technology select one of the two options: manufacturing or occupational safety. A minor in Industrial Technology with an occupational safety focus is available.

English Proficiency In order to meet graduation requirements, all students must earn an average of C (2.0) or better in all English courses taken, including Engl 104, Engl 105, and one of the following: Engl 309 or Engl 314.

U. S. Diversity and International Perspectives In order to meet graduation requirements, all students must complete 3 credits of course work in U.S. Diversity and 3 credits in International Perspectives. Courses that are acceptable for meeting these requirements are listed on the University website.

Total credits required: 120.5-123.5.
For additional information see *Index, Industrial Technology.*

Industrial Technology Major

Cr.	
44.5	General Education
3	U.S. Diversity
3	International Perspective
16	Biology, physical sciences, and mathematics—Chem 163, 163L, Math 142, 160, Phys 111
6	Social sciences—Psych 101, Econ 101
3	Humanities—Art, foreign languages, history, literature, music, philosophy, or religion.
9.5	Communication skills—Engl 104, 105, Sp Cm 212, Lib 160
4	Health, safety, exercise and sport science, dance—I Tec 270, 1 credit in Ex Sp
35	Foundation Courses
3	Professional Communication—Select from department approved list
3	Report and Proposal Writing—Engl 309 or Technical Communication—Engl 314
1	Introduction to Industrial Technology—I Tec 110
3	Introduction to Design in Industrial Technology—I Tec 120
3	Introduction to Non-metallic manufacturing Materials and Processes—I Tec 130
3	Electrical Fundamentals—I Tec 140
3	Introduction to Training and Development in Industry and Business—I Tec 202
3	Introduction to Metallic Materials and Processes—I Tec 231
3	Total Quality Improvement—I Tec 360
3	Safety in Manufacturing—I Tec 392
1	Seminar in Industrial Technology—I Tec 395
2	Supervised Industrial Internship—I Tec 481
4	Principles of Statistics—Stat 101

Students must select one of two options:
Manufacturing prepares students to plan and coordinate materials, machines, methods, and human resources in a manufacturing environ-

ment.

Occupational safety prepares students to develop, coordinate, and evaluate the safety issues relating to people, materials, equipment, and manufacturing environments.

Options

44 Manufacturing Option (123.5 Cr.)

32 Option Requirements
3 Financial Accounting—Acct 284
3 Computer Applications in Industrial Technology—I Tec 216 or Programming I—Com S 207
4 Advanced Technical Graphics, Interpretation, and CAD—I Tec 224
3 Analog Manufacturing Applications—I Tec 240
3 Automated Manufacturing Processes—I Tec 336
2 Digital Manufacturing Applications—I Tec 340
3 Facility Planning—I Tec 410
3 Computer Automated Manufacturing Systems—I Tec 435
2 Electrical Outputs for Manufacturing—I Tec 440
3 Automation Systems—I Tec 446
3 Management of Organizations—Mgmt 370
9 Technical Electives—A list of departmentally approved technical electives is available from the undergraduate academic advisor.
3 Electives

41 Occupational Safety Option (120.5 Cr.)

26 Option Requirements
3 Financial Accounting—Acct 284 or Management of Organizations—Mgmt 370
2 First Aid and Emergency Care—H S 105
3 Applied Ergonomics and Work Design—I E 271
2 Introduction to Occupational Safety—I Tec 272
3 Fire Protection andPrevention—I Tec 296
3 Legal Aspects of Occupational Safety and Health—I Tec 394
3 Industrial Hygiene: Chemical and Biological Hazards—I Tec 470
3 Industrial Hygiene: Physical Hazards—I Tec 471
2 Safety Analysis and Design—I Tec 475
3 Basic Human Physiology and Anatomy—Zool 155
8 Technical Electives—A list of departmentally approved technical electives is available from the undergraduate academic adviser.
6 Electives

College of Engineering

James L. Melsa, Dean
David K. Holger, Associate Dean
Theodore H. Okiishi, Associate Dean
Loren W. Zachary, Assistant Dean

Departments of the College

Aerospace Engineering
Agricultural and Biosystems Engineering
Chemical Engineering
Civil, Construction and Environmental Engineering
Electrical and Computer Engineering
Industrial and Manufacturing Systems Engineering
Materials Science and Engineering
Mechanical Engineering

Engineers occupy a uniquely important position in our modern civilization. They have the responsibility for taking the discoveries of basic science and translating them into processes, materials, products, structures, facilities, and services for society.

Objectives of Curricula in Engineering

Engineering education seeks to develop a capacity for objective analysis, synthesis, and design to obtain a practical solution. The engineering programs at Iowa State University are designed to develop the professional competence of a diverse student body and, by breadth of study, to prepare students to solve the technical problems of society while considering the ethical, social, and economic implications of their work.

Experiences contained within the programs are intended to develop in each student an ability to apply knowledge of mathematics and science to engineering problems; an ability to design and conduct engineering experiments, including analyzing and interpreting data from experiments; an ability to design a system, component, or process to meet desired needs; an ability to function on multi-disciplinary teams in the solution of engineering problems; an ability to identify, formulate, and solve engineering problems; an ability to communicate effectively; the broad education necessary to understand the impact of engineering solutions in a global and national context; a recognition of the need for and an ability to engage in life-long learning; a knowledge of contemporary issues; and, an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Registration as a professional engineer, which is granted by each individual state, is required for many types of positions. The professional curricula in engineering at Iowa State University are designed to prepare a graduate for subsequent registration in all states. Seniors in accredited curricula (accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology) of the College of Engineering are encouraged to take the Fundamentals of Engineering Examination toward professional registration during their final academic year. Seniors in engineering curricula who have obtained at least 6 semester credits in surveying may take the Fundamentals Examination for professional registration as land surveyors.

Four engineering departments offer the opportunity for well-qualified undergraduate juniors and seniors to pursue a graduate degree in their program while finishing the undergraduate requirements. The departments offering concurrent B.S./M.S. degree programs are: Agricultural and Biosystems Engineering, Civil, Construction and Environmental Engineering, Electrical and Computer Engineering, and Materials Science and Engineering. Refer to the Graduate Study section for each department for more information.

Advanced work in engineering is offered in the post-graduate programs. See the Graduate College section of this catalog.

Accreditation

Ten curricula in the College of Engineering are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).
Engineering Accreditation Commission
Accreditation Board for Engineering and Technology
111 Market Place, Suite 1050
Baltimore, MD 21202-7700
Phone: 410-347-7700
WWW: http://www.abet.org
Accreditation status is indicated at the beginning of the courses and programs section of each engineering curriculum.

Organization of Curricula

All curricula in engineering are designed as four-year programs. They are structured in two phases: a basic program and a professional program. The basic program consists primarily of subjects fundamental and common to all branches of engineering and includes chemistry, physics, mathematics, engineering computations, and English. The professional phase of a curriculum includes intensive study in a particular branch of engineering, as well as a continuation of supporting work in mathematics, basic sciences, humanities, and social sciences.
Students must complete the requirements of the basic program before proceeding to a professional program.

Preparation for the Engineering Curricula

High school credits particularly important to students wishing to study engineering include 2 years of algebra, 1 year of geometry, and 1/2 year of trigonometry; 1 year each of chemistry and physics, and 4 years of English. See Index for specific admission requirements. Placement in mathematics, English, and chemistry will generally be based on high school preparation and test scores. Advanced placement is possible for exceptionally well-prepared students. Students who are not adequately prepared may be encouraged or required to take additional preparatory coursework and should expect to spend more than the customary time to complete the engineering program. Any coursework which is preparatory or remedial in nature cannot be used to satisfy credit requirements for graduation in any of the engineering curricula.

Basic Program for Professional Engineering Curricula

The first year program is much the same for all professional curricula in the College of Engineering. Each curriculum requires completion of the basic program as well as the curriculum designated requirements. The basic program is a set of courses common to all engineering curricula, while the curriculum designated requirements are courses required by individual curricula. The student who desires to receive the bachelor's degree in a minimum time will find it desirable to select a curriculum as soon as possible.

Entering undergraduates must demonstrate proficiency in trigonometry based on test scores, or by having transfer credits from a college trigonometry course, or by passing either Math 141 or 142 before enrolling in Math 166, Aer E 160 or C E 160.

The Department of English may recommend placement in one or more sections of Engl 101 because of unsatisfactory performance on the English placement test administered to students whose first language is not English.

Basic Program

Cr.	
8	Mathematics 165, 166
6	English 104, 105
4	Chemistry 167 or 177*
3	Engineering 160, Aer E 160, CE 160, Cpr E 185, E E 185, or I E 148**
5	Physics 221
R	Engineering 101
0.5	Library 160
26.5	Total credits

Curriculum Designated Requirements

Aerospace Engineering—Aer E 160**, Aer E 161 (3 cr.), Aer E 192 (R)
Agricultural Engineering—Chem 167L (1 cr.), A E 110 (1 cr.), Engr 170 (3 cr.)
Chemical Engineering—Chem 177*, 177L (1 cr.), 178 (3 cr.), 178L (1 cr.)
Civil Engineering—Chem 167L (1 cr.) or Chem 177L (1 cr.)*, C E 104 (1 cr.), C E 160**, C E 170 (2 cr.), C E 111 (3 cr.).
Computer Engineering—Com S 227 (3 cr.), 185** (3 cr.), Cpr E 166 (R cr.),
Construction Engineering—Con E 110 (R cr.), Psych 101 (3 cr.), Engr 170 (3 cr.)
Electrical Engineering—E E 185** (3 cr.), Com S 207 or 227 (3 cr.), E E 166 (R cr.)
Industrial Engineering—I E 101 (R cr.), I E 148** (3 cr.)
Materials Engineering—Chem 177*, 177L (1 cr.), 178 (3 cr.), 178L (1 cr.), Engr 170 (3 cr.), (Physics 221 scheduled in sophomore year.)
Mechanical Engineering—Chem 167L (1 cr.), Engr 170 (3 cr.), M E 102 (R cr.)

The student's adviser may require or recommend courses in addition to those specified above if the preparation and progress of the student are such that additional courses are necessary or desirable.

*Students planning to enroll in C E[1], Ch E, or Mat E will find Chem 177 to be a better preparation for Chem 178. However, Chem 167 is accepted as a substitute for 177 for those students declaring one of these curricula after having completed 167. The Chem 155-165 sequence is an acceptable substitute for Chem 167.

**Recommended choices by program:
Aer E: Aer E 160 (3 cr.)
C E: C E 160 (3 cr.)
Cpr E: Cpr E 185 (3 cr.)
E E: E E 185 (3 cr.)
I E: I E 148 (3 cr.)

Credit hours for graduation will be given for any of Aer E 160, Engr 160, Cpr E 185, E E 185, or C E 160 without increasing a curriculum's minimum number of credits required for graduation.

[1]Students in the general emphasis in C E have two chemistry/physics sequence options. The environmental emphasis requires Option 1.

Option 1—Chem 177, 177L, 178, 178L, and Phys 221.

Option 2—Chem 167, 167L; or Chem 155, 165, 167L; or Chem 177, 177L; and Phys 221 and 222.

Requirement for Entry into Professional Program

Students enrolled in the College of Engineering must satisfy both of the following requirements before enrolling in the professional courses (200-level and above) offered by departments in the Engineering College:

1. Completion of the basic program with a grade point average of 2.00 or better in the basic program courses.

2. A cumulative grade point average of 2.00 or better for all courses taken at Iowa State University. The following are the only exceptions to this rule:

a. Students who have completed all of their coursework while enrolled in the College of Engineering, but have not met the two basic program requirements, may enroll for not more than one semester in 200-level or above courses offered by departments in the College of Engineering. This exception may be extended to two semesters for students whose curriculum requires Chem 178 and 178L (i.e. Ch E, C E[1], and Mat E).

b. Students transferring to the College of Engineering from another college or university, or from a program outside this college, who have not met the two basic program requirements may enroll for not more than two semesters in 200-level or above courses offered by departments in the College of Engineering.

c. Iowa State students not pursuing an engineering degree may generally take engineering courses without restrictions provided they meet the prerequisites and space is available.

d. Only the first two semesters of 200-level and above engineering courses, taken at ISU while a student is not enrolled in the College of Engineering, can be applied toward an engineering degree.

[1]General Emphasis Program option 1 with Chem 177, 177L, 178, and 178L, and Environmental Specialization Program.

Requirement for Graduation

In order to graduate in a professional engineering curriculum, a student must have a minimum GPA of 2.00 in a department-designated group of 200-level and above courses known as the Core. These courses will total no fewer than 24 nor more than 48 semester credits.

Engineering Minors

The College of Engineering offers an undergraduate minor in Nondestructive Evaluation. It is open only to engineering students who have met the basic program requirements and are not on temporary enrollment. The NDE minor consists of one common core course, at least two NDE specific technique courses and at least two supporting courses. Both technique and supporting courses must be selected from lists approved by the advisory committee. A student's minor program in Nondestructive Evaluation must include at least nine credits which are beyond the total used to meet curriculum requirements. The minor is supervised by an interdisciplinary faculty committee. Interested students may contact the Department of Aerospace Engineering to obtain more specific guidelines and requirements.

Undergraduate Majors and Minors Outside the College of Engineering

In addition to the engineering degree program, students may earn majors or minors in other colleges of the university. A major or minor program must meet all requirements of the offering department or program and its college and contain credits beyond the requirements for a B.S. degree in engineering. A minimum of 15 additional credits is required for each major area of study and an additional 9 credits for each minor.

Advising System

The purpose of the advising system in the College of Engineering is to work constructively with students in developing their individual academic programs and to maintain close contact with students during their college careers.

The college offers an orientation program during the spring and summer for students planning to enter in the fall and during the fall for students planning to enter in the spring. All entering students are encouraged to attend an orientation session. Tests given during the orientation program help determine the student's level of achievement and enable the adviser to prepare an appropriate program for the student.

Special Programs

All engineering students are strongly encouraged to participate in either the cooperative education or internship programs. Students who are qualified to participate in the engineering honors program are also urged to do so. These programs are integrated into the professional engineering curricula and may require additional work. However, both these professional and academic programs offer opportunities that will enrich the standard academic experience. Engineering students are also encouraged to take advantage of study abroad opportunities available through the College of Engineering's International Programs Office.

a. Cooperative Education Program—The College of Engineering offers, through its curricula, a cooperative education program. Enrollment in the program allows students to gain practical experience in their career field while attending college. In general, students enrolled in the co-op program will require an additional year to complete curriculum requirements.

These programs are arranged so that the student alternates academic work with employment periods. The student has the opportunity to assess career paths within her/his chosen curriculum and the employer evaluates the student's potential as a future full-time employee. Both domestic and international co-op programs are available. Cooperative education students pay no fees to the university during their work periods and do not receive credit hours for their work experience. Students register for a non-credit cooperative education course (298, 398, or 498) for each work period and are considered full time students while enrolled in these courses. For additional information contact your academic adviser and the Office of Engineering Career Services.

b. Internship Program. Internships are a mechanism by which a student may work full-time for one semester while maintaining her/his status as a full-time student. Internship students pay no fees to the university during their work periods and do not receive credit hours for their work experience. Students may register for the internship course (397) for a fall or spring semester work period or (396) for the summer term are considered to be full time students. For additional information contact your academic adviser and the Office of Engineering Career Services.

c. Honors Program. The College of Engineering participates in the University Honors Program (see *Index*). In summary, the Honors Program is designed for students with above average ability who wish to individualize their programs of study. For further details consult the chair of the Engineering College Honors Program Committee or your departmental Honors Program adviser.

d. Engineering International Programs. In a world where the sun never sets, engineers must be prepared to understand other cultures and other ways of doing business. Engineers must expand their exportable skills, language and cross-cultural skills.

Engineering International Programs (EIP) has formed worldwide partnerships to create opportunities for students to work and study with leading universities in other countries and multinational corporations. With careful planning, students may earn credit in courses that fulfill their degree requirements. To learn more about work and study with leading universities in other countries and multinational corporations, visit the EIP home page at www.eng.iastate.edu/intlprogs/.

Curriculum in Aerospace Engineering

Administered by the Department of Aerospace Engineering. Leading to the degree bachelor of science. **Total credits required: 125.5.** See also *Basic Program and Cooperative Programs.*

Professional Program

Sophomore Year

Cr.	Fall
4	Calculus III—Math 265
5	Introduction to Classical Physics II—Phys 222
3	Statics of Engineering—E M 274
3	Introduction to Aerospace Engineering—Aer E 261*
1	Instrumentation Laboratory—Aer E 202*
R	Aerospace Seminar—Aer E 291
16	

Cr.	Spring
4	Elementary Differential Equations and Laplace Transforms—Math 267
3	Mechanics of Materials—E M 324*
3	Dynamics—E M 345
3	Aerodynamics I—Aer E 243*
0.5	Aerodynamics Laboratory—Aer E 243L*
3	SSH elective1
R	Aerospace Seminar—Aer E 292
16.5	

Junior Year

Cr.	Fall
3	Thermodynamics—M E 330*
2	Principles of Material Science and Engineering—Mat E 272
3	Astrodynamics I—Aer E 351*
3	Flight Structures I—Aer E 321*
3	Aircraft Flight Dynamics and Stability—Aer E 355*
R	Flight Experience—Aer E 301
R	Aerospace Seminar—Aer E 391
3	SSH elective[1]
17	

Cr.	Spring
3	Gas Dynamics—Aer E 311*
0.5	Gas Dynamics Laboratory—Aer E 311L*
3	Aerodynamics II—Aer E 343*
1	Advanced Aerodynamics and Propulsion Laboratory—Aer E 343L*
3	Flight Control Systems I—Aer E 331*
3	Computational Techniques for Aerospace Design—Aer E 361*
3	Flight Structures II—Aer E 421*
R	Aerospace Seminar—Aer E 392
16.5	

Senior Year

Cr.	Fall
3	Aerospace Vehicle Propulsion I—Aer E 411*
3	Modern Design Methodology with Aerospace Applications—Aer E 461*
3	Technical elective[2]
3	Technical elective[2]
3	SSH elective[1]
R	Aerospace Seminar—Aer E 491
15	

Cr.	Spring
3	Design of Aerospace Systems—Aer E 462*
3	Technical elective[2]
3	Technical elective[2]
3	SSH elective[1]
3	SSH elective[1]
R	Aerospace Seminar—Aer E 492
15	

English Proficiency

The department requires a grade of C (2.0) or better in Engl 104 and 105 to be eligible for English Proficiency Certification. Students satisfying this requirement who are not cited for deficiencies in reports, laboratory reports, or other writings required in other courses, are certified during the semester prior to their semester of graduation. Students not satisfying these requirements are referred to the department's Academic Standards and Program Quality Committee for corrective action.

[1]The social sciences and humanities (SSH) electives are to be selected from the department-approved list of courses, subject to department guidelines and are not to be taken under the P-NP policy.

[2]Twelve elective credits scheduled to be taken at the senior year are of three types: (1) Aerospace Program Technical Electives, 3 credits; (2) Technical Electives, 3 credits; and (3) Career Electives, 6 credits. Aerospace Program Technical Electives and the Technical Electives must be chosen from department-approved lists for each type. All electives must be chosen following published department guidelines. These courses are not to be taken under the P-NP policy.

*Core professional curriculum. A student must have a minimum grade-point average of 2.00 in this group of courses in order to graduate.

Curriculum in Agricultural Engineering

Administered by the Department of Agricultural and Biosystems Engineering.
With options in agricultural and environmental systems engineering, biosystems engineering, food and process engineering, and power and machinery engineering. Administered jointly by the College of Agriculture and the College of Engineering. Leading to the degree bachelor of science. **Total credits required: 128.5.** See also *Basic Program and Cooperative Programs*.

Sophomore Year

Cr.	Fall
3	Computer Application and Systems Modeling—A E 203*
5	Introduction to Classical Physics II—Phys 222*
3	Statics of Engineering—E M 274*
4	Option Requirement[2]
1	Engineering Applications of Parametric Solid Modeling—A E 271* or Parametric Solid Models, Drawings, and Assemblies Using Pro/ENGINEER—A E 272*.
16	
Cr.	**Spring**
3	Agricultural Engineering Fundamentals II—A E 216*
3	Mechanics of Materials—E M 324*
1	Mechanics of Materials Laboratory—E M 327*
3	Principles of Microeconomics—Econ 101 or Principles of Macroeconomics—Econ 102
3	Elementary Differential Equations—Math 266*
3	Engineering Statistics—Stat 305
16	

Junior Year

Cr.	Fall
3	Thermodynamics—M E 330*
13	Option requirement[2]
16	
Cr.	**Spring**
10	Option requirements[2]
3	SSH elective[1]
3	Communications requirement[3]
16	

Senior Year

Cr.	Fall
1	Senior Seminar—A E 401
2	Agricultural Engineering Design I—A E 415*
6	SSH elective[1]
8	Option requirements[2]
17	
Cr.	**Spring**
2	Agricultural Engineering Design II—A E 416*
3	SSH elective[1]
11	Option requirements[2]
16	

English Proficiency
The department requires a grade of C or better in Engl 104 and 105 (or 105H) and a grade of C or better in the course taken to meet the communication requirement.

[1]Social sciences and humanities (SSH) electives are to be chosen from the department-approved list. The courses chosen must meet departmental requirements.

[2]After the freshman year, each student elects one of the options and takes courses listed for the selected option. The elective courses must be selected from the department-approved list.

[3]One course must be taken from Sp Cm 212, Engl 309, Engl 314.

*Core professional curriculum. A student must have a minimum grade-point average of 2.00 in this group of courses in order to graduate.

Options
Agricultural and Environmental Systems Engineering—A E 340, 363, 404, 421, 472; E M 378; C E 332, 372; 6 credits in biological and natural resource science from department-approved list; and 13 credits from department-approved electives list.
Biosystems Engineering—A E 363, 480; 6 credits from A E 451, 465, 469; 6 credits from Micro 201, 302; Biol 301, BBMB 301, 451; Biol 202; Ch E 356, 357; Chem 331, 331L, 332; and 11 credits from department-approved electives list.

Food and Process Engineering—A E 363, 480, select 6 credits from A E 451, 465, 469; Biol 202; Chem 231, 231L, Ch E 356 or E M 378; Ch E 357; FS HN 311, 420, Micro 201; and 11 credits from department-approved electives list.

Power and Machinery Engineering—A E 340, 342, 363, 413, 447; select one course from A E 404, 421, 472, 480, M E 436; Agron 154; E M 345, 378; Mat E 272; M E 324, 325; 3 credits in biological and natural resource science from department-approved list; 7 or 8 credits from department-approved electives list.

Curriculum in Chemical Engineering

Leading to the degree bachelor of science. **Total credits required: 125.5.** See also *Basic Program and Cooperative Programs*.

Professional Program

Sophomore Year

Cr.	Fall
3	Material and Energy Balances—Ch E 210*
4	Calculus III—Math 265
5	Introduction to Classical Physics II—Phys 222
3	Organic Chemistry—Chem 331
15	
Cr.	**Spring**
3	Transport Phenomena I—Ch E 356*
4	Elementary Differential Equations and Laplace Transforms—Math 267
3	Organic Chemistry—Chem 332
3	Physical Chemistry—Chem 321
3	SSH elective[1]
R	Seminar—Ch E 202
16	

Junior Year

Cr.	Fall
3	Transport Phenomena II—Ch E 357*
3	Chemical Engineering Thermodynamics—Ch E 381*
3	Chemistry elective[2]
3	Statistics elective[4]
3	Communication elective[3]
15	
Cr.	**Spring**
4	Separations—Ch E 358*
2	Chemical Engineering Laboratory I—Ch E 325*
3	Chemical Reaction Engineering—Ch E 382*
3	Chemistry elective[2]
3	SSH elective[1]
3	SSH elective[1]
R	Seminar—Ch E 302
18	

Senior Year

Cr.	Fall
3	Process Control—Ch E 421*
3	Engineering elective[5]
3	Professional elective[6]
3	SSH electives[1]
3	SSH electives[1]
15	
Cr.	**Spring**
4	Process and Plant Design—Ch E 430*
3	Professional elective6
3	SSH elective[1]
3	Chemical Engineering elective[7]
2	Chemical Engineering Laboratory II—Ch E 426*
15	

English Proficiency
The department requires satisfactory completion of Engl 104, 105 (or 105H), and the Communications elective.

[1]Selected from list of department-approved social sciences and humanities (SSH) courses.

[2]Selected from department-approved list.

[3]Selected from department-approved list.

[4]Selected from department-approved list.

[5]Selected from department-approved list.

[6]Selected from department-approved list.

[7]Selected from department-approved list.

*Core professional curriculum. A student must have a minimum grade-point average of 2.00 in this group of courses in order to graduate.

Curriculum in Civil Engineering (General)

Administered by the Department of Civil, Construction and Environmental Engineering. Leading to the degree bachelor of science.

Total credits required: 129.5 general emphasis; 129.5 environmental specialization emphasis. For any area of emphasis, see the department. Also see *2003-2005 Student Guide to Civil Engineering.* Also see *Basic Program and Cooperative Programs.*
For those interested in construction engineering, a curriculum is provided which leads to the degree bachelor of science in construction engineering. For particulars, see *Curriculum in Construction Engineering.*

General Emphasis
Sophomore Year

Cr.	Fall
3	Differential Equations—Math 266
4-5	Introduction to Classical Physics II—Phys 222; or 4 cr. General Chemistry—Chem 178 and 1 cr. Laboratory—Chem 178L
3	Fundamentals of Public Speaking—Sp Cm 212
3	Statics—E M 274*
2	Civil Engineering Synthesis I—C E 203
R	Technical Lecture—C E 101[6]
16	

Cr.	Spring
3	Mechanics of Materials—E M 324*
1	Mechanics of Materials Laboratory—E M 327
3	Geology for Engineers—Geol 201
3	Dynamics—E M 345
2	Civil Engineering Synthesis II—C E 204
3	Statistics Elective[1]
15	

Junior Year

Cr.	Fall
3	Mechanics of Fluids—E M 378*
2	Professional Issues in Civil Engineering —C E 303*
3	Principles of Environmental Engineering —C E 326*
3	Structural Analysis I—C E 332*
3	Soil Engineering—C E 360*
3	Numerical Analysis elective[2]
17	

Cr.	Spring
2	Civil Engineering Design and Construction—C E 304
3	Structural Steel Design I—C E 333
2	Introduction to Transportation Engineering—C E 355*
4	Engineering Hydrology and Hydraulics—C E 372*
3	Design of Concretes—C E 382
3	Engineering Science or Life Science Elective[3]
17	

Senior Year

Cr.	Fall
3	Reinforced Concrete Design I—C E 334
4	Highway Design—C E 453
3	Engineering Topics electives[4]
6	Social sciences or humanities electives[5]
16	

Cr.	Spring
R	Civil Engineering Outcomes Assessment—C E 403
3	Engineering Design II—C E 486
2	Civil Engineering Design I—C E 485
2	Engineering Topics—electives[4]
9	Social sciences or humanities electives[5]
16	

[1]Selected from a statistics elective list in the *2003-2005 Student Guide to Civil Engineering* .

[2]Selected from a numerical analysis elective list in the *2003-2005 Student Guide to Civil Engineering.* Calculus III—Math 265 may be substituted.

[3]Selected from an engineering science or life science elective list in the *2003-2005 Student Guide to Civil Engineering.*

[4]Selected from an engineering topic elective list in the *2003-2005 Student Guide to Civil Engineering.* Students appointed to advanced ROTC may substitute 3 credits of advanced ROTC credits for 3 credits of engineering topics in the general emphasis curriculum.

[5]Selected from a social science or humanities elective list in the *2003-2005 Student Guide to Civil Engineering.* Nine (9) credits shall conform to specified focal areas, or as approved by the academic adviser and the Civil Engineering Curriculum Committee to meet an approved educational objective of the student's undergraduate program. Elective courses and procedures to meet the Diversity and International Perspective requirements are given in the *2003-2005 Student Guide to Civil Engineering.*

[6]For transfer students only.

*Core professional curriculum. A student must have a minimum grade-point average of 2.00 in this group of courses in order to graduate.

Curriculum in Civil Engineering (Environmental emphasis)

Administered by the Department of Civil, Construction and Environmental Engineering Leading to the degree bachelor of science.
Total credits required: 129.5. Also see *2003-2005 Student Guide to Civil Engineering.* Also see *Basic Program and Cooperative Programs.*

Sophomore Year

Cr.	Fall
3	Differential Equations—Math 266
4	General Chemistry—Chem 178
1	Laboratory in General Chemistry—Chem 178L
3	Statics—E M 274*
2	Civil Engineering Synthesis I—C E 203
3	Statistics elective[1]
R	Technical Lecture—C E 101[4]
16	

Cr.	Spring
3	Mechanics of Materials—E M 324*
1	Mechanics of Materials Laboratory—E M 327
3	Geology for Engineers—Geol 201
3	Fundamentals of Public Speaking—Sp Cm 212
2	Civil Engineering Synthesis II—C E 204
3	Introductory Biology—Biol 109
3	Numerical Analysis Elective[2]
18	

Junior Year

Cr.	Fall
3	Mechanics of Fluids—E M 378*
2	Professional Issues in Civil Engineering—C E 303*
3	Principles of Environmental Engineering—C E 326*
3	Structural Analysis I—C E 332*
3	Soil Engineering—C E 360*
2	General Microbiology—Micro 201
16	

Cr.	Spring
2	Civil Engineering Design and Construction—C E 304
4	Engineering Hydrology and Hydraulics—C E 372*
3	Design of Concretes—C E 382
3	Social Science of Humanities electives[3]
3	Elementary Organic Chemistry—Chem 231
1	Laboratory in Elementary Organic Chemistry—Chem 231L
16	

Senior Year

Cr.	Fall
3	Reinforced Concrete Design I—C E 334
2	Introduction to Transportation Engineering—C E 355*
3	Environmental Engineering Chemistry—C E 420
3	Environmental Biotechnology—C E 421
6	Social science or humanities electives [3]
17	

Cr.	Spring
R	Civil Engineering Outcomes Assessment—C E 403
3	Water and Wastewater Treatment Plant Design—C E 428
2	Civil Engineering Design I—C E 485
3	Engineering Design II—C E 486
6	Social sciences or humanities electives [3]
14	

[1]Selected from a statistics elective list in the *2003-2005 Student Guide to Civil Engineering* .

[2]Selected from a numerical analysis elective list in the *2003-2005 Student Guide to Civil Engineering.* Calculus III—Math 265 may be substituted.

[3]Selected from an engineering topic elective list in the *2003-2005 Student Guide to Civil Engineering*. Students appointed to advanced ROTC may substitute 3 credits of advanced ROTC credits for 3 credits of engineering topics in the general emphasis curriculum.

[4]For transfer students only.

*Core professional curriculum. A student must have a minimum grade-point average of 2.00 in this group of courses in order to graduate.

English Proficiency

Students receiving a grade of C or better in Engl 104 and 105 meet the proficiency requirement of the department. Students not meeting this condition must fulfill an advanced composition requirement specified in the *2003-2005 Student Guide to Civil Engineering*.

Curriculum in Computer Engineering

Administered by the Department of Electrical and Computer Engineering.
Leading to the degree bachelor of science.
Total credits required: 125.5. See also *Basic Program and Cooperative Programs*.

Sophomore Year

Cr.	First Semester
4	Introduction to Digital Design—Cpr E 210*
3	Introduction to Data Structures—Com S 228
4	Elementary Differential Equations and Laplace Transforms—Math 267
5	Introduction to Classical Physics II—Phys 222
16	

Cr.	Second Semester
4	Introduction to Microcontrollers—Cpr E 211*
3	Theoretical Foundations of Computer Engineering—Cpr E 310*
4	Calculus III—Math 265
4	Electrnic Circuits—E E 201*
15	

Junior Year

Cr.	First Semester
6	General Education Electives[3]
4	Computer Organization and Design—Cpr E 305*
3	Data Structures and Algorithm Analysis—Com S 311*
4	Electronic Devices and Circuits—Cpr E 203*
17	

Cr.	Second Semester
3	Software Development Practices—Com S 309*
4	Operating Systems: Principles and Practice—Cpr E 308*
3	Technical Elective[2]
3	Technical Communication—Engl 314
3	General education elective[1]
16	

Senior Year

Cr.	First Semester
3	Senior Design Project I and Professionalism—Cpr E 491
9	Technical electives[2]
3	Math/Stat elective[3]
3	General education elective[1]
R	Portfolio Assessment—Cpr E 494[4]
18	

Cr.	Second Semester
2	Senior Design Project II—Cpr E 492
3	Computer Science elective[2]
6	Technical electives[2]
3	General education elective[1]
14	

English Proficiency

The department requires a grade of C or better in Engl 104, 105 (or 105H), and 314 (or 314H).

Transfer Grade Requirements

The Electrical and Computer Engineering Department requires a grade of C or better for any transfer credit course that is applied to the degree program.

[1]General Education Electives-Students must propose and have approved by their faculty adviser a general education program of 15 credits that meets the university diversity and international perspectives requirements and an objective developed by the student. Courses chosen must not be remedial courses in the university, six (6) credits must be chosen at the 300 level or higher, and courses in engineering, Computer Science, physical and mathematical sciences must not be included. Pass-Not Pass credit is not accepted.

[2]Computer Engineering, Computer Science, and general technical electives must be chosen to satisfy departmental requirements concerning content, distribution, and level. All technical electives must be chosen from lists approved by the department. Details are available in the E CPE Undergraduate Student Services Office or on the Web. Pass/not pass credit not accepted. Six credits of Computer Engineering, three credits of Computer Science, and nine credits of general technical electives are required. One credit of 490 may be used to partially meet these requirements.

[3]The student must choose one of the following math/Stat courses (pass/not pass credit not accepted): Math 273, 307, 314, 317, 365, 385, 395, 471 or 481, Stat 322, 330. Credit in 490 may not be used to fulfill this elective requirement.

[4]Outcomes Assessment- Students are required to prepare and to maintain a portfolio of their technical and non-technical skills. This portfolio is evaluated for student preparation during the student's curriculum planning process. Results of the evaluation are used to advise students of core strengths and weaknesses. Prerequisite material exams may be given at key points in the curriculum. These exams are to assist student evaluation of progress made during the academic experience as the material covered in several courses are the foundation of more advanced courses. The results of these assessments are also used to evaluate the curriculum and to implement improvements.

*Core professional curriculum. A student must have a minimum grade-point average of 2.00 in this group of courses in order to graduate.

Curriculum in Construction Engineering

Administered by the Department of Civil, Construction and Environmental Engineering.
Leading to the degree bachelor of science.

Total credits required: 122.5 Building emphasis; 124.5 Heavy emphasis; 124.5 or 122.5 Mechanical/Electrical emphasis. See also *Basic Program and Cooperative Programs*.

B - Building construction emphasis.
H - Heavy construction emphasis.
M/E - Mechanical/Electrical construction emphasis.

Undesignated courses are for all emphases.

Sophomore Year

Cr.	Fall
3	Fundamentals of Surveying—C E 111
4	Contractor Organization and Management of Construction—Con E 221
4	Calculus III—Math 265
5	Introduction to Classical Physics II—Phys 222
16	

Cr.	Spring
1	Professional Development—Con E 210
3	Economics elective (B,H,M)
3	Statics of Engineering—E M 274
3	Construction Materials and Methods—Con E 241
1	Mechanical/Electrical Materials and Methods—Con E 251
3	Elementary Differential Equations—Math 266 (B, H) or
4	Elementary Differential Equations with Laplace—Math 267 (M,E)
4	Electrical Circuits—E E 201 (E)
3	Financial Accounting—Acct 284 (B,H)
17	B,H; 15 M; 16 E

Junior Year

Cr.	Fall
2	Construction Contract Documents—Con E 245
3	Construction Equipment and Heavy Construction Methods—Con E 322 (B,H)
3	Engineering Law—Con E 380 (B,H)
3	Mechanics of Fluids—E M 378
3	Mechanics of Materials—E M 324
3	Social Science & Humanities Elective (H)
3	Engineering Thermodynamics—M E 231 (M,E)
4	Electric Circuits—E E 203 (E)
3	Financial Accounting—Acct 284 (M)
14	B; 17 H; 15 E; 14 M

Cr.	Spring
3	Concrete and Steel Construction—Con E 340 (B,H)
3	Mechanical/Electrical Systems for Buildings—Con E 351 (B,M,E)
3	Soil Engineering—C E 360 (B,H)
1	Mechanics of Materials Lab—E M 327 (B,H)
3	Structural Analysis I—C E 332
3	Elementary Differential Equations—Math 266 (B) or
3	Social Science & Humanities Elective (B)
5	Engineering Topics Elective (H)
3	Energy Systems & Power Electronics—E E 303 (E)
3	Engineering Law—Con E 380 (E,M)
3	Business Communication Elective (M,E)
4	Electrical Circuits—E E 441 (M)
16	B,M; 15 H,E

Senior Year

Cr.	Fall
3	Construction Estimating—Con E 421
2	Construction Planning, Scheduling, and Control—Con E 441
3	Social Science & Humanities Elective International Perspective
3	Structural Steel Design I—C E 333 (B,H)
1	Design of Portland Cement Concrete—C E 383 (B)
3	Design of Concretes and Pavement Structures—C E 382 (H)
2	Engineering Topics Elective (B)
3	Electrical Engineering Design—E E 456 (E)
3	Financial Accounting—Acct 284 (E)
3	Heat Transfer—M E 436 (M,E)
3	Mechanical Engineering Design—M E 441 (M)
14	

Cr.	Spring
4	Construction Engineering Design—Con E 461
3	Social Science & Humanities Elective Diversity
3	Business Communications Elective (B,H)
3	Social Science & Humanities Elective (E, M)
3	Reinforced Concrete Design—C E 334 (B,H)
3	Electrical Engineering Design—E E 457 (E)
3	Economics Elective
3	Mechanical Engineering Design—M E 442 (M)
2	Introduction to Electric Machinery—E E 448 (M)
13	B, H; 16 E; 15 M

English Proficiency
All English courses taken, including those in the Basic Program, require a grade of C or better. A C– grade or less requires additional composition coursework.

[1] Chosen from curriculum-approved lists. All electives must be taken for a grade. Pass-Not Pass grades are not acceptable.

[2] Social sciences and humanities (SSH) electives chosen from curriculum-approved list. One of these must have a prerequisite of Psych 101 or a previously taken social sciences and humanities elective. Most students meet university requirements for diversity and international perspective by selecting appropriate courses from this area.

[3] All English courses taken, including those in the basic program, require a C or better. C- or less requires additional composition course work. All electives must be taken for a grade. Pass/not pass credits are not acceptable.

*Core professional curriculum. A student must have a minimum grade-point average of 2.00 in this group of courses in order to graduate.

Curriculum in Electrical Engineering

Administered by the Department of Electrical and Computer Engineering.
Leading to the degree bachelor of science.
Total credits required: 127.5. See also *Basic Program and Cooperative Programs.*

Sophomore Year

Cr.	First Semester
4	Electric Circuits—E E 201*
3	General education elective[1]
4	Elementary Differential Equations and Laplace Transforms—Math 267
5	Introduction to Classical Physics II—Phys 222
16	

Cr.	Second Semester
4	Electronic Devices and Circuits—E E 203*
4	Introduction to Digital Design—Cpr E 210*
4	Calculus III—Math 265
4	Signals and Systems I—E E 224*
16	

Junior Year

Cr.	First Semester
3	Energy Systems and Power Electronics—E E 303*
4	Electromagnetic Fields and Waves—E E 311*
3	Technical elective[2]
3	Math elective[3]
3	General education elective[1]
16	

Cr.	Second Semester
3	Semiconductor Materials and Devices—E E 332*
3	Probabilistic Methods for Electrical Engineers—E E 322*
3	Technical elective[2]
3	Technical Communication—Engl 314
6	General education electives[1]
18	

Senior Year

Cr.	First Semester
3	Engineering Economic Analysis—I E 305
12	Technical electives[2]
3	Senior Design Project I and Professionalism—E E 491
R	Portfolio Assessment—E E 494[4]
18	

Cr.	Second Semester
9	Technical electives[2]
2	Senior Design Project II—E E 492
3	General education electives[1]
14	

English Proficiency
The department requires a grade of C or better in Engl 104, 105 (or 105H), and 314 or (314H).

Transfer Grade Requirements
The Electrical and Computer Engineering Department requires a grade of C or better for any transfer credit course that is applied to the degree program.

[1]General Education Electives-Students must propose and have approved by their faculty adviser a general education program of 15 credits that meets the university diversity and international perspectives requirements and an objective developed by the student. Courses chosen must not be remedial courses in the university, six (6) credits must be chosen at the 300 level or higher, and courses in engineering, computer science, physical and mathematical sciences must not be included. Pass/not pass credit not accepted.

[2] Technical electives are of two types: (1) courses in computer engineering and electrical engineering, and (2) other courses in engineering and science. All technical electives must be chosen from lists approved by the department and available from the department's Undergraduate Student Services office. Technical electives must be chosen to satisfy departmental requirements concerning content and distribution. Pass/not pass credit not accepted.

[3]Math elective - Students select from math elective from the following courses: Math 307, 317, 395, 471, or 481. Pass/not pass credit not accepted.

[4]Outcomes Assessment- Students are required to prepare and to maintain a portfolio of their technical and non-technical skills. This portfolio is evaluated for student preparation during the student's curriculum planning process. Results of the evaluation are used to advise students of core strengths and weaknesses. Prerequisite material exams may be given at key points in the curriculum. These exams are to assist student evaluation of progress made during the academic experience as the material covered in several courses is the foundation of more advanced courses. The results of these assessments are also used to evaluate the curriculum and to implement improvements.

*Core professional curriculum. A student must have a minimum grade-point average of 2.00 in this group of courses in order to graduate.

Curriculum in Industrial Engineering

Administered by the Department of Industrial and Manufacturing Systems Engineering.
Leading to the degree bachelor of science.
Total credits required: 121.5. See also *Basic Program and Cooperative Programs.*

Sophomore Year

Cr.	Fall
4	Calculus III—Math 265
3	Introduction to Manufacturing Processes and Specifications—I E 248*
2	Principles of Materials Science and Engineering—Mat E 272
5	Introduction to Classical Physics II—Phys 222
3	SSH elective[2]
17	

Cr.	Spring
3	Applied Ergonomics and Work Design—I E 271*
3	Elementary Differential Equations—Math 266
4	Probability and Statistical Inference for Engineers—Stat 231
3	Fundamentals of Public Speaking—Sp Cm 212
3	Statics of Engineering—E M 274
16	

Junior Year

Cr.	Fall
3	Engineering Economic Analysis—I E 305*
3	Quality Control—I E 361*
3	Optimization—I E 312*
4	Introduction to Circuits, Instruments, and Electronics—E E 441
3	SSH elective[2]
16	

Cr.	Spring
3	Solidification Processes—I E 348*
3	Engineering science elective[4]
3	Production Systems—I E 341*
3	Management elective[1]
3	SSH elective[2]
15	

Senior Year

Cr.	Fall
4	Stochastic Modeling, Simulation and Analysis—I E 413*
3	Thermodynamics—M E 330
3	Technical Communication—Engl 314
3	Manufacturing Systems Engineering—I E 448*
3	Focus elective[3]
16	

Cr.	Spring
3	Focus[3] or management[1] elective
3	Focus elective[3]
3	Management elective[1]
3	SSH elective[2]
3	Industrial Engineering Design—I E 441*
15	

English Proficiency
The department requires a C grade (2.0) or better in Engl 104 and 105 with no grade lower than a C-.

*Core professional curriculum. A student must have a minimum grade point average of 2.00 in this group of courses in order to graduate.

[1]These electives are to be chosen from department-approved lists of business-related courses with advance approval.

[2]These social sciences and humanities (SSH) electives must be chosen from a department-approved list and must include at least one 6-credit sequence of prerequisite or related courses. At least 6 credits of SSH electives at or above the 200-level electives must be included.

[3]The IMSE curriculum provides students with the opportunity to obtain depth in a topic area of their choice. At least two courses, selected from a department-approved list, must be taken from one of the following areas:

Operations Research: which is concerned with the design and analysis of quantitative models and methods having applications in production and service systems such as inventory control, scheduling, transportation, and logistics.

Manufacturing: which is concerned with the design, analysis, operation, and control of manufacturing processes and systems.

Human Factors: which is concerned with the relationships between people and their work tasks, machines, information, and environment.

Enterprise Computing and Information Management: which is concerned with the integration of information within the functional units of an enterprise as well as among multiple enterprises.

Engineering Management: which is concerned with the strategies necessary for solving internal and external problems of a company in areas such as production, quality, project management, sales, and marketing strategies.

General: for students who do not want to specialize in any of the five focus areas above, choosing instead to combine electives from a number of areas.

[4]These engineering science electives must be chosen from a department-approved list.

Curriculum in Materials Engineering

Administered by the Department of Materials Science and Engineering.
Leading to the degree bachelor of science.
Total credits required: 124.5. See also *Basic Program and Cooperative Programs.*

Professional Program

Sophomore Year

Cr.	Fall
2	Integrated Materials Design—Mat E 213*
5	Introduction to Materials Science and Engineering—Mat E 211*
5	Introduction to Classical Physics I—Phys 221
3	Elementary Differential Equations—Math 266
15	

Cr.	Spring
3	Thermodynamics in Materials Engineering—Mat E 212*
3	Structural Characterization of Materials—Mat E 214*
5	Introduction to Classical Physics II—Phys 222
3	Statics of Engineering—E M 274
3	SSH elective[1]
17	

Junior Year

Cr.	Fall
2	Integrated Materials Design—Mat E 313*
3	Kinetics and Phase Equilibria in Materials—Mat E 315*
3	Specialization I[2]
3	Specialization II[3]
3	Mechanics of Materials—E M 324
3	SSH elective [1]
17	

Cr.	Spring
3	Computational Methods in Materials—Mat E 316*
3	Mechanical Behavior of Materials—Mat E 318*
3	Specialization I[2]
3	Specialization II[3]
3	SSH elective [1]
15	

Senior Year

Cr.	Fall
2	Integrated Materials Design—Mat E 413*
3	Specialization I[2]
3	Specialization II[3]
3	SSH elective [1]
3	Technical elective[2]
3	Free elective[5]
17	

Cr.	Spring
2	Materials Engineering Design—Mat E 414*
3	Specialization I[2,6]
3	Specialization II[3,6]
3	SSH elective [1]
3	Technical elective
14	

English Proficiency
The Department of Materials Science and Engineering requires a grade of C or better in Engl 104 and 105 and certification from the departmental curriculum committee.
[1]Social sciences and humanities (SSH) electives must be departmentally approved.

[2]Course in first area of emphasis (specialization).

[3]Course in second area of emphasis (specialization).

[4]Technical electives must be department approved.

[5]The free elective may be SSH, Technical, or other graded course not of remedial nature.

[6]If Electronics is chosen as a specialization then the technical elective requirement is reduced by 2 credits since 331 and 432 are 4 credits each.

*Core professional curriculum. A student must have a minimum grade-point average of 2.00 in this group of courses and certification by the department curriculum committee in order to graduate.

A Mat E student may take up to 9 credit hours from SSH and free electives on a P/NP basis, except that courses used to meet the U.S. Diversity and International Perspectives requirements may not be among them. S/F courses (different from P/NP) will be considered for these requirements on a course-by-course basis.

Areas of specialization from which a student selects two:
Ceramic Materials: 321, 322, 423, 424
Electronic Materials: 331, 332, 432, 433
Metallic Materials: 341, 342, 443, 444
Polymeric Materials: 351, Ch E 443, 453, 454

Curriculum in Mechanical Engineering

Leading to the degree bachelor of science.
Total credits required: 128.5. See also *Basic Program and Cooperative Programs*.

Sophomore Year

Cr.	First Semester
4	Calculus III—Math 265
5	Introduction to Classical Physics II—Phys 222
3	Engineering Statistics—Stat 305
3	Statics of Engineering—E M 274*
2	Principles of Materials Science and Engineering—Mat E 272
17	
Cr.	**Second Semester**
4	Elementary Differential Equations and Laplace Transforms—Math 267
3	Dynamics—E M 345*
3	Mechanics of Materials—E M 324*
3	Introduction to Mechanical Engineering Design—M E 270*
3	Engineering Thermodynamics I—M E 231*
R	Mechanical Engineering Seminar—M E 202
16	

Junior Year

Cr.	First Semester
3	Engineering Thermodynamics II—M E 332*
4	Manufacturing Engineering—M E 324*
3	General Education electives[1]
3	Technical Communication—Engl 314
2	Introduction to Circuits and Instruments—E E 442*
2	Introduction to AC Circuits and Motors—E E 448*
17	
Cr.	**Second Semester**
3	Machine Design—M E 325*
3	Engineering Measurements and Instrumentation—M E 370*
3	General Education elective[1]
3	Technical elective[2]
4	Fluid Flow—M E 335*
16	

Senior Year

Cr.	First Semester
4	Mechanical Systems and Control—M E 421*
3	General Education elective[1]
4	Heat Transfer—M E 436*
6	Technical electives[2]
17	
Cr.	**Second Semester**
3	Design elective[3]
6	Technical electives[2]
6	General education electives[1]
15	

English Proficiency
The department requires a minimum of C– in both Engl 104 and 105 with at least a 2.00 average for the two courses.

[1] General Education electives must be chosen from department-approved lists and must include Econ 101 or 102, at least six credits in the humanities and at least six credits in the social sciences. Students must select courses that also satisfy the diversity and international perspective requirements of the university. No more than three 100 level courses are allowed.

[2] All technical electives must be chosen from a department-approved list. Students must take a minimum of six credits of electives identified on the approved list as mechanical engineering technical electives. Suggested areas of specialization are the following:
Energy conversion and utilization—M E 433, 443, 444, 446, 447, 448, 449; E E 456, 457; I E 305.

Machines and systems—M E 410, 411, 412, 414, 415, 417, 418, 419, 425, 466, 511, 516, 517, 518, 549; E M 514, 515, 517, 518, 519, 525, 544.

Materials and Manufacturing—M E 520, 521, 522; E M 514, 569; Mat E 318, 443, 444.
Thermal and environmental engineering—M E 441, 442, 444, 445, 446, 447, 448, 449, 475, 530, 532, 536, 538, 539, 540, 542, 545, 546, 547, and applicable courses in other departments.

Propulsion—M E 445, 447, 448, 449, 542, 548; Aer E 312, 412.

Nuclear Power—M E 431, 585.

[3]The design elective must be chosen from M E 415, 442, 446, or 449.

*Core professional curriculum. A student must have a minimum grade-point average of 2.00 in this group of courses in order to graduate.

College of Family and Consumer Sciences

Carol B. Meeks, Dean
Beverly J. Crabtree, Emeritus Dean
Ruth E. Deacon, Emeritus Dean
JaneAnn Stout, Associate Dean
Suzanne Hendrich, Associate Dean
Mary Winter, Associate Dean

Departments of the College

Apparel, Educational Studies, and Hospitality Management
Food Science and Human Nutrition
Human Development and Family Studies

The College of Family and Consumer Sciences (CFCS) is committed to advancing the well-being of families, consumers, and related business organizations through the creation, application, and dissemination of knowledge.

These objectives are accomplished by fostering a supportive community committed to optimizing student learning, promoting high quality scholarship that addresses important issues for individuals, families, communities, and related business organizations, and engaging key constituents and partners in addressing needs of families, communities, societies, and related business organizations around the world.

The fields of study encompassed by the College are represented within the departments described above. The College faculty and staff work to create and communicate knowledge not only in a given field, but to combine that knowledge into an integrated whole. Each part of that whole is needed to achieve the goal of enhancing quality of life for all people.

Students in CFCS learn how to contribute to the well-being of society through a variety of careers. At the baccalaureate level, students are prepared to become family and consumer sciences educators, early childhood educators, childcare providers, housing specialists, personal financial managers, apparel designers, merchandisers and entrepreneurs; also restaurant, hotel and institution managers; food scientists, dietitians and nutritionists.

They also are prepared to pursue postbaccalaureate education at other institutions in such areas as social work, law, medicine or other health care professions. In addition, the College offers masters and doctorate programs in each department.

Graduates are prepared for careers as researchers, educators, marriage and family therapists, or upper level managers and administrators in professional fields.

Faculty and staff members of the College of Family and Consumer Sciences aspire to create personal well-being. There is a strong committment to a love of learning and to nurturing students through rigorous and dynamic curricula. Extensive extracurricular opportunities, both local and international, for the personal and professional development of students are provided. These commitments are the foundation for becoming the best FCS College in the nation.

College of Family and Consumer Sciences Undergraduate Core Curriculum

Graduates of the College of Family and Consumer Sciences will demonstrate professional and personal competencies in concepts fundamental to the College's mission. These core concepts serve as a unifying focus for students in the College.

The following two core concepts are interdisciplinary in nature; competencies will be assessed by designated outcomes in courses within each major in the College.

Critical Thinking: Demonstrate the ability to evaluate information based on science and moral reasoning. Apply critical thinking skills in making value-based decisions, forming public policy, and showing civic responsibility as consumers and providers of goods and services necessary to meet the basic life needs of the individual, family, and community.

Interpersonal Communication: Demonstrate the ability to communicate appropriately and effectively as Family and Consumer Sciences professionals and members of the global community while respecting diversity and enhancing the dignity of others.

The above two interdisciplinary concepts are integral to the following three discipline-based concepts. Competencies in these three concepts will be demonstrated by satisfactory completion of approved course work in the College of Family and Consumer Sciences. Two of the three concept requirements must be fulfilled using courses outside the student's major department.

Family: Demonstrate knowledge about the family in society and its development, diverse nature, and role in nurturing children, youth, and adults as they grow and change.

Human Nutrition: Demonstrate abilities to make optimal decisions for human health through nutrition and to evaluate nutrition information based on science and moral reasoning.

Consumer Sciences: Demonstrate knowledge about issues facing individuals, families, and communities related to choices by consumers and/or providers regarding at least one of the following human needs: clothing, education, family economics, hospitality services, and housing.

Accreditation

All degree programs in the College of Family and Consumer Sciences are accredited by the American Association of Family and Consumer Sciences (AAFCS). Accreditation includes commitment to self-regulation, ongoing self-study, peer and external evaluation, and regular review by the Council for Accreditation for the AAFCS. These accreditation activities ensure that graduates of the College of Family and Consumer Sciences have had educational experiences of high quality and relevance as judged against nationally accepted standards.

Throughout the United States, only a small number of colleges and universities offering bachelors degrees in Family and Consumer Sciences meet the high standards of the AAFCS accreditation.

In addition to the College accreditation, the following program-specific accreditation/registrations have been attained by Departments within the College:

Department of Apparel, Educational Studies, and Hospitality Management:
Family and Consumer Sciences Education Teacher Licensure Program is licensed by the Iowa Department of Education and the Iowa Board of Educational Examiners.

Hotel, Restaurant, and Institution Management is accredited by the Accreditation Commission for Programs in Hospitality Administration, the accrediting agency of the International Council on Hotel, Restaurant, and Institutional Education.

Production focus of the Apparel Merchandising, Design, and Production major is endorsed by the American Apparel and Footwear Association.

Department of Food Science and Human Nutrition:
Food Science and Technology is approved by the Institute of Food Technologists. The Dietetics Internship has initial accreditation and the Didactic Program in Dietetics is currently granted approval status by the Commission on Accreditation/Approval for Dietetics Education of The American Dietetic Association, 216 W. Jackson Blvd., Chicago, IL 60606-6995, 312/899-4876.

Department of Human Development and Family Studies:
The Child Development Laboratory School is accredited by the National Academy for Early Childhood Programs and licensed by the Iowa Department of Human Services; Early Childhood, Birth-Grade 3 is approved by the Iowa Department of Education; Early Childhood Education-Unified is approved by the Iowa Department of Education; Marital and Family Therapy (Ph.D. only) is approved by the Commission on Accreditation for Marriage and Family Therapy Education.

Curricula in Family and Consumer Sciences

The College of Family and Consumer Sciences is fully accredited by the American Association of Family and Consumer Sciences Council for Accreditation. The curricula are planned to meet a variety of academic interests, abilities, and goals of the student. Each curriculum requires depth in a discipline. Breadth is acquired through general education, the College core, and careful use of electives.

Apparel Merchandising, Design, and Production—Options: Merchandising; Design; Production
Child, Adult, and Family Services—Options: Child Programs; Youth Programs; Adult Programs; Family Programs; Policy and Advocacy
Dietetics
Early Childhood Education
Family and Consumer Sciences Education and Studies—Options: Teacher Licensure; Educational Services; General Studies
Family Resource Management and Consumer Sciences—Options: Family Resource Management and Consumer Sciences; Family Financial Counseling
Food Science—Options: Food Science and Technology; Consumer Food Science; Food Science and Industry
Hotel, Restaurant, and Institution Management
Housing and the Near Environment
Nutritional Science

Minors

Minors are available to all Iowa State students including family and consumer sciences majors. Minors consist of at least 15 credits and are available in the following areas:
Apparel Merchandising, Design, and Production
Child, Adult, and Family Services
Educational Services in Family and Consumer Sciences
Family Resource Management and Consumer Sciences
Food Safety (interdepartmental minor)
Gerontology (interdisciplinary minor)
Hotel, Restaurant, and Institution Management
Housing and the Near Environment
Nutrition
See *Index* for minor requirements for specific departments and programs.

Special Interest Programs

International and Cross Cultural Programs

Study abroad opportunities are available and encouraged through the College of Family and Consumer Sciences to broaden international and cross-cultural perspectives. Scholarships and other forms of financial assistance are available which provide partial support for students studying abroad. The College has established programs with Glasgow Caledonian University, Glasgow, Scotland; University of Otago, Dunedin, New Zealand; and the International College of Hospitality Administration, Brig, Switzerland. Students also study at the London College of Fashion, London, England; Paris American Academy, Paris, France; and participate in group study abroad programs to Europe, Africa, Costa Rica, Peru, and Mexico. Other opportunities may be developed through consultation with the associate dean of undergraduate programs and the student's adviser; for example, students have acquired internships and studied in such countries as Kenya, Spain, Puerto Rico, Ireland, Guatemala, Switzerland, England, Australia, Germany, and France. Faculty members bring diversity and global perspectives to instruction and research through their work in India, South Korea, Central and South America, Pakistan, Africa, and Europe.

Honors Program

High achieving students, with a grade point average of above 3.35, are invited to apply to the Honors Program. Honors students are encouraged to develop a creative program of study expanding their interests while meeting individual educational objectives. Students in the Honors Program also participate in University Honors Seminars and complete an honors project. For further information, contact the College Honors Committee or academic adviser. Also see *Index, Honors Program*.

Dietetics Internship (DI)

This postbaccalaureate program, administered by the Department of Food Science and Human Nutrition, has initial accreditation from the American Dietetic Association (ADA). The purpose of the program is to enable those who meet the academic requirements of the ADA to obtain at least 900 hours of practice supervised by registered dietitians in medical nutrition therapy, community nutrition, and foodservice management to meet ADA performance requirements for entry level dietitians.
Students who satisfactorily complete the DI will be eligible to take the national registration examination administered by the Commission on Dietetic Registration.

Information for Prospective Students

Open Option Status

The College of Family and Consumer Sciences offers an open option for entering students who have not selected a specific area of study. Family and Consumer Sciences Orientation (FCEdS 110) helps students explore the opportunities available. Program planning information can be obtained from general college advisers.

Secondary School Preparation

Preparation required for admission is: 4 years English/language arts; 3 years mathematics; 3 years science; 2 years social studies.

Advising System

Each student in the College of Family and Consumer Sciences works closely with an academic adviser. Freshmen are advised by general college advisers. After the freshman year, each student is assigned an adviser in the department of the chosen curriculum. Freshmen students in Food Science and Human Nutrition are advised by a departmental adviser. The adviser assists the student in making adjustments to the university and provides information and guidance on course work, opportunities for professional and personal development and career choices.

Planned Transfer Programs

By careful planning with the College of Family and Consumer Sciences Academic Programs Office, students may begin their education at another college, then transfer their courses to a curriculum within the College of Family and Consumer Sciences with maximum efficiency in meeting the degree requirements. The College has developed program-to-program transfer plans with community colleges in Iowa and surrounding states. In addition, personalized plans may be developed for students attending other colleges. For more information, call 1-800-522-0683 or contact the associate dean for undergraduate programs, College of Family and Consumer Sciences, 124 MacKay, Iowa State University.

Families Extension

Students may prepare for a career in the Cooperative Extension Service by enrolling in any curriculum in the College of Family and Consumer Sciences that provides them with a broad subject matter base for conducting educational programs for families. Advice on choice of courses should be sought from the Family and Consumer Sciences Education and Studies program, the associate dean and director of Iowa State University Extension to Families programs, the director of Iowa State University Extension to Youth and 4-H programs, or the Extension Human Resources office.

Preparation for Graduate Study

Students considering graduate studies should gain background knowledge in basic subjects related to their area of interest. Undergraduate mathematics, statistics, and research methods courses are useful as preparation for advanced study in graduate school. Upon completion of graduate programs, students are qualified for leadership positions in public and private institutions and for teaching, research, and extension positions in colleges and universities.

Professional Career and Employment Opportunities in Family and Consumer Sciences

Employment of Family and Consumer Sciences graduates remains at a high level. The flexibility of College of Family and Consumer Sciences programs allows for a wide range of career opportunities in diverse areas such as government, industry, education, health and human services, business, extension, and community agencies, locally, nationally, and internationally. A few examples of the positions in these various fields are: dietitian; housing specialist; vocational family and consumer sciences teacher; infant, preschool, or special education teacher; hotel, club, or restaurant manager; financial counselor; apparel merchandiser, designer, or production specialist; food or textile researcher; food scientist; nutrition scientist; sales representative; early childhood educator; consumer product specialist; and supervisor for a human service agency.

Students may prepare for professional programs such as medicine, law, or health administration while pursuing a B.S. degree. The strength of the College programs lies in the capacity to enhance the graduate's ability to develop and deliver products, programs, or services to families and consumers, as well as to strengthen the communication and leadership skills needed in representing the interests of families and consumers.

General Education

Each department within the College requires students to select and/or elect courses to fulfill a specific number of credits in prescribed areas.

Minimum Group Requirements in the College of Family and Consumer Sciences

Cr.	
9.5	I. Communications and Library
9	II. Natural sciences and mathematical disciplines
9	III. Social sciences
9	IV. Humanities
Var.	V. Family and Consumer Sciences Core Curriculum

Independent Study

Students may pursue independent work by enrolling in 490 courses in individual departments. No more than nine semester credits of independent study may be applied to a degree from the College of Family and Consumer sciences.

Curriculum in Apparel Merchandising, Design, and Production

Administered by the Textiles and Clothing Program. Leading to the degree bachelor of science. **Total credits required: 123** including a minimum of 18 credits in AMDP at Iowa State University for the degree.

The major in apparel merchandising, design, and production provides a broad based program of study with flexibility in creating program options. Courses are required in the following groups: general education, family and consumer sciences core, and textiles and clothing core. To complete the program, a student combines structured clusters of courses to form primary and secondary program options.

A minor in apparel merchandising, design, and production is available; the requirements appear under *Textiles and Clothing, Courses and Programs.*

Cr.	Degree Requirements
12.5	Communications and library
6.5	Engl 104, 105; Lib 160
3	Select from ComSt 102, 214; HD FS 370, and Sp Cm 212
3	Select from Engl 302, 309, 314
17-21	Natural sciences and mathematical disciplines
3	FSHN 167
3-5	Select from biology, chemistry, geology, physics, zoology
3-4	Mathematics (Math 150 recommended for Merchandising and Production Options)
4	Com S 103
4-5	Stat 101 or 227
9	Social sciences
6	Econ 101; HD FS 102
3	Select from the approved FCS list
9	Humanities
6	Select from the FCS-approved list (all T C courses excluded except 257 and 342). Foreign language recommended.
3	One history or art history course. See approved list. For design primary option, course must be art history.

Professional courses

.5	Orientation - FCEdS 110
33-34	Textiles and clothing core
22	T C 131, 165, 204, 231, 245, 375, 410
3	Human studies Select from T C 342, 354, 355, 467
3-4	Product development Select from T C 225, 305, 321, 331, 404
3	International T C 362 or 472
2	T C 380, 381, or 470 (outside home state)

Primary options

Select one cluster from primary options

18-20	Merchandising
10	T C 375L, 376; Acct 284; Mkt 340
8-10	Select three courses from T C 377, 470, 472, 474; HRI 287; ADVRT 320; Mkt 410, 446, 448; Mgmt 370, 371
20	Design
14	T C 121, 225, 245L, 278, 495
3	Select from T C 321, 325, 326, 354, 355, 470
3	Select from Art 108, 130
15-19	Production/Apparel Engineering
12-16	T C 331, 470; Acct 284; I E 271
3	Select from: I E 375; I Tec 360, 408; POM 320

Secondary options

Select a second cluster from the remaining primary option areas or from the secondary option areas.

9-10	Business/Entrepreneurship
3	Select from T C 472 or 474
6-7	Select two courses from Acct 215 or 285; Econ 301, 355, 385; Fin 350; HRI 287, Mgmt 310, 313, 370; Mkt 340; MIS 330; POM 320; TrLog 360
9	Consumer behavior/marketing
6	T C 467; Mkt 340*
3	Select from T C 470, 499; Advrt 230; Hist 376; HRI 440; Jl MC 205, 220; Mkt 410, 442, 444, 446, 447, 448
9	Creative Design
3	T C 326
6	Select from T C 321, 325, 355, 404; Art 130, ArtIS 208, 224, 229, 343, 344, 345, 346, 347
9	History/Theatre Costume
9	Select three courses from T C 257, 354, 355, 362, 470, 499; Art History; Thtre 106, 110, 255
9	Human Relations/ Communications
9	Select three courses from T C 467, 470, 499; ComSt 214, 218, 310, 314, 317; HD FS 370; Mgmt 370, 371; Psych 450, Soc 380, Sp Cm 212
9	Technical Design
6	Select two courses from T C 121, 225, 305, 321, 325, 404, 470, 499
3	T C 331**
9-10	Quality Assurance
6	T C 305, 331**
3-4	Select from T C 404, 470, 499; I E 271, 361; I Tec 360; Stat 495
9-11	International Trade
3	T C 362 or 472
6-8	Choose credits from one foreign language or 6 credits from T C 381, Anthr 323, 325, 326, 417, 418, 436; FCEdS 421; IntSt 120, 220, 235; Mgmt 414; Mkt 448; TSC 341

Electives

Select courses to broaden or complement the options (see adviser).

123	Total credits

* If Merchandising primary option, must select another course from approved list.

** If Production/Apparel Engineering primary option, must select another course from approved list.

Curriculum in Child, Adult, and Family Services

Administered by the Department of Human Development and Family Studies. Leading to the degree bachelor of science. **Total credits required: 128.**

The child, adult, and family services curriculum, with options in child programs, youth programs, adult programs, family programs, and policy and advocacy, prepares students for professional work with children, adults, and families in a variety of public and private human service agencies and organizations. Examples include schools, child care programs, youth programs, adult programs, services to the elderly, community action, policy/advocacy work, and crisis intervention.

A minor in child, adult, and family services is available; the requirements appear under *Human Development and Family Studies, Courses and Programs.*

The following requirements are for the child programs, youth programs, adult programs, family programs, and policy and advocacy options:

Cr.	Degree Requirements
12.5	Communications and library
9.5	Engl 104, 105; Lib 160; Sp Cm 212
3	Select from Engl 302, 309, 314
12-14	Natural sciences and mathematical disciplines
3-4	Stat 101 or Math 105, 140, 142, 150, 165
3	Select from biology or zoology
3-4	Com S 103 or C I 201
3	Select from natural sciences or statistics
9	Social sciences*
	Select from anthropology, economics, political science, psychology, sociology
9	Humanities*
	Select from approved list.
9.5	Family and consumer sciences core
	Select from HDFS approved list
17	HD FS core
14	HD FS 269, 449, 491
3	Select HD FS other than declared child, adult and family services option
17	Child, Adult, and Family Services core
14	HD FS 218, 349, 367, 370, 395
3	HD FS 239 or 283
24	Child Programs Option
6	HD FS 220, 221
4	HD FS 340 or 343
3	HD FS 445 or 486
11	HD FS 240, 345 or 460; C I 250; H S 105
24	Youth Programs Option
6	HD FS 226, 227
3	HD FS 276
3	HD FS 486
3	HD FS 360, C I 250, or Psych 436
9	Select from HD FS 479; Sp Cm 110, H S 215, 395; Soc 241, 330, 331, 340, 371, 473; Psych 422
24	Adult Programs Option
6	HD FS 276, 377
3	HD FS 226 or 227
3	HD FS 360 or Soc 463
3	HD FS 486
9	Select from HD FS 341, 373, 448, 479; H S 395; Soc 330, 331; Sp Cm 110, 323; Psych 422
24	Family Programs Option
12	HD FS 276, 377, 479, 486
3	HD FS 360, 463; Psych 436
3	Select from HD FS 220, 221, 226, 227
6	Select from HD FS 270, 373; Soc 330, 331, 485; Phil 333; Psych 422; Sp Cm 110, 323
24	Policy and Advocacy Option
3	HD FS 239 or 341
6	Select from HD FS 220, 221, 226, 227, 377
3	HD FS 380
3	HD FS 445 or 486
3	Pol S 215 or 344
3	Select from HD FS 360, 463; Psych 436
3	Select from Sp Cm 312, 321, 323, 324, 325, 327
16-18	Electives
128	Total Credits

*Courses in these areas may be used to meet the CFCS core requirement.

Curriculum in Dietetics

Administered by the Department of Food Science and Human Nutrition.

The student is prepared for admission to dietetic internship programs and other professional experience programs approved/accredited by The American Dietetic Association. Courses included have been approved as meeting the academic requirements of The American Dietetic Association. There is a $30 fee for a statement of verification of completion of the approved program.

Cr.	Degree Requirements*
9.5	Communications
	Engl 104, 105; Lib 160; ComSt 214 or Sp Cm 212
6-7	Mathematical sciences
	3 credits in college-level math; Stat 101 or 104
9	Physical sciences
	Chem 163, 163L, 231, 231L
19	Biological sciences
	BBMB 301; Biol 201, 202; Micro 201; Zool 255, 256; 2 cr. in laboratory: BBMB 311 or Zool 255L and 256L
9	Social sciences
	Psych 101; 6 additional credits*
9	Humanities*
40	Food science and human nutrition
	FS HN 110, 167, 203, 214, 261, 340, 360, 361, 362, 403, 411, 461, 463, 464, 466, 480
11	Management
	HRI 380, 380L, 391, 392
7-8	Electives
120.5	Total credits

*Additional degree requirements: Students must fulfill international perspectives, U.S. diversity, ethics, and CFCS core requirements by selecting coursework from approved lists. These courses may be used to fulfill other area requirements.

Curriculum in Early Childhood Education

The curriculum in early childhood education is planned for students preparing to teach young children and work with their families. This program leads to careers in working with young children who are typically developing and those with special needs from birth through age eight. Graduates in this curriculum may teach in early childhood (preschool and primary) classrooms and home based programs, with emphasis on inclusive services; graduates may be employed by either public or private agencies or schools. This curriculum has been approved by the Iowa Department of Education and meets the requirements for the early childhood education unified teacher license, which permits individuals to teach general and special education for children from birth through age eight. The program is administered jointly by the Department of Human Development and Family Studies within the College of Family and Consumer Sciences, and the Department of Curriculum and Instruction within the College of Education.

For details concerning the professional teacher education requirements and admission to the undergraduate teacher education program, see *Index, Teacher Education, Courses and Programs.*

Foreign Language Requirement
Early childhood education majors must satisfy a graduation requirement equivalent to the first year of university-level study in one foreign language (normally, completion of a two-semester sequence in any one foreign language). The requirement may be met by completion of three or more years of high school study in one foreign language. Students who have completed three or more years of French, German, or Spanish in high school may not receive graded credit for 101-102 in those languages; test-out credit (T credit) may be obtained by passing an appropriate examination or by completing an advanced sequence (200-level or higher) in that language. If these students choose to take 101-102 on a remedial basis, they will be graded S-F.

Cr.	Degree Requirements
9.5	Communication skills
6.5	Engl 104, 105; Lib 160
3	Select from communications options list
12	Natural sciences and mathematics disciplines
6	FS HN 167; Math 195
3	Select from physical sciences
3	Select from biological sciences
9	Social sciences*
3	American history or American government
6	Select from approved list
9	Humanities*
	Select from approved list
2	Health, Safety
	H S 105
12	Human development and family studies*
9	HD FS 102, 220, 221
3	Select from HD FS 349, 395, 445, 449, 460
15-15.5	Professional education core
15	C I 201, 204, 250, 332, 406
R-.5	Orientation: FCS or Educ
	FCEdS 110 or C I 115 or 315; C I 215 (ECE-E only)
21	Preprimary: Inclusive
	HD FS 240, 340, 343, 345, 455, 456
21-24	Primary: Inclusive
	C I 245, 268, 367, 433 or 443, 438 or 448 (if prerequisites are met), 439 or 449, 468F, 468G, 468I; Sp Ed 355, 368, 455
16	Student teaching: preprimary and primary (inclusive)
	Sp Ed 415 and HD FS 417B or C I 416A and HD FS 417C
0-3	Electives
129.5-130	Total credits

*Courses in these areas may be used to meet the CFCS core requirement.

Curriculum in Family and Consumer Sciences Education and Studies

Administered by the Family and Consumer Sciences Education and Studies Program. Leading to the degree bachelor of science. **Total credits required: 123.**

This curriculum provides a broad-based program of study focusing on preparation for professional careers related to education or community participation. Courses are required in general education and the family and consumer sciences core. Students select one program option.

There are three choices for this curriculum. Option 1, teacher licensure, Option 2, educational services, and Option 3, general studies. In all options, students are prepared with a broad-based understanding of family and consumer sciences.

Option 1, teacher licensure, is designed for students seeking careers as family and consumer sciences educators in a variety of settings such as middle, junior, and senior high schools. With additional credits students may also be approved to teach in specific occupational areas: child care, fashion merchandising, and foodservice. Further information about licensure programs appears under *College of Education.*

Option 2, educational services, is designed for students seeking careers in extension, business, community agencies, community colleges, and adult education programs.

Option 3, general studies, is designed to provide students with the opportunity to pursue an individualized program which is planned with their academic advisers. Opportunities to participate in study abroad, international internships, field study, and international supervised student teaching experience build a solid base for work in a global world.

The program offers a minor in educational services in family and consumer sciences; the requirements appear under Family and Consumer Sciences Education and Studies, Courses and Programs.

Cr.	Degree Requirements
9.5	Communications and library
6	Engl 104, 105
3	Select from: ComSt 102, 214 218, HD FS 370, Sp Cm 212
0.5	Lib 160
9	Natural sciences and mathematical disciplines
3	Zool 155 or Biol 109
3	Select a course from the mathematical disciplines (Teacher licensure option must select Math course)
3	Select additional course in natural science. (Both teacher licensure option and educational services option must complete Chem 160 or high school chemistry)
9	Social sciences
3	Econ 101
3	Soc 134
3	Select from anthropology, economics, psychology, sociology
9	Humanities
9	Courses from approved list (Teacher licensure must complete 3 cr. of American history or American government)
13.5	Family and Consumer Sciences Education and Studies core
	FCEdS 110, 160, 206, 306, 379, 421

Option 1: Teacher Licensure

73	Additional Professional Courses
25	FCEdS 318, 403, 413, 417A, 417B, 460
6	FSHN 111, 167
12	HD FS 102, 276, 349, 488
9	220, 221 or 226; 239; 283 or 483
3	T C Select one course
15	C I 201, 204, 333, 406, 415, 426
3	Select from: Anthr 417; T C 342, 362; Phil 340
123	Total Credits

Option 2: Educational Services

73	Additional Professional Courses
12	FCEdS 415, 418A, 460
6	FSHN 111, 167
9	HD FS 102, 370, 488
9	HD FS 220, 221, or 226; 239; 283 or 483
3	HD FS 474 or T C 474 or HRI 474
3	T C Select one course
9	Select from FCEdS, FSHN, HRI, HD FS, T C
3	HRI 287, Mgmt 370, or Mkt 340
3	Engl 302, 309, 313, 314, or Sp Cm 312
3	JI MC 205
3	Select from: Anthr 417; T C 342, 362; Phil 340
10	Electives
123	Total Credits

Option 3: General Studies

73	Additional Professional Courses
6-11	FCEdS 415, 418B
9	HD FS 102, 283, 488
3	HD FS 474 or T C 474 or HRI 474
3	FSHN 167
14-19	Select from FCEdS, FSHN, HRI, HD FS, T C
3	Select from: Anthr 417; T C 342, 362; Phil 340
3	Engl 302, 314; Jl MC 205; or Sp Cm 312
14	Natural Sciences, Social Sciences, Humanities, Art and Design
13	Electives
123	Total Credits

Occupational teaching areas available:
Child care: HD FS 220, 221, 340, 343, 445
Fashion merchandising: T C 131, 165, 375, 376, 377, Com S 103
Foodservice: Biol 109, Micro 201 or HRI 233, HRI 333, 380, 380L, 438

Curriculum in Family Resource Management and Consumer Sciences

Administered by the Department of Human Development and Family Studies. Leading to the degree bachelor of science. **Total credits required: 128**

This curriculum focuses on the behavior of families as they allocate and manage their resources and function as consumers. Upon graduation, the student will be prepared to advise clients in the wise use of personal resources, in effective money management, and in sound financial planning. A minor in family resource management and consumer science is available; the requirements appear under *Human Development and Family Studies, Courses and Programs*.

Cr.	Degree Requirements
12.5	Communications and library
9.5	Engl 104, 105, Sp Cm 212, Lib 160
3	Select from Engl 302, 309, 314
13-14	Natural sciences and mathematical disciplines*
6	Select from natural or biological sciences or mathematics or statistics
3-4	Com S 103 or 107
4	Stat 101
15	Social sciences*
6	Econ 101 and 102
9	Select from anthropology, economics, political science, psychology, sociology
9	Humanities* Select from approved list
9.5	Family and consumer sciences core Select from HD FS approved list.
17	HD FS core
14	HD FS 269, 449, 491
3	Select HD FS other than family resources management curriculum

Option 1. Family Resource Management and Consumer Sciences

Cr.	Degree Requirements
12	HD FS 283, 395, 483, 488
3	HD FS 380 or Acct 215
6	Select from HD FS 239, 341, 360, 370, 377, 448, 489
12	Select from accounting, economics, finance, history, journalism, management, marketing, political science, psychology, sociology
18-19	Electives
128	Total credits

Option 2. Family Financial Counseling

Cr.	Degree Requirements
29	HD FS 283, 341, 370, 483, 488, 489, 489L; Acct 284; Econ 353; HD FS 380 or Acct 215
3	Select from HD FS395, 448, Soc 305, Psych 280
19-20	Electives
128	Total credits

*Courses in these areas may be used to meet the CFCS core requirement.

Curriculum in Food Science

Administered by the Department of Food Science and Human Nutrition.

Option 1. Food Science and Technology

Cr.	Degree Requirements*
9.5	Communications Engl 104, 105; Lib 160; ComSt 214 or Sp Cm 212
11-12	Mathematical sciences Math 165 and 166, or 181 and 182; Stat 101 or 104
23	Physical sciences Chem 177, 177L, 178, 331, 331L, 332; Phys 111, 112
13	Biological sciences BBMB 301; Biol 201, 202; Micro 302, 302L
9	Social sciences*
9	Humanities*
39	Food science and human nutrition FS HN 110, 167, 203, 311, 351, 403, 405, 406, 410, 412, 420, 421, 471, 472, 480
6-7	Electives
120.5	Total credits

*Additional degree requirements: Students must fulfill international perspectives, U.S. diversity, and CFCS core requirements by selecting coursework from approved lists. These courses may be used to fulfill other area requirements.

Option 2. Food Science and Industry

Cr.	Degree Requirements*
12.5	Communications Engl 104, 105; Lib 160; Jl MC 205, 220, or 347; ComSt 214 or Sp Cm 212
7-8	Mathematical sciences Math 160; Stat 101 or 104
16	Physical sciences Chem 163, 163L, 164, 231, 231L; Phys 106
13	Biological sciences BBMB 301; Biol 201, 202; Micro 201 and 201L, or 302 and 302L
9	Social sciences Econ 101; select 6 additional credits*
6	Business Select 6 credits from Acct 215, 284, 285; Econ 301, 320, 322; Mgmt 310, 370, 371, 414, 472; MIS 330; Mkt 340, 447, 448
9	Humanities*
42	Food science and human nutrition FS HN 110, 167, 203, 272, 311, 351, 403, 405, 406, 410, 412, 420, 421, 471, 472, 480
5-6	Electives
120.5	Total credits

*Additional degree requirements: Students must fulfill international perspectives, U.S. diversity, and CFCS core requirements by selecting coursework from approved lists. These courses may be used to fulfill other area requirements.

Option 3. Consumer Food Science

Cr.	Degree Requirements*
18.5	Communications Engl 104, 105; Jl MC 205, 220, 347; Lib 160; ComSt 214 or Sp Cm 212
6-7	Mathematical sciences 3 cr. college-level math; Stat 101 or 104
13	Physical sciences Chem 163, 163L, 231, 231L; Phys 106
18-19	Biological sciences BBMB 301; Biol 201, 202; Micro 201 and 201L, or 302 and 302L; Zool 255, 256
12	Social sciences Econ 101; Mkt 340, 447; 3 additional credits*
9	Humanities*
38	Food science and human nutrition FS HN 110, 167, 203, 214, 261, 272, 311, 403, 405, 406, 411, 412, 420, 480
4-6	Electives
120.5	Total credits

*Additional degree requirements: Students must fulfill international perspectives, U.S. diversity, and CFCS core requirements by selecting coursework from approved lists. These courses may be used to fulfill other area requirements.

Curriculum in Food Science and Technology-B.S./M.S.

Administered by the Department of Food Science and Human Nutrition.

Undergraduate Program:

Cr.	Degree Requirements*
9.5	Communications and library Engl 104, 105; Lib 160; ComSt 214 or Sp Cm 212
11-12	Mathematical sciences Math 165 and 166, or 181 and 182; Stat 101 or 104
23	Physical sciences Chem 177, 177L, 178, 331, 331L, 332; Phys 111, 112
13-16	Biological sciences BBMB 404 and 405, or 420; Biol 201, 202; Micro 302, 302L
9	Social sciences*
9	Humanities*
39	Food science and human nutrition FS HN 110, 167, 203, 311, 351, 403, 405, 406, 410, 412, 420, 421, 471, 472, 480
3-7	Electives
120.5	Total credits

*Additional degree requirements: Students must fulfill international perspectives, U.S. diversity, and CFCS core requirements by selecting coursework from approved lists. These courses may be used to fulfill other area requirements.

Graduate Program:

Cr.	Degree Requirements
30	Graduate-level coursework including research

Curriculum in Hotel, Restaurant, and Institution Management

Administered by the Hotel, Restaurant, and Institution Management Program. Leading to the degree bachelor of science. Total credits required: 127

The curriculum in Hotel, Restaurant and Institution Management develops students as leaders for the foodservice and lodging professions.

Cr.	Degree Requirements
12.5	Communications and library Engl 104, 105, 302; Lib 160; Sp Cm 212
13	Natural sciences and mathematical disciplines Math 104, 140 or 150; Stat 101; and 6 credits of natural sciences
12	Social sciences Econ 101; Psych 101; Soc 134, HD FS 102
9	Humanities T C 342 and courses from approved list.
33-34	Hotel, Restaurant, and Institution Management core HRI 101, 233, 287, 333, 352, 380, 380L, 393 or 491, 433, 438, 440, 460
11	Hotel, Restaurant, and Institution Management electives Select from HRI 260, 289, 383, 437, 439, 452, 455, 474, 480, 485, 487
19.5	Supporting courses Acct 215, 284; Com S 103; FS HN 111*, 167**; Mkt 340; FCEdS 110
16-17	Electives
127	Total credits

*A student who has not had high school chemistry is required to take Chem 160.
**A student who has not had high school biology is required to take Biol 109.

Curriculum in Housing and the Near Environment

Administered by the Department of Human Development and Family Studies. Leading to the degree bachelor of science. Total credits required: 128

The curriculum in housing and the near environment focuses on housing needs, issues, and trends, such as housing alternatives for families and children; housing for the elderly and persons with disabilities; housing finance, residential property management; and public policy. Graduates of this curriculum are prepared for employment in the housing industry, including housing-service organizations; public and private (profit and not-for-profit) agencies; real estate and lending institutions, housing management and administration; housing equipment/ furnishings industries; housing counseling and housing advocacy. A 15-credit minor in housing and the near environment is available; the requirements appear under *Human Development and Family Studies, Courses and Programs.*

Cr.	Degree Requirements
12.5	Communications and library
9.5	Engl 104, 105; Sp Cm 212; Lib 160
3	Select from Engl 302, 309, 314
9-11	Natural sciences and mathematical disciplines*
3	Select from natural sciences
3-4	Select from mathematics or statistics
3-4	Select from computer science
9	Social science* Select from anthropology, economics, geography, political science, psychology, sociology
9	Humanities* select from approved list.
9.5	Family and consumer sciences core Select from HD FS approved list
17	HD FS core
14	HD FS 269, 449, 491
3	Select HD FS other than housing curriculum
15	Housing HD FS 239, 341, 360, 460, 463
39	Related professional courses
6	Select from HD FS, T C, HRI, FCEDS, or FS HN
33	Select from accounting, anthropology, architecture, community and regional planning, design studies, economics, education, finance, gerontology, health studies, human development and family studies, interior design, management, marketing, political science, psychology, sociology, speech communication
6-8	Electives
128	Total credits

*Courses in these areas may be used to meet the CFCS core requirement.

Curriculum in Nutritional Science

Administered by the Department of Food Science and Human Nutrition.

Cr.	Degree Requirements*
9.5	Communications and Library Engl 104, 105; Lib 160; ComSt 214 or Sp Cm 212
7-12	Mathematical sciences 4 credits in calculus (2 semesters preferred); Stat 101 or 104
24	Physical sciences Chem 177, 177L, 178, 331, 331L, 332, 332L; Phys 111, 112
23	Biological sciences Biol 201, 201L, 202, 202L, 301, 302; Micro 302, 302L; Zool 355
9	Social Sciences*
9	Humanities*
29-30	Food science and human nutrition FS HN 110, 203, 214 or 311, 261, 360, 362, 463 or 466 or 565, 480; select at least 11 additional credits from FS HN 361, 403, 412, 419 or 519, 461, 463, 464, 466, 490C, 499, 553, 554, 562, 565, 575
4-10	Electives
120.5	Total credits

*Additional degree requirements: Students must fulfill international perspectives, U.S. diversity, and CFCS core requirements by selecting coursework from approved lists. These courses may be used to fulfill other area requirements.

Curriculum in Nutrition B.S./M.S.

Administered by the Department of Food Science and Human Nutrition.

Undergraduate Program:

Cr.	Degree Requirements*
9.5	Communications and library Engl 104, 105; Lib 160; ComSt 214 or Sp Cm 212
7-12	Mathematical sciences 4 credits in calculus (2 semesters preferred); Stat 101 or 104
24	Physical sciences Chem 177, 177L, 178, 331, 331L, 332, 332L; Phys 111, 112
20-22	Biological sciences BBMB 404 and 405, or 420; Biol 201, 201L, 202, 202L; Micro 302, 302L; Zool 355
9	Social sciences*
9	Humanities*
29-30	Food science and human nutrition FS HN 110, 203, 214 or 311, 261, 360, 362, 463 or 466 or 565, 480; select at least 11 additional credits from: FS HN 361, 403, 412, 419 or 519, 461, 463, 464, 466, 490C, 499, 553, 554, 562, 565, 575
5-13	Electives
120.5	Total credits

*Additional degree requirements: Students must fulfill international perspectives, U.S. diversity, and CFCS core requirements by selecting coursework from approved lists. These courses may be used to fulfill other area requirements.

Graduate Program:

Cr.	Degree Requirements
30	Graduate-level coursework including research

College of Liberal Arts and Sciences

Peter W. Rabideau, Dean
Zora D. Zimmerman, Associate Dean
Steven R. Rodermel, Associate Dean
Michael B. Whiteford, Associate Dean
Ruth W. Swenson, Associate Dean Emerita

Departments of the College

Air Force Aerospace Studies
Anthropology
Biochemistry, Biophysics, and Molecular Biology
Botany
Chemistry
Computer Science
Economics
English
Foreign Languages and Literatures
Geological and Atmospheric Sciences
Greenlee School of Journalism and Communication
History
Mathematics
Military Science
Music
Naval Science
Philosophy and Religious Studies
Physics and Astronomy
Political Science
Psychology
Sociology
Statistics
Zoology and Genetics

In the College of Liberal Arts and Sciences, students select from a wide and rich range of program options. The goal of the college is to prepare the student to enter the world beyond the university with skills in reasoning, analysis, and communication; with an appreciation of history and culture, an understanding of the challenges of the future, and a sensitivity toward people and their environments. To achieve this goal, the college asks students to acquire depth in learning within disciplines of their own choice, by way of single or multiple majors and breadth through elective courses and courses fulfilling general education requirements.

The College of Liberal Arts and Sciences is the academic home, the foundation, for many essential learning disciplines. The college provides students with all the components of a modern liberal education. Students may choose to study in various fields of the physical, biological, and social sciences; in mathematical disciplines; in methods and systems of communication; and in the arts and humanities.

The flexible degree requirements in the curriculum in Liberal Arts and Sciences permit programs of study suited to a variety of interests and goals. Students having academic interests not fully met by a departmental major may pursue a major offered by one of the College's interdepartmental programs or may apply for an undergraduate major in interdisciplinary studies (See *Index, Liberal Arts and Sciences, Cross-Disciplinary Studies*). The college participates in the University Honors Program; thus, students of exceptional academic promise can develop unique and challenging programs of study.

The college has three curricula: a curriculum in Liberal Arts and Sciences, leading to the bachelor of arts or the bachelor of science degree; a curriculum in music, leading to the bachelor of music degree; and a curriculum in liberal studies, leading to the bachelor of liberal studies degree.

High School Preparation/ Admission Requirements

Students entering the college are required to present evidence of the following high school preparation:

4 years of English (Typically this preparation includes courses in British, American, and world literature in which critical reading and writing skills are emphasized and courses in speech and composition, including at least one senior-level writing course.)

3 years of social studies (Typically such preparation includes two semesters of world history, two semesters of American history, and a semester of American government. Electives can be chosen from areas such as economics, sociology, or psychology.)

2 years of a single foreign language (Three years or more of a single foreign language are strongly recommended for students who wish to continue their work in that language. A minimum of three years of a single foreign language is required to fulfill the foreign language graduation requirement in the College of Liberal Arts and Sciences.)

3 years of mathematics (Such preparation shall include two semesters of beginning algebra, two semesters of geometry, and two semesters of intermediate algebra. A fourth year of study involving analytic geometry, trigonometry, linear algebra, and/or calculus is strongly recommended for students who will major in mathematical or scientific disciplines.)

3 years of science (At least two years of such preparation shall be chosen from biology, chemistry, and physics.)

Recommended but not required as a condition of admission to the College of Liberal Arts and Sciences is one semester of computer experience. (Such a course should stress problem-solving with computers and should not substitute for courses in mathematics. In schools where computer use is an integral part of most courses, separate instruction in computers is not necessary.)

Students who transfer from another college or university with at least 24 credits of satisfactory coursework may be exempt from most of these requirements. Students who do not meet the requirements listed here may be admitted with a limited number of deficiencies. Contact the college office for further information about resolving these deficiencies.

Transfer Students

To graduate from the College of Liberal Arts and Sciences, a transfer student must complete the general requirements of the college as well as those of the university. Students planning to transfer to Iowa State University for the purpose of enrolling in the College of Liberal Arts and Sciences are advised to contact the college office for information concerning degree program requirements. Prospective transfer students are urged to learn about the academic programs that are of interest to them well before arriving on campus so that pretransfer courses are appropriate to the planned major and transferable toward graduation from ISU. Additional information concerning transfer credit evaluation may be obtained through the Office of Admissions as well as the department in which a student is interested.

A transfer student in the College of Liberal Arts and Sciences may choose to graduate under the catalog in effect at the time of his or her graduation or under one of the two immediately preceding catalogs, provided that it covers the period of his or her enrollment either at Iowa State or any other accredited school. Full requirements of the chosen catalog must be met except that adjustments will be made in instances where courses are no longer available or where programs have been changed. A transfer student is responsible for reviewing his/her transfer credit evaluation with the academic adviser during the first semester of enrollment.

University Requirements

The university requirements for the bachelor's degree, including statements of academic standards, the university residence requirement, the English proficiency requirement, U.S. diversity and international perspectives requirement, and the library requirement, appear in the Colleges and Curricula portion at the beginning of this bulletin.

Curriculum in Liberal Arts and Sciences

To obtain a bachelor's degree from the College of Liberal Arts and Sciences, curriculum in liberal arts and sciences, an undergraduate student must earn a minimum of 124.5 semester credits including a minimum of 32 semester credits earned in residence at Iowa State University. In addition, the student must meet general education, English proficiency, library proficiency, foreign language, and

advanced credit requirements, as well as the requirements of a major. Courses taken on a pass/not pass basis may be counted toward the required total of 124.5 credits, and may be used to meet the advanced credit requirement, if appropriate, but may not be used to satisfy any other graduation requirement. No more than 9 credits of 490 (Independent Study) courses in a single discipline may be counted toward graduation.

General Education Requirements

Students must earn the minimum credits listed in each of the four general education groups in courses outside the department of the first major listed on the degree program. Interdisciplinary courses may be used to satisfy requirements in any group for which they have been approved, but a student may not apply the same course to more than one group.

Credit by Examination Program

Individual departments may use CLEP Subject Tests for testout of specific courses. Students in the College of Liberal Arts and Sciences may use CLEP General Test credits as free electives but not toward any of the general education group requirements.

General Education Groups

I. Arts and humanities (minimum 12 credits). The student should develop an understanding of human cultural heritage and history, and an appreciation of reasoning and the aesthetic value of human creativity.*

II. Verbal communication (minimum 2 credits). The student should develop skill in and an understanding of the principles involved in effective communication among people.*

III. Natural sciences and mathematical disciplines (minimum 11 credits including 3 in the mathematical disciplines and 8 in the natural sciences). The student should experience science as a rational search for understanding the structure and behavior of the natural world, and should appreciate mathematics as a valuable tool of the sciences and as an intrinsically important way of thinking.*

IV. Social sciences (minimum 9 credits). The student should develop an appreciation of the principal methods of studying human behavior and an understanding of the structure and functioning of institutions. Courses must be taken in at least two disciplines represented in Group IV.*

*Lists of approved courses are available from advisers or the Office of the Dean, College of Liberal Arts and Sciences.

Other Requirements

English Proficiency

The faculty of Iowa State University believes that its graduates should acquire competence in written communication during their undergraduate careers. All students must earn an average grade of C– or better in required basic composition courses (e.g., Engl 104 and 105). This should be regarded as a minimally acceptable grade standard. Departments may have stricter criteria as appropriate to their disciplines.

The continued development of communication skills following the freshman year is the responsibility of the student's major department. The department shall promote this development by adopting measures to certify the writing proficiency of its own majors. Certification is to occur a reasonable time before graduation and shall be based upon satisfactory completion of a designated course in the student's program in which writing is evaluated or an advanced writing course offered in the English department (e.g. Engl 302, 305, or 314).

Library Proficiency

A library minimum proficiency requirement must be met by satisfactory completion of one of the following options:
1. Library 160
2. A test-out examination for credit to be administered by the library staff, who will control the testing procedure and will determine those students who are eligible to take the examination.

Foreign Language Requirement

The faculty of the College of Liberal Arts and Sciences believes that undergraduate students should acquire elementary practical experience in a second language, should be introduced to the theoretical study of language structure, and should begin to develop an understanding of a second culture through study of that culture's language. As a means of achieving this objective, a student must satisfy a graduation requirement equivalent to the first year of university-level study in one foreign language (normally, completion of a two-semester sequence in any one foreign language).

Students who have completed three or more years of high-school foreign language study are deemed to have completed the LAS Foreign Language requirement. These students may not enroll in or receive credit for 101-102 or 110 in those languages; test-out credit may be obtained by passing an appropriate examination or by completing an advanced sequence (200-level or higher) in that language. 101-102 may not be taken on a remedial basis.

Students who have completed more than one year but less than three years of high-school foreign language study may not enroll in 101 in the same language. These students may satisfy the foreign language requirement by (a) passing the exam for credit at the 102 level, (b) receiving a passing grade in a 102 foreign language course, or (c) receiving a passing grade in a foreign language course at the 200-level or higher. For more information see *Department of Foreign Languages and Literatures.* (Courses taught in English do not satisfy the foreign language requirement).

Certification in American Sign Language is recognized by the University and satisfies the LAS foreign language requirement.

Students with disabilities who need to satisfy the foreign language requirement may direct questions to the Advising Coordinator in the Foreign Language Department and the Disability Resource Office.

Credits applied toward the foreign language requirement cannot be used to satisfy the general education requirements, but students who have fulfilled the foreign language requirement may apply additional courses in foreign languages toward the appropriate general education groups.

Majors in any foreign language are deemed to have fulfilled the college foreign language requirement. International students for whom English is a second language may satisfy the foreign language requirement by completion of Engl 104 and 105 at ISU with an average grade of C– or better. See Foreign Languages and Literatures for additional information on international students.

Advanced Credit Requirements

To obtain a baccalaureate degree from the College of Liberal Arts and Sciences, curriculum in liberal arts and sciences, a student must earn at least 45 credits at the 300 level or above taken at a four-year college. Credits earned in electives taken on a pass/not pass basis or in the major or a minor may be used to meet this requirement.

Major

Students must complete the requirements of a major which will include 24 to 48 credits in the major discipline as specified by the major department or program. Tracks within a major must have a common 24 credit core. Some courses outside the major discipline may also be required as supporting work for the major. (See Index for page reference to individual department and program requirements.)

The major must contain at least 8 credits in courses taken at Iowa State University that are numbered 300 or above and in which the student's grade is C or higher. In addition, the average grade of all courses in the major (those courses listed under major on the degree audit) must be 2.0 or higher. Courses from the first major listed on the degree program may not be counted in the general education groups.

Courses in general education may be counted in meeting the requirements of additional majors. When choosing an additional major, students must confirm that the additional major is not prohibited (see list under "*Double Majors*").

The major shall be chosen from the following list, which also indicates the degree(s) offered in the respective majors.

Advertising, B.A.
Anthropology, B.A., B.S.
Applied Physics, B.S.
Biochemistry, B.S.
Biological/Pre-Medical Illustration, B.A.
Biology, B.S.
Biophysics, B.S.
Botany, B.S.
Chemistry, B.A., B.S.
Communication Studies, B.A.
Computer Science, B.S.
Earth Science, B.A., B.S.
Economics, B.A.*, B.S.
English, B.A., B.S.
Environmental Science, B.S.
Environmental Studies (may be taken as a second major with the degree to be determined by the first major)
French, B.A.
Genetics, B.S.
Geology, B.S.
German, B.A.
History, B.A., B.S.
Interdisciplinary Studies, B.A., B.S.
International Studies (may be taken as a second major with the degree to be determined by the first major)
Journalism and Mass Communication, B.A., B.S.
Linguistics, B.A.
Mathematics, B.S.
Meteorology, B.S.
Music, B.A., B. Mus.
Performing Arts, B.A.
Philosophy, B.A.
Physics, B.S.
Political Science, B.A.
Psychology, B.A., B.S.
Religious Studies, B.A.
Russian Studies, B.A.
Sociology, B.A., B.S.
Spanish, B.A.
Speech Communication, B.A., B.S.
Statistics, B.S.
Technical Communication, B.S.
Women's Studies, B.A., B.S.
Zoology, B.S.

*Available only to students who were enrolled as majors before the 1995-1996 year. (See *Index, Economics*.)

The major in interdisciplinary studies (B.A., B.S.) is available for undergraduate students who have unique interdisciplinary educational goals. Such a major is designed by the faculty and the student and is approved only when the educational goals cannot be met by a reasonable combination of existing majors, minors, and electives. (See *Index, Interdisciplinary Studies*.)

A curriculum in liberal studies leading to a bachelor of liberal studies degree (B.L.S.) is also available. (See *Index, Liberal Studies*.)

Double Majors

Students may elect a second major from the departments and program areas listed above, or from a major field offered for the bachelor's degree in another college of the university. Double majors between the following are prohibited: Chemistry with Biochemistry and Agricultural Biochemistry; Biology with Animal Ecology, Agricultural Biochemistry, Biochemistry, Botany, Genetics, Microbiology, and Zoology.

The major departments must then approve the degree program, and if those majors involve two colleges, both deans must approve. Such programs must fulfill the general education requirements of the college of the primary major. If one major leads to the B.A. degree and the other to the B.S. degree, the degree awarded will be the one offered by the department of the primary major.

If the primary major may lead to either a B.A. or a B.S., a student may choose to receive either degree. In all cases, the student must satisfy the requirements of each major and of the degree that is chosen for the primary major. Students with a primary major in another college who wish to take a second major in the College of Liberal Arts and Sciences are not required to meet the Liberal Arts and Sciences General Education and Foreign Language requirements. Majors from the Curriculum in Liberal Arts and Sciences may not be added to a Bachelor of Liberal Studies degree or a Bachelor of Music degree.

A student may earn two degrees in this curriculum with two appropriate majors and at least 30 additional credits. Either the B.A. or the B.S. in this curriculum may be earned with the bachelor of music. Any degree offered by this college may be earned together with a degree with a major in any other college of the university. For the requirements for two degrees, see *Index, Bachelor's Degree Requirements.*

Minor

A minor, which is optional, must consist of at least 15 credits, with at least 6 credits in courses numbered 300 and above taken at ISU with a grade of C or higher. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. (See *Index, Minors*.)

The following minors are offered by the college of Liberal Arts and Sciences:
Advertising
African American Studies
American Indian Studies
Anthropology
Astronomy
Biochemistry
Biological Illustration
Biology
Botany
Chemistry
Chinese Studies
Classical Studies
Criminal Justice Studies
Economics
Emerging Global Disease
English
Environmental Science
Environmental Studies
French
Genetics
Geology
German
History
International Studies
Journalism and Mass Communication
Latin
Linguistics
Mathematics
Meteorology
Military Studies
Music
Performing Arts
Philosophy
Physics
Political Science
Portuguese
Psychology
Religious Studies
Russian Studies
Sociology
Spanish
Speech Communication
Statistics
Technical Communication
Technology and Social Change
Women's Studies
Zoology

Courses applied toward the general education groups may be used to meet the requirements of a minor. (For restrictions, see the *Index, Minors*.)

If a student declares a minor and completes the requirements specified by the offering department/program, the minor will be recorded on the transcript.

Electives

Students will take additional courses, freely elected, sufficient to accumulate a total of 124.5 credits. These additional courses together with the general education courses may be used to meet the requirements of a minor or of another major, provided that they are taken on a graded basis.

Planning the Program of Study

Careful, comprehensive planning is important for meeting graduation requirements and taking advantage of the resources offered by the university. Each student is encouraged to work with his or her academic adviser in developing a four year plan as soon as possible after declaration of the major. A degree audit listing all completed courses and those remaining to be taken for fulfillment of the degree requirements in the student's chosen major is provided to the student and the adviser each semester. The student should review the audit each semester and consult with the adviser when changes are required. Any changes to the audit must be approved by the academic adviser and by the dean's office. It is essential that the audit be reviewed and updated in a timely fashion in order to avoid delay in the student's graduation.

During the first year, students should meet proficiency requirements in English and in library. They should also make progress toward meeting the general education requirements, a large part of which should be completed by the end of the second year. The third and fourth years should emphasize completion of the major (and minor, if elected) and of general education requirements, and should give the student an opportunity to take electives.

The Open Option

Recognizing the fact that many students entering Iowa State University will not have selected a major, the College of Liberal Arts and Sciences provides the open option in order to give them time to explore possible majors and programs. Open option students who enter as freshmen are expected to declare a major by the beginning of the third semester of enrollment. Entering students who have completed three semesters in another school and students who wish to change majors but are not yet ready to declare the new major may register under the open option for one semester, provided they have completed no more than 75 credits.

Program planning information is available through advisers of open option students, in departmental offices, and in the office of the dean of the College of Liberal Arts and Sciences. Early enrollment in certain course sequences is essential for students who are considering sciences or mathematical disciplines, and selection of a major field by the end of the first year is strongly recommended.

Honors Program

For information on the Honors Program in the College of Liberal Arts and Sciences, see *Index, Liberal Arts and Sciences, Cross-Disciplinary Programs, Honors Program.*

ROTC Programs

The College of Liberal Arts and Sciences also offers students the opportunity to combine their academic programs with ROTC programs in the Army, Navy, and Air Force.

Teacher Licensure

Students in the College of Liberal Arts and Sciences may be recommended for the Iowa Professional License for full-time teaching of certain subjects in secondary schools. For further information see *Index, Teacher Education Program.*

Preprofessional Programs

Students in the College of Liberal Arts and Sciences may participate in preprofessional programs in human health-related fields, law, and theology by taking the courses required for admission to professional schools. Students may enter the college with the designation Premed, Prelaw, or Preprofessional Health Programs. Most will earn a bachelor's degree by choosing a major and meeting the requirements for the major while taking the preprofessional courses.

Others will spend one to three years as students in the college before transferring to a professional school to which they have applied and been accepted. For further information, see *Index, Preprofessional Study.*

Experiential Learning (Internship/ Co-op) Program

The Experiential Learning (Internship/Co-op) Program assists students in gaining career-related experience while going to school. Internships/Co-ops provide students with the opportunity to gain specific skills, apply academic knowledge in practical situations, pretest their career choice, earn a salary, and establish a network of professional contacts. Most internships are full-time and last for a semester or a summer, but a part-time experience is possible. Students wishing to receive academic credit for their internship must make arrangements with a faculty member in their major department. In contrast, co-op students work full-time on an extended basis (work two semesters) or on an alternating basis (work, school, work, etc.) during any semester (fall, spring, summer).

It may take students participating in the Experiential Learning (Internship/Co-op) Program an additional semester or more to complete their academic curriculum requirements. For additional information, contact Business/Liberal Arts and Sciences Career Services.

Curriculum in Music

This curriculum leads to the degree bachelor of music and is an alternative to the curriculum in liberal arts and sciences with a major in music. To obtain a bachelor of music degree, a student must earn a minimum of 124.5 credits including a minimum of 32 credits in residence at Iowa State University and a minimum of 45 advanced credits (credits in courses numbered 300 or above) and must meet all of the requirements specified below.

Courses taken on a pass/not pass basis may be counted toward the required total of 124.5 credits, and may be used to meet the advanced credit requirement, if appropriate, but may not be used to satisfy any other graduation requirement. No more than 9 credits in 490 (Independent Study) courses in a single discipline may be counted toward graduation. See *Index, Music.* Students interested in pursuing an emphasis in music theater should see *Index, Theater and Performing Arts.* A minor in music is available; the requirements appear under *Music, Courses and Programs.*

Cr.	Degree Requirements
32	General Education Requirements (Students choosing the music education option should consult their advisers regarding general education requirements)*
6	Social sciences
6	Humanities
6	Music 383, 384
3	Phys 198
6	Mathematical, physical, and biological sciences
5	Electives
6.5-14.5	Other Requirements
6	Engl 104, 105†
0.5	Library 160
0-8	Foreign language (one)††
47	**Music core**
22	Music 120, 221, 222, 231, 232, 331, 332, 337, 338, 361
12	Music 119, 219, 319, 419
3	One of the following: Music 471, 472, 473, 475, 476
3	One of the following: Music 430, 440, 448
7	Ensembles
31-47	**Area of concentration**
(select one of the following options)	
46-47	**Music education****
46	Vocal K-12 option Music 248, 266, 366, 327, 358A, 360, 362A, 367, 465, 466; Music 301 or Theater 354, or Theater 355; C I 204, 406, 415, 426; LAS 417K, 417L
46-47	Instrumental K-12 option Music 248, 266, 350, 351, 352, 353, 354, 355, 356, 358B, 366, 362B, 464, 466, 368 or 369; C I 204, 406, 415, 426; LAS 417K, 417L
31	Organ
4	Music 119B, 219B
8	Music 319C, 419C
5	Music 417
3	Music history
3	Music theory
8	Second foreign language
31	Piano
12	Music 119, 219, 319, 419
4	Music 321
8	Music 417
3	Music theory
4	Electives
31	String instruments
12	Music 119, 219, 319, 419
6	Music 181, 321
3	Music theory
4	Music 417
6	Electives
31	Composition
8	Applied music
4	Music 362A, 362B
13	Music theory and composition
6	Electives
31	Voice
4	Music 327 and 119B, 119C, or 119K
8	Music 319A, 419A
6	Music 324, 325, 360
3	Music theory
2	Music 417
8	Second foreign language
31	Wind or percussion instrument
12	Music 119, 219, 319, 419
1-3	Music 351-352 or 353-354 or 355
3	Music 321
3	Music theory
4	Music 417
6-8	Electives
124.5-140.5	Total credits

†A student must earn an average grade of C- or better in Engl 104 and 105.

††The requirement may be met by completion of three or more years of high school study in one foreign language. Prospective students are encouraged to begin foreign language training as early as possible in their academic careers. Students who have a strong foreign language preparation may attempt to acquire college credit by taking a test-out examination which is administered each semester by the Department of Foreign Languages and Literatures.

*As described in the Teacher Education section of this bulletin, music education students must meet additional specific course requirements. In many cases these courses can be used to satisfy general education requirements as well.

**K-12 options include 16 weeks of student teaching. All students will complete at least 50 hours of field experiences, of which at least 40 hours must occur after admission to teacher education but before student teaching. Music education students should refer to the Teacher Education section of this catalog for further information.

Curriculum in Liberal Studies

The bachelor of liberal studies degree (B.L.S.) was established by the three Iowa Regent universities to meet the needs of Iowans who want to earn a college degree but whose circumstances present obstacles to completing a traditional on-campus degree program. The degree may be earned from Iowa State University, the University of Iowa, or the University of Northern Iowa.

The B.L.S. is a general studies degree in the liberal arts. There is no traditional major. Instead, students take coursework in three areas of distribution. These areas may be focused in a single discipline or diversified over several disciplines. With the assistance of a B.L.S. adviser, students can structure a program that meets their individual educational, vocational or personal goals.

Up to three-fourths of the total degree requirements can be transferred from accredited institutions. Work done in community colleges or other accredited colleges and universities can be applied toward the degree, as can applicable courses taken at any of the three Iowa Regent universities, whether on or off campus.

The B.L.S. program has no residence requirements. To complete the degree, students may offer credits earned in various study formats: correspondence courses; telecourses; Saturday and evening courses; off-campus courses, including those with distance-learning formats; and regular on-campus courses. Students may also earn credits by proficiency or test-out examinations.

Admission

Admission to the B.L.S. program is open to persons who meet either of the following levels of previous educational attainment: Hold the associate in arts (A.A.) or associate in science (A.S.) degree from an accredited two-year college. (Holders of the associate in applied science or associate in applied arts degree are not automatically eligible, although some courses may be found applicable upon review.)

Have at least 62 semester credits of collegiate work acceptable toward graduation at ISU with a total cumulative grade point average of at least 2.00 (a C average).

Requirements for the B.L.S. Degree

The B.L.S. candidate must earn a total of 120 credits in accordance with requirements listed below. Courses taken at Iowa State University on a pass/not pass basis may be counted toward graduation only as electives. No more than 9 credits of 490 (Independent Study) courses in a single discipline may be counted toward graduation.

Cr.	
48	**General Education Requirements**
6	Basic English composition
8	Foreign language*
12	Arts and humanities
2	Verbal communication
3	Mathematics, statistics, or computer science
8	Natural sciences
9	Social sciences from at least two different disciplines

A list of courses acceptable in the general education groups can be obtained from the college office.

36	**Distribution Requirements**

A minimum of 12 credits is required in each of three of the five distribution areas listed below.

Humanities (literature, philosophy, history, religion, art and music appreciation)

Communications and arts (journalism, speech, writing, drama, art, foreign language)

Natural sciences and mathematical disciplines (chemistry, physics, biology, geological and atmospheric sciences, mathematics, statistics, computer science)

Social sciences (sociology, psychology, economics, political science, anthropology, geography)

Professional fields (business, education, family and consumer sciences, social work, agriculture, engineering, nursing)

At least 24 upper-level credits are required in the three distribution areas with a minimum of 6 upper-level credits in each of the areas.

36	Electives
120	Total credits required for graduation

*The requirement may be met by completion of three or more years of high school study in one foreign language.

Other Requirements

Included in the total of 120 credits must be the following:

45 upper-level credits from a four-year college
30 credits from ISU earned during the junior/ and or senior year.

Three credits of course work in U.S. Diversity and 3 credits in International Perspectives.
A grade average of at least 2.00 (a C average) in all coursework applied to the B.L.S. degree, in all upper-level coursework, and in all work completed after admission to the B.L.S. program.

Proficiency in English demonstrated by completion of an approved composition course from a four-year college or by faculty evaluation, as advised.

College of Veterinary Medicine

Norman F. Cheville, Dean
Donald D. Draper, Interim Associate Dean
Donald L. Reynolds, Associate Dean

Departments of the College

Biomedical Sciences
Veterinary Clinical Sciences
Veterinary Diagnostic and Production Animal Medicine
Veterinary Microbiology and Preventive Medicine
Veterinary Pathology

Other units of the college include the Veterinary Medical Research Institute, Veterinary Medical Diagnostic Laboratory, the Veterinary Teaching Hospital, and Biomedical Communications. The college also participates in interdisciplinary majors in genetics, molecular, cellular and developmental biology, toxicology, immunobiology, and neuroscience.

The instructional objective of the College of Veterinary Medicine is to enable students to assume vital roles in society as productive health care deliverers and biomedical scientists. Such an education provides students with general learning, communication, and problem solving abilities; veterinary medical practice and research skills; and professional and ethical values.

The curriculum incorporates basic biomedical and clinical principles, clinical decision making skills, and exceptional clinical experience in production medicine, food animal medicine and surgery, companion animal medicine and surgery, and equine medicine and surgery.

The college is uniquely qualified to provide education in urban and rural veterinary medicine. Ames, Iowa is located in the heart of one of the world's most intensive livestock producing areas and is just 40 minutes from the state's capitol. The College provides extensive production animal medicine experiences and numerous diagnostic cases for students' education. Companion animal medicine and surgery experiences are provided within the regionally recognized referral hospital and the college's community practice and equine ambulatory services.

The professional curriculum is a four-year course of study leading to the doctor of veterinary medicine degree. Students are admitted into the fall semester of the first year of the professional curriculum after completing a minimum of 60 semester credits in a preprofessional program. A strong and reputable basic science education during the first two years of the professional curriculum prepares veterinary students for a wide range of clinical experience during the last two years of the educational program. Fourth-year students may choose to enhance their education by earning clinical elective credits at approved government agencies, research laboratories, veterinary practices, and other university hospitals. Outstanding research programs in infectious diseases, neuroscience, and numerous other areas provide opportunities for qualified students to participate in research.

Concurrent D.V.M./M.S., DVM/Ph.D. programs are available for exceptionally qualified students who wish to obtain both veterinary and graduate degrees. Students must have a bachelor's degree or a minimum of 128 semester credits in undergraduate and professional curricula in order to participate in the concurrent degree program. Admission to the concurrent D.V.M./graduate degree program is subject to the approval of the dean of the College of Veterinary Medicine and the dean of the Graduate College.

The College of Veterinary Medicine is an important recruiting center for employers seeking veterinarians for private practice; industry; educational institutions; international agencies; federal, state and local governments; the armed forces; departments of public health; zoological gardens; laboratory animal medicine agencies; and other related fields of professional activity. Graduates are highly sought after and typically have multiple employment offers upon graduation. A career development office is available to help match students with appropriate employers.

Pre-veterinary Medicine Preparation

Admission Requirements

The College of Veterinary Medicine seeks students with diverse backgrounds and encourages students to enroll in baccalaureate programs in the college of their choice.

Undergraduate students are strongly encouraged to complete a bachelor's degree before applying to the College of Veterinary Medicine. When deciding which major to pursue as an undergraduate, the student should consider the area of veterinary medicine in which they intend to emphasize when they become a veterinarian. For example, those interested in food animal practice may wish to pursue a degree in biological science, animal science, agricultural economics, or business. Future companion animal practitioners may wish to consider a biological science, physical science, business, social science, or humanities degree. These examples are only suggestions. They should be considered as but a few of the many possibilities.

For the most current information regarding applications and admission to the College of Veterinary Medicine, please refer to the College website at http://www.vetmed.iastate.edu/.

Applicants for admission to the College of Veterinary Medicine must have attended an accredited college or university, have completed 40 semester credits prior to the deadline for filing an application for admission, and have completed 60 semester credits prior to the end of the spring term of the year in which the applicant seeks to be admitted to the College of Veterinary Medicine. All science requirements must be fulfilled by the time of filing or scheduled for completion by the **end of Fall term of the year in which the applicant applies.** The remaining required courses must be completed by the end of the spring term of the year in which the applicant seeks to be admitted. Credits earned must include the following Iowa State semester course offerings or their equivalents:

English Composition 1 year of composition or writing emphasis courses. May include business or technical writing. (Engl 104, 105, 302, 309, or 314)	6 cr.
Public Speaking 1 semester public speaking course (Sp Cm 212, ComSt 214 or Ag Ed 311)	3 cr.
General Chemistry with Laboratory* 1 year series (2 semesters or 3 quarters) with one semester lab (Chem 177-177L, 178)	8 cr.
Organic Chemistry with Laboratory* 1 year series (2 semesters or 3 quarters) with one semester lab (Chem 331, 331L, 332)	7 cr.
Biochemistry* (BBMB 301)	3 cr.
General Physics with Laboratory* 1 year series (2 semesters or 3 quarters) with labs each term (Phys 111, 112)	8 cr.
Biology with Laboratory* 1 year series (2 semesters or 3 quarters) with labs each term (Biol 201, 201L, 202, 202L)	8 cr.
Genetics (Biol 301)	3 cr.
Genetics * Mendelian and molecular genetics (Biol 301)	3 cr.
Mammalian Anatomy or Physiology* (An S 214, BMS 329, Zool 155, or Zool 255 or Zool 355)	3 cr.
Humanities or Social Sciences	9 cr.
Electives	**2 cr.**
TOTAL Credits Required	**60 cr.**

* science requirement

Credits in the previously specified courses will normally be earned on the traditional four-letter grading system with A as the highest grade and D as the lowest passing grade. All required courses must be completed with a grade of "C" or better. It is generally expected that required courses have been completed within the past eight (8) years. AP or CLEP credits must be documented by original scores submitted to the University and MUST meet the University's minimum requirement in the appropriate subject area. CLEP credits may be accepted only for arts, humanities and social sciences. Credits in the preceding specified courses will not be accepted if earned under the pass-not pass grading system or similar options.

Application and Admission

Applicants may apply directly to the College of Veterinary Medicine at Iowa State University using the downloadable application and evaluation forms which are available on or before July 1 on the College of Veterinary Medicine website (www.vetmed.iastate.edu under Students/Prospective Students). The application, three letters of recommendation, transcripts and processing fee must be postmarked by October 1 and scores received by November 1 of the year prior to the year in which the applicant seeks to be admitted.

Paper copies of the professional curriculum application can be requested from the Office of Admissions, 100 Alumni Hall, Iowa State University, Ames, Iowa 50011.

Applicants may also apply using the Veterinary Medical College Application Service (VMCAS). The VMCAS application may be found online at the VMCAS website (www.aavmc.org under VMCAS). Those applying through VMCAS will also need to complete the ISU Supplementary Application also downloadable from the College of Veterinary Medicine website. For further information contact the College of Veterinary Medicine at 515-294-6808.

Any student wishing to use international coursework (including study abroad) to fulfill a required undergraduate course must apply using the direct Iowa State University College of Veterinary Medicine application and must provide a transcript from the foreign institution.

A list of courses in progress at the time of filing and scheduled for completion by the end of spring term should accompany the application and transcripts. Undergraduate college credits must average at least 2.50 on a 4.00 marking system for the application to be accepted. The preceding scholastic requirements are minimum and do not assure admission even though these requirements have been fulfilled.

Admission to the College of Veterinary Medicine is on a competitive and selective basis. Undergraduate GPA (cumulative, required science course, last 45 undergraduate credits), Graduate Record Exam (GRE) general test score (The GRE must be taken prior to October 1 of the year the applicant applies and the scores must be received by November 1), animal and veterinary experience, essays, recommendations and personal development (leadership, citizenship, etc.) are given consideration in the selection of candidates.

The majority of the positions in the entering class are reserved for residents of Iowa. Two states, North Dakota (10) and South Dakota (6), have contracts for up to 16 students in each entering class. A similar contract is in place with the state of New Jersey for up to 4 positions. In addition, a number of positions are available to residents of other states. A few highly qualified international students may also be accepted. Consideration is given equally to all applicants without regard to race, color, national origin, gender, religion, disability, or age, political beliefs, or marital or familial status.

Curriculum in Veterinary Medicine

Graduation Requirements

To be awarded the degree doctor of veterinary medicine, candidates must have passed all required courses in the curriculum in veterinary medicine, have earned at least 4 elective credits on a graded basis of A, B, C, D while enrolled in the College of Veterinary Medicine, and have at least a 2.0 grade-point average in the veterinary medicine curriculum.

Professional Program

First Year

Cr.	Fall
5	Principles of Morphology I—B M S 330
6	Biomedical Sciences I—B M S 333
3	Physiological Chemistry—BBMB 420
2	Case Study I—B M S 345
R	Veterinarian in Society I—V Med 311
16	

Cr.	Spring
4	Principles of Morphology II—B M S 331
6	Biomedical Sciences II—B M S 334
3	Neurobiology—B M S 337
2	Veterinary Immunology—V MPM 380
1	Radiology—V C S 391
2	General Pathology—V Pth 342
1	Case Study II—B M S 346
R	Veterinarian in Society II—V Med 312
19	

Second Year

Cr.	Fall
4	Veterinary Parasitology—V Pth 376
3	Systemic Pathology—V Pth 372
5	Veterinary Microbiology I—V MPM 386
2	Case Study III—V Pth 377
1	Integrative Physiology—B M S 355
1	Veterinarian in Society III—V Med 313
16	

Cr.	Spring
3	General Pharmacology—B M S 354
1	Anesthesiology—VCS 398
3	Veterinary Microbiology II—V MPM 387
3	Public Health—V MPM 388
6	Principles of Surgery—V C S 397
2	Case Study IV—V MPM 378
1	Veterinarian in Society IV—V Med 314
19	

Third Year

Cr.	Fall
3	Clinical Pathology—V Pth 425
2	Infectious Diseases and Preventive Medicine—V MPM 436
5	Clinical Medicine I—V C S 444
3	Surgery Laboratory—V C S 449
4	Disturbances of Reproduction—V C S 450/VDPAM 450
3	Pharmacology and Therapeutics—B M S 443
R	Introduction to Clinics—V C S 440/VDPAM 440
R	Seminar—V C S 385
20	

Cr.	Spring
4	Special Pathology—V Pth 422
3	Infectious Diseases and Preventive Medicine—V MPM 437
5	Clinical Medicine II—V C S 445/VDPAM 445
3	Veterinary Toxicology—VDPAM 426
2	Radiology—V C S 448
1	Ophthalmology—V C S 399
R	Seminar—V C S 385
18	

Fourth Year

The fourth year of the veterinary medical curriculum is designed to be flexible and to provide for species emphasis. Students must complete 38 credits during their fourth year. They must take a required block and at least one option block. The remainder of the fourth year credits are acquired by selecting additional option blocks, Veterinary Teaching Hospital clinical electives, off-campus clinical electives, or other electives. Additional off-campus clinical elective credits can be earned at approved government agencies, research laboratories, veterinary practices, and other university hospitals.

Required Block

Cr.	
3	Anesthesiology—V C S 466
3	Radiology—V C S 460
1	Necropsy—V Pth 456
1	Clinical Microbiology—VDPAM 488
4	ICU/Emergency Medicine—V C S 468
1	Clinical Pathology—V Pth 457
1	Laboratory in Public Health—V MPM 486
R	Seminar—V C S 495
14	Total required block credits

Small Animal Option Block

Cr.	
2	Soft Tissue Surgery—-V C S 455
2	Orthopedic Surgery—V C S 456
2	Ophthalmology—V C S 469
2	Small Animal Medicine I—V C S 453
2	Small Animal Medicine II—V C S 454
2	Community Practice—V C S 463
12	Total Small Animal Option credits

Food Animal Option Block

Cr.	
4	Production Animal Medicine—VDPAM 411
2	Diagnostic Laboratory—VDPAM 455
6	Total Food Animal Option credits

Production Animal Medicine Option Block

Cr.	
4	Production Animal Medicine—VDPAM 411
2	Diagnostic Laboratory—VDPAM 455
6	Species Emphasis Courses (minimum of 6 credits required) 2-6 Swine Production Medicine Series—VDPAM 478, 479, 480 2-6 Beef Production Medicine Series—VDPAM 481, 482, 483 2-4 Introduction to Dairy Production Medicine—VDPAM 484, 485 2-4 Introduction to Small Ruminant Production Medicine—VDPAM 486
12	Total Production Animal Medicine Option credits

Equine Option Block

Cr.	
3	Equine Medicine—V C S 457
3	Equine Surgery—V C S 458
6	Total Equine Option credits
38	Total fourth year required credits

Reinstatement

Any student who voluntarily withdraws from the College of Veterinary Medicine or who is dropped for cause, after having successfully completed one or more semesters forfeits his/her standing and must make written application for reinstatement to this college a minimum of 60 days prior to the opening of the semester for which they seek to re-enter. Any student who voluntarily withdraws from the College of Veterinary Medicine prior to completion of one semester must re-apply for admission to the college in the general applicant pool.

Graduate College

James R. Bloedel, Dean
George A. Jackson, Assistant Dean
Donna S. Kienzler, Assistant Dean
John E. Mayfield, Associate Dean

The Graduate College and graduate faculty at Iowa State University are responsible for the quality of graduate education, for administering students' graduate programs, and for promoting research support from various governmental, industrial, and private agencies.

The graduate faculty in various programs handle admission and classification of graduate students, establish requirements for advanced degrees, and have charge of instruction and research at the graduate level. Graduate faculty members also teach graduate courses, serve on program of study (POS) committees, and direct work of master's and doctoral students. All graduate courses offered for major or nonmajor credit are taught by graduate faculty members or graduate lecturers.

Graduate study was offered soon after the university was founded, and the first graduate degree was conferred in 1877. Experimentation and research also started early, first in agriculture and shortly thereafter in home economics, engineering, science, and veterinary medicine. In 1913, the graduate faculty was organized formally and an executive graduate committee was appointed. In 1915, the graduate faculty held its first meeting, and in 1916, it granted the first doctor of philosophy degree.

Graduate education is vital to the quality of university teaching. The creative efforts of graduate faculty members and graduate students result in knowledge necessary to help society solve problems in educational, scientific, technological, and socio-economic areas. The Graduate College encourages educational exchange and contact with undergraduate areas of the university to promote improved teaching on both the undergraduate and graduate levels. A part of this exchange is accomplished by the publication of books and technical articles which are made possible by graduate research.

The degrees master of arts, master of science, and doctor of philosophy are research oriented. In many fields master's degrees are also awarded without a thesis, but a written report of independent study, called a creative component, is generally required. For those individuals interested in advanced study directed toward meeting vocational or professional objectives, the following degrees are offered: master of accounting, master of agriculture, master of architecture, master of business administration, master of community and regional planning, master of education, master of engineering, master of family and consumer sciences, master of fine arts, master of landscape architecture, master of public administration, and the master of school mathematics.

The Graduate College Handbook lists policies and procedures of the Graduate College. It is available at the Graduate College's Web site: www.grad-college.iastate.edu/.

Admission

Admission to the Graduate College may be granted to a graduate of an institution in the United States that is accredited by a recognized regional association or to a graduate of a recognized institution in another country whose requirements for the bachelor's degree are substantially equivalent to those of Iowa State University. For information concerning graduate study in a particular academic discipline, prospective students should correspond with the chair of the major program in which they wish to study.

The graduate application process at Iowa State is "self-managed," which means that the student manages his/her own application by collecting the application, fee, academic records, letters of recommendation, and other supporting materials, and sends them in one package to the address listed in the Majors and Programs section of the graduate application brochure. The addresses are also listed on the Graduate College web site at www.grad-college.iastate.edu/academicprogram/programsummariesbya.html.

If an electronic application is submitted, two copies of the application are printed and the supplementary materials are collected and sent to the same address.

The application fee is $20 ($50 for international applicants). An electronic application is available on ISU's graduate web site at www.grad-college.iastate.edu. This application fee is $25 for U.S. students and $57 for international applicants and msut be paid by credit card or electronic check (U.S. banks only). The application fee is required of all applicants except those who have attended Iowa State as undergraduates, or those applying for admission in the nondegree admission status. In addition, an applicant must request that each previous college or university attended provide official transcripts of grades and credits earned, and request that the institution from which the degree was granted provide a statement of the degree received and the applicant's quartile class rank.

Many programs have very early application deadlines. For more details, check program deadlines at www.grad-college.iastate.edu/academicprogram/programsummariesbya.html. If a program has no deadline listed, the Graduate College recommends that for priority consideration of financial support and other program opportunities, applications should be submitted by March 1 for summer and fall and October 1 for spring, prior to the term for which admission is sought.

Categories of Graduate Admission

An applicant pursuing an advanced degree must be recommended by the program in which he/she will be pursuing an advanced degree and must be approved by the Dean of the Graduate College.
There are three admission categories for students who wish to pursue an advanced degree:

Full Admission status may be granted to students who meet either of the following requirements:

1. Graduate in the upper one-half of the graduating class with a bachelor's degree from a regionally accredited U.S. institution; or

2. Graduate in the upper one-half of the graduating class from a recognized foreign institution where the requirements for the bachelor's degree are similar to those at Iowa State.

Provisional admission status may be granted to students who meet the requirements for full admission (listed above), but have academic or prerequisite deficiencies to remedy. Transfer from provisional admission to full admission status requires the completion of the graduate English requirement, completion of the coursework prescribed to remedy the background deficiencies with a grade average of B or better, and the written recommendation of the major professor and approval by the Dean of the Graduate College.

Restricted admission status may be granted to students who do not rank in the upper one-half of their graduating class and/or lack adequate undergraduate preparation in the proposed field of study. Restricted admission may be granted to graduates of non-English-speaking foreign institutions, even though the student ranks in the upper one-half of the graduating class. Advancement from restricted to full admission status requires completion of 9 semester credits of graduate level course work as a graduate student with a cumulative grade average of B or better and satisfaction of the Graduate College English requirement. A recommendation is submitted in writing by the major professor and must be approved by the Dean of the Graduate College.

Graduate Admission Without a Declared Major

Admission without a declared major is a category for graduates of regionally accredited institutions in the United States who do not intend to seek an advanced degree from Iowa State University. Such students usually include:

1. Those who intend to transfer graduate credit earned at Iowa State University to other institutions.

2. Those who intend to use graduate credits earned for professional certification.

3. Those who enroll for personal satisfaction.

4. Those who enroll occasionally in off-campus graduate courses.

Students who wish to apply to Iowa State University without a declared major need to contact the Office of Admissions, 100 Alumni Hall (1-800-262-3810) for the nondegree application form for students in this category. The application form is also available at the web site at www.iastate.edu/~adm_info/nondegreegrad.html.

Applications and schedules for such students with an undeclared major are processed directly by the Office of Admissions and the Graduate College office; no program approvals are required. (Applications and schedules for students declaring a major require program evaluation and approval.)

A student without a declared major who subsequently seeks full, provisional, or restricted admission must apply to and be accepted by a graduate program and by the Graduate College for degree study. A new application, the application fee (unless the student attended Iowa State University as an undergraduate), and transcripts from all colleges attended are required.

For those students originally admitted to the Graduate College on a nondegree basis, no more than 9 semester hours of graduate credit earned under the nondegree option may be applied if the student later chooses to undertake a graduate degree program. The student's program of study committee will recommend to the Graduate College which courses (if any) taken on a nondegree basis may be included in the degree program.

Graduate Admission of International Students

An applicant who is a graduate of a recognized foreign institution is subject to the same criteria for admission as a graduate from an institution in the United States and may be recommended for the same admission categories described above except that of the nondegree option. International applicants for nondegree status may be considered for admission at the discretion of the Graduate College dean. Application and admission deadlines for international students can be obtained from the publication Information for International Graduate Applicants.

International students are required to show evidence of financial support and to carry adequate health and accident insurance while in residence.

Admission Examinations

Graduate Record Examination. The Graduate Record Examination (GRE) is not a university-wide requirement for all applicants. However, many programs require or recommend submission of GRE scores; individual program statements appearing in the publication Graduate Admissions Bulletin should be consulted for this information.

English Requirement for Native Speakers

The English requirement for native speakers is fulfilled by taking a diagnostic English test in their first semester of enrollment at ISU, and following the course of action recommended by their graduate program. The requirement must be satisfied before a student can change from restricted or provisional admission to full admission status. Additionally, the requirement must be met before taking a preliminary oral examination (Ph.D. students) or a final oral examination.

English Requirements for Non-native Speakers

Applicants whose native language is not English and who have not earned a bachelor's or master's in a country where the only official language is English are required to submit Test of English as a Foreign Language (TOEFL) scores as part of their application for admission. A minimum score of at least 197 on the computer-based TOEFL test is required for admission to the Graduate College. International students may also submit IELTS (International English Language Testing System) scores in lieu of the TOEFL. The ISU Graduate College minimum is 6.0. Because some programs require a higher scores, applicants should check directly with the program to which they desire admission or see the bulletin Information for International Graduate Applicants for this information.

Graduate students whose native language is not English and who do not have an undergraduate degree from Iowa State University must also take the English Placement Test at the beginning of their first semester of enrollment. This test is administered by the Department of English in lieu of the Graduate English Examination. Students who do not pass this examination are assigned to one or more courses in the English 101 series. This coursework must be completed during the first year of study.

Graduate students whose native language is not English, but who have an undergraduate degree from Iowa State University, must take the Graduate English Examination for International Students, also administered by the Department of English, at the beginning of their first semester of graduate work. Students who do not pass this examination must complete English 101D during their first year of study.

New teaching assistants whose native language is not English are evaluated for their ability to communicate effectively in English before their assistantship assignments are made. Tests of oral proficiency and teaching skills (SPEAK and TEACH) are given before the beginning of each semester. A prospective teaching assistant who does not pass is required to complete coursework in speaking and teaching skills and must be retested.

Graduate Appointments

Graduate assistantships, fellowships, and research grants have been established at Iowa State University to encourage graduate work and to promote research. Such appointments and research opportunities are available through the various departments of instruction and the research centers on campus.

Graduate assistantships, the most common form of graduate student support, are available in three categories: the research assistantship, the teaching assistantship, or the administrative assistantship. A half-time graduate assistantship (20 hours per week) permits the holder to enroll for a maximum of 12 semester credits. Recipients of these assistantships are assessed fees at full Iowa resident rates regardless of the number of credits for which they register. Students who are graduates of a regionally accredited college or university in the United States or of a recognized institution in another country whose requirements for the bachelor's degree are substantially equivalent to those of Iowa State University, who graduated in the top half of their respective classes and who present the requisite undergraduate or graduate preparation, may apply for these appointments. Students registered on a restricted basis or those placed on academic probation are eligible for assistantship appointment only on a term by term basis. Students admitted without a declared major are not eligible for assistantship appointments. Further information may be obtained by writing to the appropriate graduate program.

The satisfactory completion of one appointment, plus satisfactory academic performance, will ordinarily make a student eligible for reappointment. After a period of three years of full time study for the master's degree or five years for the doctorate, the student will not normally be continued on assistantship support (shorter periods may be stipulated by the student's program or department).

Postdoctoral Study
Opportunities are provided for postdoctoral study through the extensive research programs of the university. Inquiries should be directed to the appropriate program, institute, or to the dean of the Graduate College.

Graduate Study by Staff Members
Any full-time member of the research, instructional, or extension staff at the rank of instructor, research associate, or assistant scientist may carry up to six course credits per semester and three credits per summer session, subject to the approval of the head of the program or section, and provided it does not interfere with other duties. This privilege may be extended to members of the research, instructional, or extension staffs at the rank of assistant professor with approval of the college dean and the Dean of the Graduate College. Staff members at the rank of professor or associate professor cannot become candidates for graduate degrees from ISU.

Registration
Graduate students are encouraged to register for courses on the ISU web site (www.iastate.edu) via AccessPlus. Students who are unable or who choose not to register through this system may use a walk-through registration procedure. Students who do not register by the published deadline for initiation of a schedule through the AccessPlus systems must use the walk-through procedure. For complete information on registration, see the ISU Schedule of Classes or the Registration Web site at www.iastate.edu/~registrar/registration/.

Credit Limits
Registration is limited to a maximum of 15 credits per semester. Schedules for graduate assistants on one-half time appointments are limited to a maximum of 12 credits. For full-time staff members, the limit is 6 credits. (Different credit limits apply during the summer session; see the Graduate College Handbook at www.grad-college.iastate.edu/deadline/publications.html for more details.)

Interim Registration
Registration for special work between semesters and during certain vacation periods cannot exceed one credit for each week that the student is in residence. For more information, consult the Graduate College Handbook.

"In Absentia" Registration
Students completing research or thesis preparation may register in absentia; these credits do not apply toward residence campus requirements.

Off-campus Course Registration
Students who take off-campus courses taught by members of the graduate faculty must register for off-campus credit. Instructions for registering for off-campus credits courses are available from the ISU Extended and Continuing Education Office (102 Scheman, 515-294-6222, www.lifelearner.iastate.edu/).

Continuous Registration
Even when Ph.D. graduate students have completed course work and residence requirements, they are required to register and pay tuition and fees, whether or not university facilities and equipment are used or staff is consulted—either in person or in absentia.
After the preliminary oral examination is passed (with either full or conditional pass) and if university facilities, equipment, and staff time are used, the Ph.D. candidate must register for the appropriate number of credits in the major department or program and pay the appropriate graduate tuition and fees.
After the preliminary oral examination is passed (with either full or conditional pass) and if university facilities, equipment, and staff time are not used, the Ph.D. candidate may register for Gr St 680 (Continuous Registration) and pay the Continuous Registration fee.
The Ph.D. candidate must be aware that registration for Gr St 680 is allowed only after the Ph.D. candidate passes the preliminary oral examination; is required only in the fall and spring semesters, and not during the summer term; is not allowed after the completion of the final oral examination; and is not sufficient registration for the term the preliminary or final oral examination is taken; and does not defer student loans.
If students take the final examination during the interim between terms (including the first day of classes), registration can be for the term either before or after the examination is held.

Auditing
Audit registration means taking courses without receiving formal credit. Beginning Fall 2001, a new audit policy was instituted at Iowa State University. Its provisions are as follows: Instructors must approve ALL audits; students must register for audits by day 10 of the semester; students are assessed tuition and fees as though they were taking the course for credit; and the course DOES NOT count in determining full-time student status. Audited courses do not appear on the student's permanent record unless the "Request for Audit(s) to Appear on Transcript" form is completed and signed by the student, course instructor, and major professor. Copies of this form, which are available from the Graduate College or from the Graduate College's web site at www.grad-college.iastate.edu/deadlines/formss.html, must be filed with the Graduate College, 10 Pearson Hall. After the fifth class day, if a student changes a regular course to an audit, that course will appear on the student's permanent record as a drop. Audits are not acceptable as registration for loan deferments.

Graduate Courses Taken by Undergraduates
Certain graduate level courses listed in the ISU General Catalog may be used in the program of study even though they were taken for graduate credit by the student as an undergraduate at ISU. The following conditions must be met: the POS committee can request approval from the Dean of the Graduate College that up to nine hours of such credit to be applied toward meeting advanced degree requirements (these courses must be clearly marked on the POS); credits earned in these courses must be in addition to those used to meet requirements for the bachelor's degree and must have grades of B or better; the student must be classified as an undergraduate and not a special student (credits taken as a special student are not allowed); a letter of certification must be obtained from the Graduation Office (10A Alumni Hall) indicating that the courses were not taken as a special student and were not used toward fulfillment of the undergraduate degree program. This letter must be submitted with the POS form.

Admission of Undergraduates to Concurrent Graduate Degree Programs
Programs in ten departments (Accounting, Agricultural and Biosystems Engineering, Animal Science, Biochemistry and Biophysics, Civil, Construction and Environmental Engineering, Electrical and Computer Engineering, Food Science and Human Nutrition, Materials Science and Engineering, Psychology, and Zoology and Genetics) provide opportunities for well qualified ISU juniors and seniors majoring in those curricula to apply for admission to programs leading to both an M.S. and a B.S. awarded at the end of a fifth year of study. Students interested in a research career may apply for graduate research assistantships during their fourth and fifth years of study. Students should contact the above departments about applying to these programs early in their undergraduate careers. Undergraduate students seeking admission to concurrent graduate degree programs in fields other than the ten above must submit a written proposal for an individualized program, co-signed by their advisers, to the Graduate College for review and approval. The graduate degree will only be awarded at the same time as, or after, the undergraduate degree is conferred. For more information about transferring credits, consult the Gradudate College Handbook.

Veterinary Medicine Students in Concurrent Graduate Degree Programs
Students may be concurrently enrolled in the professioal curriculum leading to the D.V.M. degree and in a graduate program leading to the M.S. or Ph.D. degree after completion of 128 semester credits. The graduate program may be in the College of Veterinary Medicine or in another college.

Interested students must complete a graduate application, complete a "Concurrent Enrollment Request" form available in the Graduate College office or on the web site at www.grad-college.iastate.edu/deadline/formss.html, submit both forms with appropriate transcripts and letters of recommendation to the Office of Admissions (100 Alumni Hall). (Copies of the forms may be obtained from the Office of Admissions.) State on the application that the application is for a concurrent degree program. Signed approvals on the Graduate Admissions Evaluation form are required from the graduate program, the Dean of the College of Veterinary Medicine, and the Dean of the Graduate College. On admittance, the student receives an admission notification from the Office of Admissions. For more information see the *Graduate College Handbook*.

Graduate Students in Concurrent Undergraduate Programs

Graduate students interested in enrolling in a concurrent undergraduate program should contact the Office of Admissions (100 Alumni Hall) to obtain admission information (even if the student has been previously admitted as an undergraduate). A "Concurrent Enrollment Request" form should be obtained from the Office of Admissions or on the Graduate College Web site at www.grad-college.iastate.edu/deadline/formss.html and circulated for the appropriate approvals. The student must be formally admitted both as a graduate student and as an undergraduate student. Official enrollment and fee payment will be as a graduate student. Credits transferred from the graduate permanent record to the undergraduate permanent record are no longer available for use on a graduate program of study.

Courses Taken as a Special Student

A person classified as a "special student" is considered an undergraduate and may not use courses taken under that status in a graduate degree program. A student who has received the baccalaureate degree must register as a graduate student if he/she is to receive graduate credit for courses.

Grading

Grades are the permanent official record of a student's academic performance. Iowa State uses A through F grading for most courses. S, P, and NP grades are given in some courses. The standard four-point scale is used to calculate a grade point average.

Grade Point Average (GPA)

All courses (even if they are undergraduate courses) taken as a graduate student will be calculated into the graduate GPA. The GPA is determined by dividing the number of grade points earned by the total number of ISU cumulative hours. The grade given when an incomplete (I) is resolved is figured into the cumulative grade point average, but not into a particular semester's average. Marks of I, S, P, NP, T, and X are not counted in the grade point average; a mark of F (even if taken S/F) is counted in the grade point average. Creative Component/Research (599 and 699) credits are not used in the calculation of the GPA. In the case of repeated courses, only the grade achieved the last time the course is taken is used in computing the grade point average. (However, grades in courses that are noted as repeatable courses in the catalog, such as certain repeatable seminars, will all be used in calculating the grade point average.)

Grading Research and Creative Component Credits

Creative Component/Research credits may be graded as A, B, C, D, I, S, or F. Plus and minus grades are optional. These credits are not calculated in a student's GPA.

Pass (P)/Not Pass (NP) Course Credit

Pass/Not Pass courses are those that a student, with the approval of the major professor, may take for personal enrichment, but not for satisfying prerequisites or deficiencies in the undergraduate background. P/NP marks may not be used in a POS, nor do P/NP marks contribute to the student's GPA. Full credit for P/NP courses is used in calculating tuition assessment and credit load limitations. For more information, see *the Graduate College Handbook*.

Satisfactory/Fail (S/F) Grading

S/F grading is not the same as P/NP grading. S/F grading is by instructor option; all students in a particular course receive S/F grading. P/NP grading is generally a student option. A P mark is equivalent to at least a D- grade whereas an S mark is equivalent to at least a B grade at the graduate level. No special registration procedures are required for S/F grading. An S mark in a course taken S/F is not counted in the grade point average, but an F mark in a course taken S/F is counted in the grade point average and is equivalent to an F in a regularly graded (A-F) course. No more than 20 percent of the total credits (excluding creative component, thesis or dissertation research) in the program of study may be earned on an S/F basis.

S/F grading may be used only for approved courses offered as seminars, symposia, workshops, special topics, and research. Programs must submit requests for S/F grading to the Dean of the Graduate College. The Graduate College Curriculum and Catalog Committee reviews and approves or rejects all S/F courses.

Grievances about Grades

A graduate student who feels that a course grade has been unjustly assigned, and whose attempts to resolve the matter with the instructor have failed, may appeal through the grievance procedures described in the *Graduate College Handbook*.

Probation

If a graduate student does not maintain a cumulative 3.0 grade point average on all course work taken, exclusive of research credit, he or she may be placed on academic probation by the Dean of the Graduate College. Grades earned by graduate students in undergraduate courses are included in the calculation of the grade point average. Academic probation judgments are made on the basis of grades in course work only. While on academic probation a student will not be admitted to candidacy for a degree and if appointed to a graduate assistantship, the student will not receive a Graduate College tuition scholarship. If a student is to qualify for a tuition scholarship, he/she must be removed from probation by the end of the first full month of the term.

To insure that registration does not take place without a review by the program, the Graduate College places a hold on future registrations by a student on probation. Before the student registers for each term, the program must review his or her record and recommend in writing if the Graduate College should permit further registration. Before graduation is approved, the student must complete all courses listed on the program of study with a minimum grade of C and have achieved a 3.0 GPA or greater.

Master's Degrees

General requirements for all master's degrees are as follows:

General Requirements

Appointment of the Student's Program of Study (POS) Committee. Faculty in a major field have the responsibility for establishing specific course requirements and research requirements appropriate to the master's programs in the major. These requirements may place additional responsibilities on the student, the major professor, or the student's POS committee beyond those listed in this bulletin or the *Graduate College Handbook* as deemed appropriate to the goals of the major program.

New graduate students at ISU may be assigned a temporary academic adviser by the major program inthe first semester of the student's residence. This faculty member guides the student in selection of a field of study and in development of a graduate program of study until the major professor and POS committee are selected. After the POS committee has been selected, it guides and evaluates the student during the remainder of graduate study.

A master's POS committee consists of at least three members of the graduate faculty. It must include two members, including the major professor, from inside the major or program. The committee must include members from different majors or different departments so as to ensure diversity of perspectives. A term member of the graduate faculty may participate in the direction of a student's master's research as a co-major professor if a member of the graduate faculty serves as a co-major professor and jointly accepts responsibility for the direction of a program of study. For more information on duties and makeup of the committee as well as changes to the committee makeup, see the *Graduate College Handbook*.

Program of Study. The student and major professor develop the program of study with the consultation and approval of the POS committee. This agreement between the student and the Graduate College should be submitted as early as possible for approval. It is recommended that the committee be formed and the POS form submitted as early as the second semester of graduate study. In no case can the commitee be formed later than the term before the final oral examination.

Residence. There is no on-campus residence requirement for the master's degree.

Credits. Unless otherwise noted, at least 30 credits of acceptable graduate work must be completed in all master's programs. At least 22 graduate credits must be earned from Iowa State University unless noted in the descriptions under "Specific Master's Degrees" in this catalog.

Transfer Credits. At the discretion of the POS committee, and with the approval of the program and the Graduate College, graduate credits earned as a graduate student at another institution or through a distance education program offered by another institution may be transferred if the grade was B or better. Such courses must have been acceptable toward an advanced degree at that institution and must have been taught by individuals having graduate faculty status at the institution. If a student wishes to transfer credits from graduate courses taken at or through another university as an undergraduate student, it is the student's responsibility to provide verification by letter from that institution that these graduate courses were not taken to satisfy undergraduate requirements for a degree.

A transcript must accompany the POS in order to transfer credits. The POS committee may ask for other materials, such as a course outline or accreditation of the institution, to evaluate the course. Transfer courses not completed when the POS is submitted must be completed before the term in which the student graduates. A transcript must then be submitted for review and final approval.

Research credits earned at another institution are generally not transferred. In rare circumstances, the transfer of S or P marks may be accepted for research credits only. It is the responsibility of the POS committee to obtain a letter from the responsible faculty member at the other institution stating that research credits recommended for transfer with S or P marks are considered to be worthy of a B grade or better. Audits may be listed on the program of study, but do not carry credit.

Major. A major is an approved area of study leading to a graduate degree. The exact number of credits in a major is not prescribed.

Minor. Students may request a minor in any program approved to grant a graduate degree and in programs approved to offer only a minor. A student may not minor and major in the same field. Requirements for declared minors are determined by the minor program and the faculty member representing the minor field on the student's POS committee.

The minor subject area must be tested at the final oral examination and cannot be placed on the transcript after graduation unless it was approved on the program of study, listed on all examination reports, and recorded on the "Application for Graduation" form (diploma slip). A minor cannot be added to a degree that has already been received.

Department/Program Change.
Transferring from One Major/Program/Department to Another
Students who have been admitted to a graduate program and to the Graduate College may request to transfer at a later date to another department or program. Because graduate students are admitted to particular programs, transfers require the approval of both the receiving program and the Graduate College.

Students seeking transfer to another program or department should first discuss their wishes with the new program DOGE (Director of Graduate Education) to determine requirements and interest by the new program. When a student receives a favorable preliminary response from the new program, he or she should fill out the student portion of the form entitled "Request to Transfer from One/Major/Program/Department to Another" and submit this form to his or her current DOGE. The current DOGE will fill out the Current Program Information adding any comments he or she believes the new program should consider and forward the form to the proposed new program. This form is available from the department, the Graduate College, or the Graduate College web page.

The receiving program will generally give the student the same consideration and employ the same admissions standards that are used for original applications for admission and will expect the same application materials (transcripts, letters of recommendation, test scores, etc). During the process, the new and old programs and the Graduate College are authorized and encouraged to seek and disclose information related to the student's overall fitness for studies in the receiving program. Programs are authorized to inquire into the student's prior conduct at the university, both with the prior department and with the Dean of Students.

Upon departmental action (acceptance or denial), the request to transfer form must be sent to the Graduate College for approval. All parties will receive a copy of the completed form from the Graduate College.

Students desiring to transfer from a degree-seeking status to a nondegree-seeking status need to fill out the "Request to Transfer from One Major/Program/Department to Nondegree" form and bring it to the Graduate College.

Students desiring to transfer from nondegree-seeking status to a degree-seeking status must be admitted by a program through the regular graduate admission process.

Curriculum Change from Active Graduate to Active Undergraduate Status
Individuals who are in good standing in the Graduate College and who wish to transfer to an undergraduate curriculum must contact the graduate classification officer (10 Pearson Hall). The classification officer will consult with the student and determine the proper course of action.

Curriculum Change from Inactive Graduate to Active Undergraduate Status
Individuals who were admitted to the Graduate College more than one year previous and who do not have active graduate status but who wish to change their status from inactive graduate to active undergraduate, must follow the same procedures required of reentering undergraduate students and must begin the process by filing a completed "Undergraduate Reentry" form with the Office of the Registrar. When considering reinstatement, the undergraduate college may consider the student's overall fitness for continued studies including information about the student's conduct, employment and education since the student's last enrollment.

Individuals who do not have active graduate status and who first enrolled less than one year previous should first see the classification officer in the Graduate College.

Time Limits. It is expected that work for the master's degree shall be completed within five years. In special circumstances the student's POS committee may recommend that the Dean of the Graduate College extend these degree time limits. Cases in which the student leaves Iowa State during his or her graduate career and later returns are dealt with individually by the student's POS committee and the Graduate College. The inclusion in the student's program of study of course work that is beyond the time limits ("over-age" courses) must be justified by the POS committee in a statement accompanying the submission of the program of study.

Application for Graduation. Students planning to graduate must submit an "Application for Graduation" form (diploma slip) to the Graduate Office by the end of the first week of the semester (fall or spring) in which he/she expects to receive the degree, or by the last day of spring semester when wishing to graduate during summer.

Before submitting this form, a student must have submitted and had approved by the Graduate College a "Recommendation for Committee Appointment" form and a "Program of Study" form. Also the student must have been fully admitted to a program and have met the Graduate English requirement. Graduation may be delayed if the "Application for Graduation" form filing deadline is not met. If it becomes apparent that a student cannot graduate during the indicated term, he/she should call the Graduate College (515-294-4531) and cancel the previously submitted "Application for Graduation" form. The student must then file a new form for the next planned term of graduation.

Thesis. A master's thesis is a scholarly composition that demonstrates the ability of the author to do independent and creative work. A thesis is required in all fields in which a master's degree is awarded, except where specific provision is made for a nonthesis degree program. A minimum of three research credits is required on every program of study for a thesis master's degree.

Responsibility for writing and editing of the thesis rests with the student, under the supervision of the major professor, and not with the Thesis Office. The Graduate College does not permit joint authorship of theses. It is the responsibility of the major professor to supervise the preparation of preliminary and final drafts of the thesis to assure the highest level of quality when the student presents the thesis to the committee for final approval. Copies of the thesis must be submitted to the members of the POS committee at least two weeks before the final oral examination.

The Graduate College Thesis Manual, available free of charge from the Thesis Office (203 Beardshear Hall, 515-294-2666) or online at www.grad-college.iastate.edu/thesis/thesis.html, outlines the details of Graduate College requirements covering the preparation and submission of theses. Students are also encouraged to contact the Graduate College thesis specialist for a preliminary format check.

After the final oral examination, two unbound, signed copies of the thesis must be submitted to the Thesis Office no later than the Final Submission deadline for the term of graduation. Some colleges, programs, and departments require the submission of additional copies of the thesis either to the Thesis Office or directly to the program (see *the Graduate College Thesis Manual* for a list of the units requiring submission of an additional copy to the Thesis Office). A thesis processing fee is charged during the term in which the student intends to graduate.

Creative Component. Every nonthesis student must present substantial evidence of individual accomplishment (e.g., a special report, capstone course, integrated field experience, annotated bibliography, research project, design, or other creative endeavor). A minimum of two credits of such independent work is required on every program of study for a nonthesis master's degree. Some programs require more credits. (For more information, contact the individual program or consult the Specific Master's Degrees section in this bulletin.) The element of creative independent study must be explicitly identified on the program of study. The format of the creative component is determined in cooperation with the POS committee. As with a thesis, a creative component should be submitted to members of the POS committee two weeks before the final oral examination. However, no first submission or final submission of a creative component is turned in to the Thesis Office or Graduate College for review and approval.

Final Oral Examination. All master's (except M.B.A. students) candidates must pass final oral examinations. The final oral examination must be held by the final examination deadline date for the semester in which the degree is granted. All coursework in the program of study must either be completed or in progress before the final examination can be scheduled. This examination is oral; it may also include a written component if specified by the student's (POS) committee.

Graduate students must register for the equivalent of two credits, or for the R-credit course GR ST 600 (Examination Only) if no course work is needed, during the semester in which the final examination is taken. Taking only an R-credit course where the fee is not equivalent to the 2-credit minimum charge is not acceptable for the term of the final oral examination. If the examination is taken during the interim between terms (including the first day of classes), registration can be for either the term before or the term after the examination is held.

The candidate is responsible for initiating the "Request for Final Oral Examination" form, which must be submitted to the Graduate College at least three weeks before the examination. This form can be obtained only from the student's program/department. The entire POS committee must be convened for the final oral examination. For more information on the final oral examination, see *the Graduate College Handbook*.

Graduate Student Approval Slip for Graduation. Every candidate for an advanced degree is required to complete a "Graduate Student Approval Slip for Graduation" form. It is sent to the major professor or program to give to the student after the "Request for Final Examination" form is received and approved by the Graduate College. Signatures are required by the major program, the Thesis Office (for those completing a thesis), and the Graduate College. Final clearance of academic requirements will be made when current term grades have been submitted and evaluated by the Graduate College.

All incompletes from previous terms must be completed by the deadline for completion of the Graduate Student Approval Slip. An incomplete or non-report grade that a student receives for the term of graduation will result in removal from that term's graduation list. The student will need to complete a new Application for Graduation and Graduate Student Approval Slip for the new term of graduation. If a conditional pass was recommended at the final oral examination, the major professor and the committee members, if so specified, must notify the Graduate College in writing no later than the due date for the Graduate Student Approval Slip for the term of graduation that the conditions have been met.

Specific Master's Degrees

The number of credits in a major for a master's degree will vary according to the degrees listed below. General credit requirements for all master's degrees include: a minimum of 30 graduate credits is required for all master's programs at ISU; at least 22 graduate credits must be earned at ISU unless noted in descriptions; any transfer of graduate credits from another institution must be recommended in the program of study by the POS committee; and graduate credit earned as a graduate student will be approved for transfer only if a B grade or better was earned. A transcript must accompany the POS form.

Master of Arts or Master of Science—Thesis

At least 30 credits of acceptable graduate work must be completed, not less than 22 of which must be earned from ISU. Students are expected to research and write a thesis that demonstrates independent and creative work. A minimum of 3 semester credits is required for thesis research.

Master of Arts or Master of Science—Nonthesis

In certain programs a nonthesis degree program is offered. (For more information on requirements, contact the individual program or department.) This option requires the satisfactory completion of at least 30 graduate credit hours of acceptable work (not including research credit), not less than 22 credits of which must be earned from Iowa State University, and satisfactory completion of a comprehensive final oral examination. In addition, every nonthesis master's program must present substantial evidence of individual accomplishment (e.g., a special report, capstone course, integrated field experience, annotated bibliography, or other creative endeavor). A minimum of two semester hours of such independent work (referred to as the creative component) is required on every program of study for a nonthesis master's degree and is applied toward the credit-hour requirement. This element of creative independent study must be explicitly identified on the program of study. Detailed requirements may vary with fields. Reference should be made to the *Courses and Programs* section in this catalog.

Master of Accounting. The Department of Accounting offers a 32-credit Master of Accounting graduate degree. The program requires 15 credits of graduate accounting courses, at least 9 credits of non-accounting graduate electives, a communications course, an international course from an approved list, and a creative component. The degree is appropriate for any student wanting to pursue a variety of accounting careers. Additionally, the program is designed to help interested candidates meet the 150-hour education requirement for the CPA certification in Iowa.

Master of Agriculture. The major in professional agriculture is an off-campus, nonthesis program leading to the master of agriculture degree. It is available to students wishing to pursue graduate study in agriculture without taking formal coursework on campus. The program is considered to be a terminal master's degree. Students are required to take a minimum of two courses in each of three disciplines and complete 28 semester credits of formal coursework and four credits of creative component experience, resulting in a total of 32 graduate credits of coursework. Courses are delivered via video-tapes, interactive video, world-wide web, on-and off-campus classes and workshops. Specific courses offered in the program and the location of the off-campus classes may be obtained from the departmental course listings, off-campus course catalog, or by contacting the Professional Agriculture Coordinator, 201 Curtiss Hall.

Master of Architecture. The Department of Architecture offers a two-part program leading to the master of architecture, a professional degree. The M. Arch (100) option is designed for individuals with an undergraduate degree other than architecture. Students explore a full range of architectural subjects through seminars, an intensive sequence of design studios, and thesis. One hundred credits are required, including 40 graduate credits.
The M. Arch. (60) option is for individuals with a preprofessional undergraduate major in architecture. Applicants are given advanced standing in the M. Arch (100) option based on a review of their academic record. Following the completion of the requisite professional courses the student is expected to develop an individualized course of study leading to the thesis. Sixty credits are required, including 30 graduate credits.

Master of Business Administration. The College of Business offers a 48 graduate credit-hour program leading to a nonthesis master of business administration degree. Students may select courses in the traditional business disciplines or choose areas of specialization in accounting, agribusiness, finance, human resource management, information systems, marketing, and sports management.

Since no final oral examination is required, M.B.A. students must be registered for the equivalent of 2 credits the term of graduation or Gr St 601 (required registration) if no course work is required.

Master of Community and Regional Planning. The master of community and regional planning degree requires a minimum of 48 graduate semester credit hours. This degree is available as a thesis or nonthesis option.

Master of Education. For the master of education degree, a range of 30 to 40 graduate credits are required. The student demonstrates an ability to perform independent study through the completion of a creative component or a field-based activity.

Master of Engineering. The academic standards and the general level of attainment are the same for the master of engineering and master of science degrees. Master of engineering programs are offered to meet the needs for professionally oriented programs on campus and for off-campus professionally oriented programs at locations with adequate library and laboratory facilities. An appropriate number of credit hours in design, laboratory work, computation, or independent study is required as evidence of individual accomplishment. Of the minimum 30 graduate credits requirement, 22 credit hours must be earned at ISU.

Master of Family and Consumer Sciences. The College of Family and Consumer Sciences offers two nonthesis options leading to the degree master of family and consumer sciences. Both options are designed to enhance the skills of those holding the bachelor's degree so that they may meet the requirements of their present jobs or progress in their careers. The comprehensive option can be followed on- or off-campus and requires 36 graduate credits covering a variety of family and consumer sciences subject matter. The specialization option requires 36 credits and is offered on-campus from the following departments and programs: Hotel, Restaurant, and Institution Management; Human Development and Family Studies; and Textiles and Clothing. Both options require a written and oral integrative final exam.

Master of Fine Arts. For this degree a minimum of 60 graduate credits is required, 61 for the MFA in Integrated Visual Arts, including the completion of a thesis-exhibition or a thesis.

Master of Landscape Architecture. The master of landscape architecture degree requires a minimum of 36 graduate credits and the satisfactory completion of a thesis or a creative component.

Master of Public Administration. This is a professional degree program designed to provide training necessary for an administrator in a public or quasi-public bureaucracy. The MPA degree requires 37 credit hours, which includes (a) 12 credit hours in Core Competency, (b) 12 credit hours in one of the Concentration areas, (c) 3-7 credit hours in Research Method, (d) Electives up to 7 credit hours, (e) 3 credit hours of Internship, and (f) 3 credit hours of Creative Component (a Capstone Project).

Master of School Mathematics. This degree is designed primarily for inservice secondary mathematics teachers. Its prescribed program of study requires 36 graduate credits, two of which come from the writing of an approved creative component, 15 from courses offered for graduate credit, and 13 from courses offered for nonmajor graduate credit. At least 22 credit hours must be earned at ISU.

Master's Double Degree Programs

A double degree requires fulfillment of the requirements for two graduate majors for which two differently named master's degrees and two diplomas are granted at the same time. For double degrees the final project (thesis or creative component) must integrate subject areas from both departments. One final oral examination must be held covering the combined thesis or creative component. Students planning to pursue double degrees must complete a double degree request form and submit it to the Dean of Graduate College for approval. Just one "Recommendation for Committee Appointment" form and one "Program of Study (POS)" form need to be submitted for the two degrees. However, two "Application for Graduation" forms, one for each degree, will need to be submitted. All forms should show clearly that the student is enrolled in a double-degree program.

Like other master's programs, three graduate faculty members can constitute a POS committee; however, POS committees for double degrees must include co-major professors from each of the majors. Although specific degree programs may require more, the program of study must include at least 44 hours of non-overlapping credit (22 for each major) in the two degrees.

Six such combinations are currently available: (1) Master of Architecture/Master of Business Administration; (2) Master of Architecture/ Master of Community and Regional Planning; (3) Master of Community and Regional Planning/Master of Business Administration; (4) Master of Landscape Architecture/Master of Community and Regional Planning; (5) Master of Public Administration/Master of Community and Regional Planning; and (6) Master of Science in Statistics/Master of Business Administration. If a student outside one of the named areas is interested in an individually-developed double degree program, a written proposal for a double degree to serve those interests and needs must be submitted to the Dean of the Graduate College for review. Please see t*he Graduate College Handbook* for more information.

Drake University Law School/Iowa State University Combined Degree

To provide training in the complementary fields of law, political science, and economics with a minimum amount of academic duplication, special arrangements for combined degree programs have been approved with the Drake University Law School. ISU and Drake offer a combined J.D.-M.A. in political science and J.D.-Ph.D. in economics. Drake Law School students are permitted to transfer the equivalent of nine semester credits of

specified law courses to ISU for nonmajor graduate credit. Because of the difference in grading systems, the Law School grades are transferred as passes, provided the student has achieved a grade of C or better in those courses at Drake for the political science program or a grade of B or better for the economics program.

Applicants for either of the combined programs must meet the regular entrance requirements of, and be admitted to, both the Drake Law School and the ISU Graduate College.

Doctor of Philosophy

General Requirements

The degree doctor of philosophy is strongly research oriented. The primary requirements for the degree are: (1) high attainment and proficiency of the candidate in his or her chosen field, (2) development of a dissertation which is a significant contribution to knowledge and which shows independent and creative thought and work, and (3) successful passing of detailed examinations over the field of the candidate's major work, with a satisfactory showing of preparation in related courses. General requirements for Ph.D. candidates are as follows:

Appointment of the Student's Program of Study (POS) Committee. The POS committee for a doctoral program consists of at least five members of the graduate faculty. It must include at least three members, including the major professor, from within the student's major or program. The committee must include members from different majors or different departments so as to ensure diversity of perspectives. A term member of the graduate faculty may participate in the direction of a student's dissertation research as a co-major professor if a member of the graduate faculty serves as a co-major professor and jointly accepts responsibility for direction of the dissertation.

Changes to POS committee. Recommendations for changes in the POS committee must have the approval of the student, major professor, DOGE, and all committee members involved in the change (committee members who are on Faculty Professional Development Assignments, retired, or resigned do not have to sign) before seeking approval of the Graduate College. A form to seek approval is available in program offices or on the web at www.grad-college.iastate.edu/deadline/formss.html. These changes must be approved by the Dean of the Graduate College before the preliminary or final oral examination is held. For more information on changes to the committee and to the Program of Study, see the *Graduate College Handbook*.

Program of Study. The student and the major professor develop the program of study with the consultation and approval of the POS committee. Early selection of a major professor, appointment of a POS committee, and development of a program of study are very important. It is recommended that the committee be formed as early as the second semester of graduate study. In no case can the committee be formed later than the term before the preliminary oral examination.

Credits. A minimum of 72 graduate credits must be earned for a Ph.D. degree. At least 36 graduate credits, including all dissertation research credits, must be earned at Iowa State University. At least 24 of these credits must be earned during two consecutive semesters or during a continuous period including two semesters and a summer session while in residence at the university. (This requirement does not apply to doctoral students who are employed more than half time at ISU). There is no specific university requirement regarding the number of credits to be taken inside or outside the major/program.

Transfer Credits. At the discretion of the POS committee, and with the approval of the program and the Graduate College, graduate credits earned as a graduate student at another institution or through a distance education program offered by another institution may be transferred if the grade was B or better. Such courses must have been acceptable toward an advanced degree at that institution and must have been taught by individuals having graduate faculty status at that institution. If a student wishes to transfer credits from graduate courses taken at or through another university as an undergraduate student, it is that student's responsibility to provide verification by letter from that institution that those graduate courses were not taken to satisfy undergraduate requirements for a degree.

A transcript must accompany the POS in order to transfer credits. The POS committee may ask for other materials, such as a course outline or accreditation of the institution, to evaluate the course. Transfer courses not completed when the POS is submitted must be completed before the term in which the student graduates. A transcript must then be submitted for review and final approval. Research credits earned at another institution are generally not transferred. In rare circumstances, the transfer of S or P marks may be accepted for research credits only. It is the responsibility of the POS committee to obtain a letter from the responsible faculty member at the other institution stating that research credits recommended for transfer with S or P makrs are considered to be worthy of a B grade or better.

Residence. At least 24 semester credits must be earned during two consecutive semesters or during a continuous period including two semesters and a summer session. This requirement does not apply to doctoral students who are employed at least half-time by Iowa State University and government laboratories located in Ames. Of the 72 graduate credits required for a Ph.D. at least 36 credits, including all dissertation research credits, must be earned under the supervision of the student's POS committee.

Major. A major is the area of study or academic concentration in which a student chooses to qualify for the award of a graduate degree. Majors are listed at the end of this section of the bulletin. Opportunities also exist for majoring in more than one area of study (co-major or joint major programs).

Minor. Students may request a minor in any program approved to grant a graduate degree and in programs approved to offer only a minor. Requirements for declared minors are determined by the minor program and the faculty member representing the minor field on the student's POS committee. The minor subject area must be tested at the preliminary oral and final oral examinations. A minor cannot be added to a program of study after the preliminary oral examination has been taken, nor can a minor be place on the transcript after graduation, unless it was approved on the program of study, listed on all examination reports, and recorded on the "Application for Graduation" form (diploma slip). A student may not minor and major in the same field. A minor cannot be added to a degree that has already been awarded.

Time Limits. A student beginning a Ph.D. degree program at Iowa State with a master's degree from another institution is expected to complete the Ph.D. within five years, while a student beginning a Ph.D. degree program without the master's degree is expected to complete the program within seven years. If warranted, the Program of Study (POS) Committee may request by letter that the Dean of the Graduate College extend these time limits. Cases in which the student leaves Iowa State during his or her graduate career and later returns are dealt with individually by the student's program of study committee and the Graduate College. The inclusion in the program of study of coursework that is beyond the time limits ('over-age" courses) must be justified by the POS committee in a statement accompanying the submission of the program of study.

Preliminary Examination. The Graduate College requires a preliminary oral examination of Ph.D. degree students; most programs add a written portion to the preliminary oral examination. The Ph.D. degree preliminary oral examination rigorously tests a graduate student's knowledge of major, minor, and supporting subject areas as well as the student's ability to analyze, organize, and present subject matter relevant to the field. A "Request for Preliminary Examination" form must be submitted to the Graduate College by the major professor at least two weeks before the proposed date of the examination.

The following conditions should be met before the "Request for Preliminary Examination" form is submitted to the Graduate College: admitted to full admission status in a Ph.D. granting program, approved "Recommendation for Committee Appointment" form, approved POS form, English requirement met, not on probation, time limit not exceeded, qualifying examination (if required by program) passed, and registration for at least the equivalent of 2 credits, or for the R-credit course GR ST 600 (Examination Only) if no course work is needed, during the term in which the preliminary oral examination is taken. (Taking only an R-credit course where the fee is not equivalent to the 2-credit minimum charge is not acceptable for the term of the preliminary oral examination.)

A preliminary oral examination will not be scheduled for a student on provisional or restricted admission or on academic probation. Upon successful completion of the preliminary oral examination, the student is admitted to candidacy for the Ph.D. degree. If the graduate student fails all or part of the preliminary oral examination, he/she may be allowed to retake it. Six months must elapse between the first attempt and the next. The entire POS committee must be convened for the preliminary oral examination. The preliminary oral examination must be passed at least six months prior to the final oral examination. An exception to the rule is allowed if a request, signed by the entire POS committee, is approved by the Dean of the Graduate College.

Application for Graduation. Application for graduation should be made by the end of the first week of the semester (fall or spring) in which the student expects to receive the degree, or by the last day of the spring semester if graduation is planned during summer session. To apply for graduation, the student is required to submit to the Graduate College a signed "Application for Graduation" form, available in the program office or on the web at www.grad-college.iastate.edu/forms/forms.html. Before submitting this form, a student must have submitted and had approved by the Graduate College a "Recommendation for Committee Appointment" form and a "Program of Study" form. Also the student must have been fully admitted to a program and have met the Graduate English requirement. Graduation may be delayed if the "Application for Graduation" form filing deadline is not met. If it becomes apparent that a student cannot graduate during the indicated term, he/she should call the Graduate College (515-294-4531) and cancel the previously submitted "Application for Graduation" form. The student must then file a new form for the next planned term of graduation.

Dissertation. A doctoral dissertation must demonstrate conclusively the ability of the author to conceive, design, conduct, and interpret independent, original, and creative research. It must attempt to describe significant original contributions to the advancement of knowledge and must demonstrate the ability to organize, analyze, and interpret data. In most instances, a dissertation includes a statement of purpose, a review of pertinent literature, a presentation of methodology and results obtained, and a critical interpretation of conclusions in relation to the findings of others. When appropriate, it involves a defense of objectives, design, and analytical procedures. Dissertation research should be worthy of publication and should appear in appropriate professional journals or in book form.

Responsibility for writing and editing of the dissertation rests with the student, under the supervision of the major professor, and not with the Thesis Office. The Graduate College does not permit joint authorship of dissertations. It is the responsibility of the major professor to supervise the preparation of preliminary and final drafts of the dissertation, so as to assure the highest level of quality when the student presents the dissertation to the committee for final approval. Copies of the dissertation must be submitted to the POS committee at least two weeks before the final oral examination.

The Graduate College Thesis Manual, available free of charge from the Thesis Office (203 Beardshear Hall, 515-294-2666) or online at www.grad-college.iastate.edu/thesis/thesis.html, outlines the details of Graduate College requirements covering the preparation and submission of dissertations.

After the final oral examination, two unbound, signed copies of the dissertation must be submitted to the Thesis Office no later than the Final Submission deadline for the term of graduation. Some colleges, programs, and departments require the submission of additional copies of the dissertation either to the Thesis Office or directly to the program (see the *Graduate College Thesis Manual* for a list of the units requiring submission of an additional copy to the Thesis Office).

During the term of graduation, a fee for processing the dissertation is billed by the university accounting system.

Final Oral Examination. The Ph.D. final oral examination, conducted after the dissertation is finished, is oral and often limited to a defense of the dissertation. To receive the degree at the end of a given semester, the student must hold the final oral examination before the final oral examination deadline for the semester.

The candidate is responsible for initiating the "Request for Final Oral Examination" form, which must be submitted to the Graduate College at least three weeks before the examination. This form can be obtained only from the student's program/department. The entire POS committee must be convened for the final oral examination. For more information on the final oral examination, see t*he Graduate College Handbook*.

Graduate Student Approval Slip for Graduation. Every candidate for an advanced degree is required to complete a "Graduate Student Approval Slip for Graduation" form. It is sent to the major professor or program to give to the student after the "Request for Final Examination" form is received and approved by the Graduate College. Signatures are required by the major program, the Thesis Office, and the Graduate College. Final clearance of academic requirements will be made when current term grades have been submitted and evaluated by the Graduate College.

All incompletes from previous terms must be completed by the deadline for completion of the Graduate Student Approval Slip. An incomplete or non-report grade that a student receives for the term of graduation will result in removal from that term's graduation list. The student will need to complete a new Application for Graduation and Graduate Student Approval Slip for the new term of graduation. If a conditional pass was recommended at the final oral examination, the major professor and the committee members, if so specified, must notify the Graduate College in writing no later than the due date for the Graduate Student Approval Slip for the term of graduation that the conditions have been met.

Graduate Majors

More information on each major can be found in the Courses and Programs section of this catalog under the department or program listed in parentheses after the degree information.

Accounting: M.Acc. (see *Accounting*)

Aerospace Engineering: M.Eng., M.S., Ph.D. (see *Aerospace Engineering*)

Agricultural Economics: M.S., Ph.D. (see *Economics*)

Agricultural Education: M.S., Ph.D. (see *Agricultural Education and Studies*)

Agricultural Engineering: M. Eng., M.S., Ph.D. (see *Agricultural Engineering*)

Agricultural History and Rural Studies: Ph.D. (see *History*)

Agricultural Meteorology: M.S., Ph.D. (see *Agronomy*)

Agronomy: M.S. (see *Agronomy*)

Analytical Chemistry: M.S., Ph.D. (see *Chemistry*)

Animal Breeding and Genetics: M.S., Ph.D. (see *Animal Science*)

Animal Ecology: M.S., Ph.D. (see *Natural Resource Ecology and Management*)

Animal Nutrition: M.S., Ph.D. (see *Animal Science*)

Animal Physiology: M.S., Ph.D. (see *Animal Science*)

Animal Science: M.S., Ph.D. (see *Animal Science*)

Anthropology: M.A. (see *Anthropology*)

Applied Mathematics: M.S., Ph.D. (see *Mathematics*)

Applied Physics: M.S., Ph.D. (see *Physics and Astronomy*)

Architectural Studies: M.S. (see *Architecture*)

Architecture: M. Arch., M. Arch./M.B.A., M. Arch./M.C.R.P. (see *Architecture*)

Art and Design: M.A. (see *Art and Design*)

Astrophysics: M.S., Ph.D. (see *Physics and Astronomy*)

Biochemistry: M.S., Ph.D. (see *Biochemistry, Biophysics and Molecular Biology*)

Bioinformatics and Computational Biology: M.S., Ph.D. (see *Bioinformatics and Computational Biology*)

Biomedical Engineering: M.S., Ph.D. (see *Biomedical Engineering*)

Biophysics: M.S., Ph.D. (see *Biochemistry, Biophysics and Molecular Biology*)

Biorenewable Resources and Technology: M.S., Ph.D. (see *Biorenewable Resources and Technology*)

Botany: M.S., Ph.D. (see *Botany*)

Business: M.S. (see *Business Administration*)

Business Administration: M.B.A., M. Arch./M.B.A., M.B.A./M.C.R.P., M.B.A./M.S. (Statistics) (see *Business Administration*)

Chemical Engineering: M. Eng., M.S., Ph.D. (see *Chemical Engineering*)

Chemistry: M.S., Ph.D. (see *Chemistry*)

Civil Engineering: M.S., Ph.D. (see *Civil Engineering*)

Community and Regional Planning: M.C.R.P., M. Arch./M.C.R.P., M.B.A./M.C.R.P., M.L.A./M.C.R.P, M.P.A./M.C.R.P. (see *Community and Regional Planning*)

Computer Engineering: M.S., Ph.D. (see *Computer Engineering*)

Computer Science: M.S., Ph.D. (see *Computer Science*)

Condensed Matter Physics: M.S., Ph.D. (see *Physics and Astronomy*)

Crop Production and Physiology: M.S., Ph.D (see *Agronomy*)

Earth Science: M.S., Ph. D. (see *Geological and Atmospheric Sciences*)

Ecology and Evolutionary Biology: M.S., Ph.D. (see *Ecology and Evolutionary Biology*)

Economics: M.S., Ph.D. (see *Economics*)

Education: M.Ed., M.Ed. Practitioner, M.S., Ph.D. (see *Curriculum and Instruction, Educational Leadership and Policy Studies, and Health and Human Performance*)

Electrical Engineering: M.S., Ph.D. (see *Electrical and Computer Engineering*)

Engineering Mechanics: M.Eng., M.S., Ph.D. (see *Engineering Mechanics*)

English: M.A. (see *English*)

Entomology: M.S., Ph.D. (see *Entomology*)

Exercise and Sport Science: M.S. (see *Health and Human Performance*)

Family and Consumer Sciences: M.F.C.S. (see *College of Family and Consumer Sciences*)

Family and Consumer Sciences Education: M.Ed., M.S., Ph.D (see *Family and Consumer Sciences Education and Studies*)

Fisheries Biology: M.S., Ph. D. (see *Natural Resource Ecology and Management*)

Food Science and Technology: M.S., Ph.D. (see *Food Science and Human Nutrition*)

Foodservice and Lodging Management: M.S., Ph.D. (see *Hotel, Restaurant, and Institution Management*)

Forestry: M.S., Ph.D. (see *Natural Resource Ecology and Management*)

Genetics: M.S., Ph.D. (see *Genetics*)

Geology: M.S., Ph.D. (see *Geological and Atmospheric Sciences*)

Graphic Design: M.F.A. (see *Art and Design*)

Health and Human Performance: Ph.D. (see *Health and Human Performance*)

High Energy Physics: M.S., Ph.D. (see *Physics and Astronomy*)

History: M.A. (see *History*)

History of Technology and Science: M.A., Ph.D. (see *History*)

Horticulture: M.S., Ph.D. (see *Horticulture*)

Human Development and Family Studies: M.S., Ph.D. (see *Human Development and Family Studies*)

Immunobiology: M.S., Ph.D. (see *Immunobiology*)

Industrial Education and Technology: M.S., Ph.D. (see *Industrial Education and Technology*)

Industrial Engineering: M.S., Ph.D. (see *Industrial Engineering*)

Industrial Relations: M.S. (see *Industrial Relations*)

Information Assurance: M.S. (see *Information Assurance*)

Information Systems: M.S. (see *Management Information Systems*)

Inorganic Chemistry: M.S., Ph.D. (see *Chemistry*)

Integrated Visual Arts: M.F.A. (see *Art and Design*)

Interdisciplinary Graduate Studies: M.A., M.S (see *Interdisciplinary Graduate Studies*)

Interior Design: M.F.A. (see *Art and Design*)

Journalism and Mass Communication: M.S. (see *Journalism and Communication, Greenlee School of*)

Landscape Architecture: M.L.A., M.L.A./ M.C.R.P. (see *Landscape Architecture*)

Materials Science and Engineering: M.S., Ph.D. (see *Materials Science and Engineering*)

Mathematics: M.S., Ph.D. (see *Mathematics*)

Meat Science: M.S., Ph.D. (see *Animal Science, Food Science and Human Nutrition* (offered as Ph.D. only jointly with Animal Science))

Mechanical Engineering: M.S., Ph.D. (see *Mechanical Engineering*)

Meteorology: M.S., Ph.D. (see *Geological and Atmospheric Sciences*)

Microbiology: M.S., Ph.D. (see *Microbiology*)

Molecular, Cellular, and Developmental Biology: M.S., Ph.D. (see *Molecular, Cellular, and Developmental Biology*)

Neuroscience: M.S., Ph.D. (see *Neuroscience*)

Nuclear Physics: M.S., Ph.D. (see *Physics and Astronomy*)

Nutrition: M.S., Ph.D. (see *Food Science and Human Nutrition*)

Operations Research (must be a joint major with Statistics): M.S. (see *Industrial Engineering/Statistics*)

Organic Chemistry: M.S., Ph.D. (see *Chemistry*)

Physical Chemistry: M.S., Ph.D. (see *Chemistry*)

Physics: M.S., Ph.D. (see *Physics and Astronomy*)

Physiology: M.S., Ph.D. (see *Biomedical Sciences*)

Plant Breeding: M.S., Ph.D. (see *Agronomy*)

Plant Pathology: M.S., Ph.D. (see *Plant Pathology*)

Plant Physiology: M.S., Ph.D. (see *Plant Physiology*)

Political Science: M.A., M.P.A. (see *Political Science*)

Professional Agriculture: M.Ag. (see *Professional Agriculture*)

Psychology: M.S., Ph.D. (see *Psychology*)

Public Administration: M.P.A., M.P.A./ M.C.R.P. (see *Political Science*)

Rhetoric and Professional Communication: Ph.D. (see *English*)

Rural Sociology: M.S., Ph.D. (see *Sociology*)

School Mathematics: M.S.M. (see *Mathematics*)

Sociology: M.S., Ph.D. (see *Sociology*)

Soil Science: M.S., Ph.D. (see *Agronomy*)

Statistics: M.S., M.B.A./M.S., Ph.D. (see *Statistics*)

Sustainable Agriculture: M.S., Ph.D. (see *Sustainable Agriculture*)

Systems Engineering: M.Eng. (see *Systems Engineering*)

Teaching English as a Second Language/ Applied Linguistics: M.A. (see *English*)

Textiles and Clothing: M.S., Ph.D. (see *Textiles and Clothing*)

Toxicology: M.S., Ph.D. (see *Toxicology*)

Transportation: M.S. (see *Transportation*)

Veterinary Anatomy: M.S., Ph.D. (see *Biomedical Sciences*)

Veterinary Clinical Sciences: M.S. (see *Veterinary Clinical Science*)

Veterinary Diagnostic and Animal Production Medicine: M.S. (see *Veterinary Diagnostic and Animal Production Medicine*)

Veterinary Microbiology: M.S., Ph.D. (see *Veterinary Microbiology and Preventive Medicine*)

Veterinary Pathology: M.S., Ph.D. (see *Veterinary Pathology*)

Veterinary Preventive Medicine: M.S. (see *Veterinary Diagnostic and Animal Production Medicine*)

Water Resources: M.S., Ph.D. (see *Water Resources*)

Wildlife Biology: M.S., Ph.D. (see *Natural Resource Ecology and Management*)

Zoology: M.S., Ph.D (see *Zoology and Genetics*)

Declared Minors

(in addition to the majors above which can also be minors)

Agricultural Systems Technology (see *Agricultural Systems Technology*)

Complex Adaptive Systems (see *Complex Adaptive Systems*)

Gerontology (see *Gerontology*)
Philosophy (see *Philosophy and Religious Studies*)

French (see *Foreign Languages and Literatures*)

German (see *Foreign Languages and Literatures*)

Latin (see *Foreign Languages and Literatures*)

Linguistics (see *Linguistics*)
Russian (see *Foreign Languages and Literatures*)

Spanish (see *Foreign Languages and Literatures*)

Speech Communication (see *Speech Communication*)

Technology and Social Change (see *Technology and Social Change*)

Graduate Certificate Programs

Advanced Medical Nutrition Therapy Certificate (see *Food Science and Human Nutrition*)

Community College Leadership Certification (see *Educational Leadership and Policy Studies*)

Counselor Education Endorsement (see *Educational Leadership and Policy Studies*)

Dietetics Communication and Counseling Certificate (see *Food Science and Human Nutrition*)

Dietetics Management Certificate (see *Food Science and Human Nutrition*)

Electric Power Systems Engineering Certificate (see *Electrical Engineering*)

Family Financial Planning Certificate (see *Family Financial Planning*)

Information Assurance Certificate (see *Information Assurance*)

Principal Endorsement (Pre-LEAD) (see *Educational Leadership and Policy Studies*)

Superintendent Licensure (see *Educational Leadership and Policy Studies*)

Special Education Endorsement (see *Curriculum and Instruction*)

Public Management Certificate Public Management Major (see *Political Science*)

Courses and Programs

Information About Courses

Course Numbers

The courses in each department are numbered from 1 to 699 according to the following groups

1-99	Courses not carrying credit toward a degree (zero credit)
100-299	Courses primarily for freshman and sophomore students
300 499	Courses primarily for junior and senior students
500 599	Courses primarily for graduate students but open to qualified undergraduates
600-699	Courses for graduate students

Credits and Contact Hours

The academic value of each course is stated in semester credits Each credit is normally earned by attending one (50-minute) hour of lecture or recitation per week for the entire semester or by attending a laboratory or studio period of two or three hours per week As a guideline undergraduate students typically will be expected to spend two hours in preparation outside of class for each lecture or recitation hour additional outside work may be required for laboratory or studio classes

Each course states the number of semester credits assigned to the course preceded in parentheses by the number of hours in class (contact hours) expected of the student The first of the two contact-hour numbers indicates the number of lecture or recitation class hours per week for the semester The second is the number of laboratory or studio hours required per week Laboratory and studio hours may include some time devoted to lectures and recitations For example Com S 103 is listed as (3-2) Cr 4 In that case the course is 4 semester credits 3 hours of lecture and two hours of laboratory each week

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

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

Semester of Offering

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

Course Prerequisite

A prerequisite indicates the specific academic background or general academic maturity considered necessary for the student to be ready to undertake the course Prerequisites are usually stated in terms of specific courses but equivalent preparation is usually acceptable An instructor may however direct a student whose background does not meet the stated prerequisite or its equivalent to drop the course Conversely an instructor may waive the prerequisite for a course for which he or she is responsible Thus permission of the instructor is understood to be an alternate to the stated prerequisites in all courses

Cross-listed Courses

A course may be listed with its complete description in one department and without its description in another department In both cases the department with which the course is cross-listed is noted in parentheses The full description appears with the department responsible for the course but credit for the course may also be obtained through the department in which it is cross-listed

Co-listed Courses

A course including its complete description may be listed in two or more departments with the department or departments co-listing the course being noted in parentheses in each case All departments in which the course is listed share responsibility for its offering and credit for it may be obtained through any of the departments in which it is listed

Designators

For abbreviations for designating departments and programs See *Index Designators*

Dual-listed Courses

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

Off-campus courses-Residential Credit

Iowa State University offers distance education courses over the Iowa Communications Network (ICN) by videotape and on the World Wide Web Courses are the same as those offered on campus carry residential credit and are taught by ISU faculty members Credit earned in off-campus courses becomes a part of your academic record at Iowa State University and may be used to meet degree requirements in the same manner as credit earned on campus

Priority Enrollment

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

Special Course Fees

Courses for which special course fees are assessed are designated in the *Schedule of Classes* Special course fees may be assessed for such extraordinary costs as materials fees (which may include consumable materials or equipment replacement) field trip expenses developmental math fees and camp fees In some cases special course fee amounts vary from term to term Additional information on camp fees and the developmental math fee may be found in the fees and expenses section See *Index Fees*

Graduate Programs

Graduate Major

A major in the Graduate College is the area of academic professional concentration approved by the Board of Regents in which the student chooses to qualify for the award of a graduate degree

Graduate Area of Specialization

Areas of specialization are indicated in the graduate statements of some departments This is a subdivision of a major in which a strong graduate-level program is available When approved by the Graduate College such areas of specialization are shown parenthetically after the major on official records including transcripts and thesis/dissertation title pages

Interdepartmental Programs

Interdepartmental programs are available at both graduate and undergraduate levels An interdepartmental program is an administrative structure usually not functioning as a department ordinarily headed by a supervisory committee and offering a degree with

major(s) in that subject area Interdepartmental programs have been officially approved and may offer courses

Nonmajor Graduate Credit

All courses included on the Program of Study of a graduate student must be approved by the student s program of study committee Usually courses in the major are selected from 500- and 600- level courses in the major Courses outside of the major can be selected from other 500- and 600- level courses and from 300- and 400- level courses which have been approved for nonmajor graduate credit In the catalog the approved 300- and 400 level courses are indicated by the words Nonmajor graduate credit in the course description

Accounting

Richard B Carter Chair of Department

Professors Hira Smith

Professors (Emeritus) Brown Elvik Handy

Associate Professors Bouillon Dilla Doran Jeffrey Kurtenbach Ravenscroft Swanson

Assistant Professors Caplan Clem Janvrin Terando

Assistant Professors (Adjunct) Curtis

Instructors (Adjunct) Blanshan Duffy Mazzitelli

Undergraduate Study

For undergraduate curriculum in business major in accounting see *College of Business Curricula*

The primary purpose of accounting is to provide relevant information to both internal users (manage ment) and external users such as investors creditors government and the general public Accounting is an integral part of the management of business and public organizations Accountants therefore participate in planning evaluating and controlling the activities of the firm Accounting is needed by external users in order to make investment decisions grant or withhold credit and in the case of government to collect revenue and gather statistical information In order to provide useful information accountants collect analyze synthesize and report data in an understandable manner

The instructional objective of the Accounting Program is to provide a well rounded professional education in accounting Such an education should provide the student with (1) a mastery of basic accounting concepts (2) an ability to think critically and creatively about accounting problems (3) an ability to communicate effectively and work with others as a member of a team (4) an awareness and sensitivity for dealing with ethical concerns

The major in accounting is designed to give students a conceptual foundation as well as to provide a wide range of basic skills and analytical tools for use in reporting for both public and private concerns Students who complete the accounting major are well prepared to accept positions in industry government and the public accounting profession The require ments for the accounting major are met by successful completion of the following courses Acct 383 384 386 387 485 and 497 Completion of Stat 326 is required prior to Acct 497 See the graduate study curricula in accounting for the 150 hour education requirement for CPA certification in Iowa

In addition it is highly recommended that an accounting major include Business Law II (Acct 316) The Department of Accounting should be consulted for information on specific alternative plans of study

The department also offers a minor for College of Business students with a different major They are required to take 15 credits from a list of approved courses of which 9 credits need to be stand alone

CPA Note In addition to the 18 credit hours of accounting required for the accounting major candidates for the CPA exam must complete two additional accounting courses to sit for the CPA exam for a total of 24 hours beyond principles Students may use the electives shown above or petition to take graduate courses to fulfill the additional six hours In order to be certified or licensed to practice in Iowa students must complete 150 credit hours Students should consider early on how they intend to meet these requirements Options include the Master of Accounting or double majors Business Law II (Accounting 316) is also highly recommended please note this class does not count towards the aforementioned 24 hours required to sit for the exam For states outside Iowa be sure to check local rules as each state determines its own licensing requirements

Graduate Study

The department offers work for a graduate degree the masters of accounting (M Acc) This is a 32 hour degree The program requires 15 hours of graduate accounting courses at least 9 hours of nonaccounting graduate electives a communications course and an international course from an approved list and a 2 hour creative component The M Acc is appropriate for any student wanting to pursue a variety of accounting careers Additionally the program is designed to help interested candidates meet the 150 hour education requirement for CPA certification in Iowa

The department participates in two graduate degree programs the M S in business and the M B A full time and part time programs The M S degree in business is a 30-credit curriculum culminating in a thesis The M B A program is a 48 credit nonthesis noncreative component curriculum Twenty four of the 48 credit hours are core courses and the remaining 24 are graduate electives

Within the M B A program students may develop an area of specialization in accounting This specialization requires that 12 of the 24 credit hours of the graduate electives be from accounting Included in this 12 credit hour requirement is a three credit hour required course Acct 598 Enrollment in Acct 598 is limited to those students with fifteen hours of undergraduate and/or graduate accounting courses or the permission of the instructor

The specialization in accounting is designed to meet the 150 hour education requirement for CPA certification in Iowa

Courses open for nonmajor graduate credit 485 488 495 and 497

Courses Primarily for Undergraduate Students

Acct 215 Legal Environment of Business (3 0) Cr 3 FS SS *Prereq Sophomore classification* General history structure and principles of law The legal system as an agency of social control good business practices *and tool for change The court systems* Constitution torts contracts administrative agencies and agency law

Acct 284 Financial Accounting (3-0) Cr 3 FS SS Introduction to the basic concepts and procedures of financial accounting from a user perspective The course examines the accounting cycle business terminology basic control procedures and the preparation and evaluation of financial reports with an emphasis on financial statement analysis

Acct 285 Managerial Accounting (3-0) Cr 3 FS SS *Prereq 284* Preparation and use of internal managerial reports for decision making planning and performance evaluation

Acct 316 Business Law (3 0) Cr 3 FS *Prereq 215* Continuation of 215 Sales under the Uniform Commercial Code negotiable instruments secured transactions property transactions partnerships and wills and estates

Acct 383 Intermediate Managerial Accounting (3 0) Cr 3 FS *Prereq 285 or 508* Generation communica tion and use of information to assist management with planning control and decision making in manufacturing and service organizations Includes traditional and contemporary models of cost estimation assignment and control responsibility accounting and nonrecurring decisions Emphasis on developing written and oral communication skills as well as spreadsheet capabilities

Acct 384 Accounting Information Systems (3-0) Cr 3 *Prereq 285* Analysis of concepts and procedures underlying the automated accumulation and processing of accounting data EDP internal *control and audit techniques Trends in accounting* information systems

Acct 386 Intermediate Accounting I (3 0) Cr 3 FS *Prereq 285 or 508* The conceptual framework of financial accounting Communication of financial information on the income and retained earnings statements statement of cash flows and the balance sheet Accounting concepts relating to current and operational assets of the firm

Acct 387 Intermediate Accounting II (3 0) Cr 3 FS *Prereq 386* Financial accounting and reporting practices for business entities Generally accepted accounting principles (GAAP) relative to firm liabilities equity income taxes employee benefits leases accounting changes and cash flows Discussion of current issues in financial accounting

Acct 485 Principles of Federal Income Tax (3 0) Cr 3 FS *Prereq 285 or 508* An introduction to the fundamentals of income tax related to entities and individual taxpayers and concepts applicable to all tax entities Depreciation like kind exchanges and capital gain treatment Transaction planning to maximize participation in preferential tax opportunities Nonmajor graduate credit

Acct 488 Governmental and Non profit Institution Accounting (3 0) Cr 3 *Prereq 386 or 508* Budgeting accounting auditing and financial reporting principles associated with private and public nonprofit organizations Includes survey of state local municipal and federal government accounting as well as accounting for colleges universities public schools health care facilities voluntary health and welfare organizations and other not for profit entities Nonmajor graduate credit

Acct 490 Independent Study Cr 1 to 3 each time taken FS SS *Prereq 285 senior classification permission of instructor*

Acct 495 Advanced Accounting Problems (Dual listed with 595) (3 0) Cr 3 *Prereq 387* Partnerships branch operations accounting for business combina tions and affiliated companies consolidated financial statements reporting for multinational operations Nonmajor graduate credit

Acct 497 Introduction to Auditing (3-0) Cr 3 FS *Prereq 384 386 and Stat 326* The conceptual framework of auditing Professional ethics External reporting concepts Audit methodology including risk analysis internal control procedures for gathering evidence and the role of statistical sampling in auditing Nonmajor graduate credit

Courses Primarily for Graduate Students, open to qualified undergraduate students

Acct 508 Survey of Financial and Managerial Accounting (2 0) Cr 2 *Prereq Graduate classifica tion* A general introduction to both financial and managerial accounting information Financial topics covered include the use and analysis of financial information the regulatory environment and the use of the internet and electronic spreadsheets as a means of accessing and analyzing financial data Managerial topics covered include the use of accounting information as a basis for management decisions basic cost concepts cost volume profit analysis strategic cost issues and performance measurement

Acct 581 Accounting for Decision Making (3 0) Cr 3 *Prereq 383 508 or equivalent* Decision analysis applied to managerial accounting issues Generation of information for management decision making and control Responsibility accounting and non recurring decisions

Acct 583 Accounting for Strategic Management (3 0) Cr 3 *Prereq 383 508* Focus on generation and analysis of accounting information for strategic purposes Includes performance measurement decisions balanced scorecard alternative costing methods capital budgeting Emphasis on communica tion and analysis of information

Acct 584 Information Technology and Assurance (3-0) Cr 3 *Prereq 384 or 508 or permission of the instructor* Focus on information technology control design implementation and assurance services relating to information technologies Course requires travel to businesses for on site evaluation and design

Acct 585 Tax Implications of Business Decisions (3 0) Cr 3 *Prereq 285 6 credits in accounting or 508* The impact of federal tax legislation on the formation operation and liquidation or reorganization of entities Income tax planning for executives

Acct 586 Advanced Federal Taxation (3 0) Cr 3 FS *Prereq 485* Advanced topics in Federal Taxation An in-depth study of partnership corporation fiduciary and estate and give taxation Tax administration practice and tax planning are covered Strongly recommended for those who plan a career in public accounting or taxation

Acct 590 Special Topics Cr 1 to 3 each time taken FS SS *Prereq Permission of instructor* For students wishing to do individual research in a particular area of accounting

Acct 592 Financial Statement Analysis (3 0) Cr 3 *Prereq 284 or 508* The presentation and analysis of financial statement information from the point of view of the primary users of such data owners and creditors Topics covered will include the financial reporting system the primary financial statements and effects of accounting method choice on reported financial data and firm valuation

Acct 595 Advanced Accounting Problems (Dual listed with 495) (3 0) Cr 3 *Prereq 387* Partnerships branch operations accounting for business combinations and affiliated companies consolidated financial statements reporting for multinational operations

Acct 596 International Accounting (3 0) Cr 3 *Prereq 284 or 508* Accounting and reporting requirements and managerial issues faced by multinational corporations The international environment of standard setting will be examined Technical issues such as transfer pricing inflation accounting and taxation will be discussed

Acct 597 Advanced Auditing and Assurance Services (3 0) Cr 3 *Prereq 497* A study of advanced auditing and assurance issues Topics include risk analysis internal control fraud detection analytical procedures evaluating operational and strategic objectives and reporting and implementing audit findings

Acct 598 Financial Accounting Theory and Contemporary Issues (3-0) Cr 3 F *Prereq 386 and 383 or 508* Theoretical discussion of the financial accounting and reporting environment The usefulness of financial accounting information for decision making will be examined A number of current financial accounting issues and the financial accounting standard setting process will be discussed and examined

Acct 599 Creative Component Cr 2 *Prereq Admission to the Master of Accounting Program* This course prepares students to complete their creative component project required in the Master of Accounting degree

Aerospace Engineering

(Administered by the Department of Aerospace Engineering)

Thomas J Rudolphi Chair of Department

Distinguished Professors R B Thompson

Professors Chimenti Holger Inger McDaniel Pierson Rajagopalan Rothmayer Rudolphi Schmerr Tannehill Tsai Zachary

Professors (Adjunct) Hsu

Distinguished Professors (Emeritus) D Thompson Young

Professors (Emeritus) Akers Greer Iversen Jenison McConnell Munson Rizzo Rogge Rohach Weiss Wilson

Associate Professors Dayal Hilliard Hindman Lu Mann Mitra Sarkar Sherman Sturges

Associate Professors (Adjunct) Biner Cox Roberts

Associate Professors (Collaborators) Flatau

Associate Professors (Emeritus) Hermann Seversike Trulin Vogel

Assistant Professors Bastawros Chavez Haan Jacobson

Assistant Professors (Adjunct) Byrd Gray Kellogg Legg Wolter

Undergraduate Study

For undergraduate curriculum in aerospace engineering leading to the degree bachelor of science see *College of Engineering Curricula* This curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology

The aerospace engineer is primarily concerned with the design analysis testing and overall operation of vehicles which operate in air water and space The curriculum is designed to provide the student with an education in the fundamental principles of aerodynamics flight dynamics propulsion structural mechanics flight controls design testing and space technologies A wide variety of opportunities awaits the aerospace engineering graduate in research development design production sales and management in the aerospace industry and in many related industries in which fluid flow control and transportation problems play major roles

A cooperative education program in aerospace engineering is available in cooperation with several industries and government agencies The usual four year curriculum is extended over a five year span to permit alternate industrial experience periods and academic periods This arrangement offers valuable practical experience and financial assistance during the college years See *College of Engineering Cooperative Programs*

Undergraduate Mission and Educational Objectives

The Department of Aerospace Engineering maintains an internationally recognized academic program in aerospace engineering via ongoing consultation with students faculty industry and aerospace professionals Results of these consultations are used in a process of continuous academic improvement to provide the best possible education for our students

Mission Statement The mission of the Aerospace Engineering Program is to prepare the aerospace engineering student for a career with wide-ranging opportunities in research development design production sales and management in the aerospace industry and in the many related industries which are involved with the solution of multi-disciplinary advanced technology problems

Program Educational Objectives

1 Coordinate the Aerospace Engineering Program s mission educational objectives and learning outcomes with the Iowa State University College of Engineering and the Aerospace Engineering Department mission objectives and outcomes

2 Educate students to be proficient in the application of fundamental principles of aerodynamics flight dynamics propulsion structural mechanics flight controls design testing and space technologies to the solution of significant aerospace problems

3 Prepare students to be successful in the workplace utilizing non technical skills that include communication skills teamwork leadership ethical and societal responsibility considerations

4 Provide students with applied engineering experiences through hands-on laboratory courses internships and cooperative education experience

5 Maintain an ongoing consultation with students faculty industry and aerospace professionals for the continuous process of academic improvement

Graduate Study

The department offers work for the degrees master of engineering master of science and doctor of philosophy with major in aerospace engineering and minor work to students taking major work in other departments For all graduate degrees it is possible to establish a co major program with another graduate degree granting department Within the aerospace program work is available in the following areas aerospace systems design atmospheric and space flight dynamics computational fluid dynamics control systems wind engineering fluid mechanics optimization structural analysis and non-destructive evaluation

The degrees master of science and doctor of philosophy require an acceptable thesis in addition to the coursework For the degree master of engineering a creative component or suitable project is required Appropriate credit is allotted for this requirement

Minor work for aerospace engineering majors is usually selected from mathematics physics electrical engineering engineering mechanics mechanical engineering materials science meteorology computer science and computer engineering

The normal prerequisite to major graduate work in aerospace engineering is the completion of a curriculum substantially equivalent to that required of aerospace engineering students at this university However because of the diversity of interests within the graduate programs in aerospace engineering a student whose prior undergraduate or graduate education has been in allied engineering and/or scientific fields may also qualify In such cases it may be necessary for the student to take additional work to provide the requisite background A prospective graduate student is urged to specify the degree program and the specific field(s) of interest on the application for admission

Courses normally will be offered at the times stated in the course description Where no specific time of offering is stated the course may be offered during any semester provided there is sufficient demand

Courses open for nonmajor graduate credit 311 321 331 343 351 355 361 411 412 421 422 423 426 432 441 442 446 451 461 464

Courses Primarily for Undergraduate Students

Aer E 160 Aerospace Engineering Problems With Computational Laboratory (1 5-4 5) Cr 3 FS *Prereq Credit or enrollment in Math 142 165* Solving aerospace engineering problems and presenting solutions through technical reports Graphing and curve fitting Use of SI units Significant figures Flowcharting Use of FORTRAN and Matlab programming environments Introduction to solid modeling

Aer E 161 Numerical and Graphical Techniques for Aerospace Engineering (2 2) Cr 3 FS *Prereq Math 141 or 142 or satisfactory scores on mathematics placement examinations credit or enrollment in Math 165 proficiency in FORTRAN programming languages* Computer solutions to aerospace engineering problems using the FORTRAN language and Matlab Development of algorithms Graphical description of geometrical objects with emphasis on aerospace design

Aer E 192 Aerospace Seminar (1 0) Cr R S Professional skills development activities Designed to encourage involvement in a variety of aerospace engineering activities and related professional activities Academic program planning departmental symposium participation

Aer E 202 Instrumentation Laboratory (0 2) Cr 1 FS *Prereq Math 165 credit or enrollment in Aer E 161 and Phys 221* Develop proficiency with basic instrumentation utilized in other Aer E laboratory courses Computer usage Probes and data acquisition equipment for fluid mechanics and structural mechanics Operation accuracy and errors of instruments experiment design reporting results and observation of basic phenomena

Aer E 243 Aerodynamics I (3 0) Cr 3 FS *Prereq Grade of C or better in 261 Math 265 enrollment in 243L* Introduction to fluid mechanics and aerodynamics Fluid properties statics and kinematics Conservation equations in differential and integral form Bernoulli's equation Dimensional analysis Basic potential flow concepts and solutions Examples of numerical methods Applications of multi variable calculus to fluid mechanics and aerodynamics

Aer E 243L Aerodynamics Laboratory I (0 3) Cr 0 5 FS (8 weeks) *Prereq 202 enrollment in Aer E 243* Introduction to fluid dynamic principles and instruments in aerodynamics through laboratory studies and experiments Report writing

Aer E 261 Introduction to Aerospace Engineering (3 0) Cr 3 FS *Prereq 161 Math 166 Phys 221* Introduction to aerospace disciplinary topics including aerodynamics structures propulsion and flight dynamics with emphasis on performance

Aer E 265 Scientific Balloon Engineering and Operations (Same as Mteor 265) (0-2) Cr 1 each time taken F Engineering aspects of scientific balloon flights Integration of science mission objectives with engineering requirements Operations team certification FAA and FCC regulations communications and command systems Flight path prediction and control

Aer E 291 Aerospace Seminar (1 0) Cr R F Professional skills development activities Designed to encourage involvement in a variety of aerospace engineering activities and related professional activities Academic program planning departmental symposium participation

Aer E 292 Aerospace Seminar (1-0) Cr R S Professional skills development activities Designed to encourage involvement in a variety of aerospace engineering activities and related professional activities Academic program planning departmental symposium participation

Aer E 298 Cooperative Education Cr R FS SS *Prereq Permission of department* First professional work period in the cooperative education program Students must register for this course prior to commencing work

Aer E 301 Flight Experience Cr R F *Prereq Credit or enrollment in 355* Two hours of in flight training and necessary ground instruction Course content prescribed by the Aerospace Engineering Department Six hours of flight training certified in a pilot log book can be considered by the course instructor as evidence of satisfactory performance in the course

Aer E 311 Gas Dynamics (3 0) Cr 3 S *Prereq 243 M E 330 enrollment in 311L* Properties of liquids and gases review of thermodynamic processes and relations energy equation compressible flow shock and expansion waves isentropic flow Fanno and Rayleigh flow Nonmajor graduate credit

Aer E 311L Gas Dynamics Laboratory (0 3) Cr 0 5 S (8 weeks) *Prereq 243 243L enrollment in 311* Introduction to experimental compressible flow and propulsion principles techniques and instruments through laboratory studies and experiments Report writing

Aer E 321 Flight Structures Analysis and Laboratory (2 5 0 5) Cr 3 F *Prereq E M 324 credit or enrollment in 243 Mat E 272* 3 hours of lecture weekly plus recitation and laboratory alternating weeks Determination of flight loads Materials selection for flight applications Analysis of flight structures including trusses beams frames and shear panels employing classical and finite element methods Laboratory experiments on flight structures

Aer E 331 Flight Control Systems I (3-0) Cr 3 S *Prereq 355* Linear system analysis Control system designs using root-locus and frequency response methods Applications in flight control systems Nonmajor graduate credit

Aer E 340 Introduction to Aerodynamics and Space Flight (3-0) Cr 3 *Prereq Math 265 Phys 221* Aerodynamics of flight vehicles Dynamics of space flight For nonaerospace engineering students

Aer E 343 Aerodynamics II (3 0) Cr 3 S *Prereq Credit or enrollment in 311 and enrollment in 343L* Incompressible subsonic transonic supersonic hypersonic flow over airfoils and wings Viscous flow theory Laminar boundary layers Transition and turbulent flow Nonmajor graduate credit

Aer E 343L Aerodynamics Laboratory II (0 2) Cr 1 S *Prereq Enrollment in 343* Advanced concepts in aerodynamics and propulsion through laboratory experience Experiments include model tests Techniques in subsonic and supersonic measurements Report writing

Aer E 351 Astrodynamics I (3 0) Cr 3 F *Prereq Math 265 E M 345* Introduction to astrodynamics Two body motion Geocentric lunar and interplanetary trajectories and applications Launch and atmospheric re entry trajectories Nonmajor graduate credit

Aer E 355 Aircraft Flight Dynamics and Control (3 0) Cr 3 F *Prereq 261 Math 267 E M 345* Aircraft rigid body equations of motion linearization and modal analysis Longitudinal and lateral-directional static and dynamic stability analysis Flight handling characteristics analysis Longitudinal and lateral directional open loop response to aircraft control inputs Aircraft flight handling qualities Nonmajor graduate credit

Aer E 361 Computational Techniques for Aerospace Design (1 4) Cr 3 FS *Prereq 243 Math 267 E M 324 E M 345* Advanced programming workstation environment and development of computational tools for aerospace analysis and design Nonmajor graduate credit

Aer E 391 Aerospace Seminar (1 0) Cr R F Professional skills development activities Designed to encourage involvement in a variety of aerospace engineering activities and related professional activities Academic program planning departmental symposium participation

Aer E 392 Aerospace Seminar (1-0) Cr R S Professional skills development activities Designed to encourage involvement in a variety of aerospace engineering activities and related professional activities Academic program planning departmental symposium participation

Aer E 396 Summer Internship Cr R SS *Prereq Permission of department* Summer professional work period Students must register for this course prior to commencing work

Aer E 397 Engineering Internship Cr R FS Prereq *Permission of department* Professional work period one semester maximum per academic year Students must register for this course prior to commencing work

Aer E 398 Cooperative Education Cr R FS SS *Prereq 298 permission of department* Second professional work period in the cooperative education program Students must register for this course prior to commencing work

Aer E 411 Aerospace Vehicle Propulsion I (3 0) Cr 3 F *Prereq 311* Momentum theorem thrust and propulsive efficiency Thermodynamics of compressible flow with heat addition Components and principles of turbojets and turbofans Rocket engines and ramjet principles Engine/airframe integration Nonmajor graduate credit

Aer E 412 Aerospace Vehicle Propulsion II (3 0) Cr 3 *Prereq 411 343* Liquid and solid rocket propulsion including cold gas bi propellant and mono propellant rocket propulsion Magnetohydrodynamics Hall thrusters and electric propulsion Space mission requirements Advanced and esotric space propulsion concepts Nonmajor graduate credit

Aer E 421 Advanced Flight Structures (2 5 1) Cr 3 S *Prereq 321 Math 266 or 267* Analysis of indeterminate flight structures including a finite element laboratory Static analysis of complex structural components subject to thermal and aerodynamic loads Analytical and finite element solutions for stresses and displacements of membrane plane stress plate structures Buckling of beams frames and plate structures Introduction to vibration of flight structures Steady state and transient structural response using normal modal analysis Nonmajor graduate credit

Aer E 422 Vibrations and Aeroelasticity (3-0) Cr 3 *Prereq 321 Math 266 or 267* Single and multiple degree of freedom vibration Free and forced vibration Matrix methods Modal analysis static aeroelasticity divergence control surface reversal Dynamic aeroelasticty flutter Application of finite element technique (ANSYS) to aeroelasticity problems Nonmajor graduate credit

Aer E 423 Composite Flight Structures (2 2) Cr 3 *Prereq E M 324 Mat E 272* Fabrication testing and analysis of composite materials used in flight structures Basic laminate theory of beams plates and shells Manufacturing and machining considerations of various types of composites Testing of composites for material properties strength and defects Student projects required Nonmajor graduate credit

Aer E 426 Design of Aerospace Structures (1-6) Cr 3 *Prereq E M 324* Detailed design and analysis of aerospace vehicle structures Material selection strength durability and damage tolerance and validation analysis Design for manufacturability Introduction to concepts of expert systems in design Nonmajor graduate credit

Aer E 432 Flight Control Systems II (3-0) Cr 3 *Prereq 331* Aircraft lateral directional stability augmentation Launch vehicle pitch control system design Control of flexible vehicles Satellite attitude control Flight control designs based on state space methods Introduction to sample-data systems Nonmajor graduate credit

Aer E 441 Viscous Flow Theory (3-0) Cr 3 *Prereq 343* Navier Stokes equations Laminar and turbulent boundary layers Exact approximate and numerical solutions Compressibility effects Turbulence modeling Nonmajor graduate credit

Aer E 442 V/STOL Aerodynamics and Performance (3 0) Cr 3 *Prereq 355* Introduction to the aerodynamics performance stability control and critical maneuvering characteristics of V/STOL vehicles Topics include hovercrafts jet flaps ducted fans and thrust vectored engines Nonmajor graduate credit

Aer E 446 Computational Fluid Dynamics (3 0) Cr 3 *Prereq 343* Introduction to modern computational fluid dynamics Finite difference and finite volume methods Explicit implicit and iterative techniques Solutions of elliptic parabolic and hyperbolic equations Emphasis on applications Commercial software Nonmajor graduate credit

Aer E 451 Astrodynamics II (3 0) Cr 3 *Prereq 351* Orbit determination and prediction Transfer orbits using the universal variable formulation Relative motion in orbit Perturbation methods applied to trajectory analysis Introduction to the N body problem Nonmajor graduate credit

Aer E 461 Modern Design Methodology with Aerospace Applications (2 2) Cr 3 FS *Prereq 361 311 321 351 355* Introduction to modern engineering design methodology Computational constrained optimal design approach including selection of objective function characterization of constraint system materials and strength considerations and sensitivity analyses Nonmajor graduate credit

Aer E 462 Design of Aerospace Systems (1 4) Cr 3 FS *Prereq 461* Fundamental principles used in engineering design of aircraft missile and space systems Preliminary design of aerospace vehicles

Aer E 464 Spacecraft Mission and Systems Analysis (3 0) Cr 3 *Prereq 351* Mission design and navigation of satellite and spacecraft missions Introduction to low thrust trajectory dynamics Attitude sensing and control Launch vehicle integration and payload mass analysis Scientific measurements from space Introduction to communication power thermal and structure constraints Nonmajor graduate credit

Aer E 490 Independent Study Cr 1 to 6 Arr *Prereq Junior or senior classification approval of the department*

A Aero and/or Gas Dynamics
B Propulsion
C Aerospace Structures
D Flight Dynamics
E Spacecraft Systems
F Flight Control Systems
G Aeroelasticity
H Honors

I Design
J Non-destructive Evaluation
K Wind Engineering
L Multi functional Ultra light Structures
M Senior Project

Aer E 491 Aerospace Seminar (1 0) Cr R F S Professional skills development activities Designed to encourage involvement in a variety of aerospace engineering activities and related professional activities Academic program planning departmental symposium participation

Aer E 492 Aerospace Seminar (1 0) Cr R FS Professional skills development activities Writing and presentation of a technical paper at the department s Aerospace Symposium or at a recognized student or professional meeting of the American Institute of Aeronautics and Astronautics (AIAA)

Aer E 498 Cooperative Education Cr R FS SS *Prereq 398 permission of department* Third and subsequent professional work periods in the cooperative education program Students must register for this course before commencing work

Courses Primarily for Graduate Students, open to qualified undergraduate students

Aer E 514 Advanced Mechanics of Materials (Same as E M 514) See *Engineering Mechanics*

Aer E 517 Experimental Stress Analysis (Same as E M 517) See *Engineering Mechanics*

Aer E 521 Airframe Analysis (3 0) Cr 3 F *Prereq 421 or E M 424* Analysis of static stresses and deformation in continuous aircraft structures Various analytical and approximate methods of analysis of isotropic and anisotropic plates and shells Laboratory experience

Aer E 524 Numerical Mesh Generation (Same as M E 524) (3 0) Cr 3 *Prereq Math 385 proficiency in programming* Introduction to modern mesh generation techniques Structured and unstructured mesh methods algebraic and PDE methods elliptic and hyperbolic methods variational methods error analysis Delaunay triangulation data structures geometric modeling with B spline and NURBS surfaces surface meshing

Aer E 525 Finite Element Analysis (Same as E M 525) See *Engineering Mechanics*

Aer E 531 Automatic Control of Flight Vehicles (3 0) Cr 3 S *Prereq 331* Applications of classical and modern linear control theory to automatic control of flight vehicles Spacecraft attitude control Control of flexible vehicles Linear quadratic regulator and pole placement design applications

Aer E 532 Compressible Fluid Flow (Same as M E 532) (3-0) Cr 3 S *Prereq M E 335 or Aer E 541* Thermodynamics of compressible flow Viscous and inviscid compressible flow equations One dimensional steady flow isentropic flow normal shock waves oblique and curved shocks constant area flow with friction and heat transfer Linear theory and Prandtl Glauert similarity Method of characteristics Subsonic transonic supersonic and hypersonic flows

Aer E 541 Incompressible Flow Aerodynamics (3 0) Cr 3 F *Prereq 343 or M E 335* Kinematics and dynamics of fluid flow Derivation of the Navier Stokes Euler and potential flow equations Introduction to generalized curvilinear coordinates Ideal fluids Two-dimensional and three dimensional potential flow Complex variable methods

Aer E 543 Viscous Flow Aerodynamics (3 0) Cr 3 S *Prereq 541* Navier Stokes equations Incompressible and compressible boundary layers Similarity solutions Computational and general solution methods Introduction to stability of laminar flows transition and turbulent flow

Aer E 544 Applied Wing Theory (3 0) Cr 3 Alt S offered 2005 *Prereq 532* Potential flow methods Linear theory Aerodynamics of wings and bodies Similarity rules Applied computational methods Sensitivity analysis

Aer E 546 Computational Fluid Mechanics and Heat Transfer I (Same as M E 546) (3 0) Cr 3 F Introduction to finite difference and finite volume methods used in modern engineering Basic concepts of discretization consistency and stability Applications of numerical methods to selected model partial differential equations

Aer E 547 Computational Fluid Mechanics and Heat Transfer II (Same as M E 547) (3-0) Cr 3 S *Prereq 546* Application of computational methods to current problems in fluid mechanics and heat transfer Methods for solving the Navier Stokes and reduced equation sets such as Euler boundary layer and parabolized forms of the conservation equations Introduction to relevant aspects of grid generation and turbulence modeling

Aer E 551 Orbital Mechanics (3 0) Cr 3 F *Prereq 351* Review of 2 body problem Orbit perturbation analysis Gravity field expansions and effects on orbiters 3 body problem with applications

Aer E 556 Guidance and Navigation of Aerospace Vehicles (3 0) Cr 3 F *Prereq 331* Principles of guidance systems for spacecraft launch vehicles homing and ballistic missiles Optimal guidance Interplanetary transfer guidance with low thrust Principles of inertial navigation Theory and applications of the Global Positioning System Celestial navigation procedures Application of Kalman filtering to recursive navigation theory

Aer E 565 Systems Engineering and Analysis (Same as E E 565 I E 565) (3 0) Cr 3 F *Prereq Graduate classification in engineering* Introduction to organized multidisciplinary approach to designing and developing systems Concepts principles and practice of systems engineering as applied to large integrated systems Life cycle costing scheduling risk management functional analysis conceptual and detail design test evaluation and systems engineering planning and organization

Aer E 566 Avionics Systems Engineering (Same as E E 566) (3-0) Cr 3 S *Prereq 565* Avionics functions Applications of systems engineering principles to avionics Top down design of avionics systems Automated design tools

Aer E 569 Mechanics of Composite and Combined Materials (Same as E M 569) See *Engineering Mechanics*

Aer E 570 Wind Engineering (Same as E M 570) See *Engineering Mechanics*

Aer E 572 Turbulence (Same as Ch E 572) (3 0) Cr 3 Alt S offered 2005 *Prereq 541* Qualitative features of turbulence Statistical and spectral representation of turbulent velocity fields averages moments correlations length and time scales and the energy cascade Averaged equations of motion closure requirements Reynolds stress dissipation rate Isotropic turbulence homogeneous shear flows free shear flows wall bounded flows Scalar transport particulate transport

Aer E 573 Random Signal Analysis and Kalman Filtering (Same as E E 573 Math 573 M E 573) (3 0) Cr 3 F *Prereq 331 or E E 321 or M E 370 or 411 or Math 341 or 395* Elementary notions of probability Random processes Autocorrelation and spectral functions Estimation of spectrum from finite data Response of linear systems to random inputs Discrete and continuous Kalman filter theory and applications Smoothing and prediction Linearization of nonlinear dynamics

Aer E 574 Optimal Control (Same as E E 574 Math 574 M E 574) (3 0) Cr 3 *Prereq 577* The optimal control problem Variational approach Pontryagin s principle Hamilton Jacobi equation Dynamic programming Time-optimal minimum fuel minimum energy control systems The regulator problem Structures and properties of optimal controls

Aer E 575 Introduction to Robust Control (Same as E E 575 Math 575 M E 575) (3 0) Cr 3 *Prereq 577* Introduction to modern robust control Model and signal uncertainty in control systems Uncertainty description Stability and performance robustness to uncertainty Solutions to the H2 H¥ and l1 control problems Tools for robustness analysis and synthesis

Aer E 576 Digital Feedback Control Systems (Same as E E 576 Math 576 M E 576) (3-0) Cr 3 *Prereq 432 or E E 475 or M E 411 or 414 or Math 415 and Math 267* Sampled data discrete data and the z transform Design of digital control systems using transform methods root locus frequency response and direct design methods Design using state space methods Controllability observability pole placement state estimators Digital filters in control systems Microcomputer implementation of digital filters Finite wordlength effects Linear quadratic optimal control in digital control systems Simulation of digital control systems

Aer E 577 Modern Control Systems I (Same as E E 577 Math 577 M E 577) (3-0) Cr 3 F *Prereq 331 or E E 321 or M E 414 or Math 415 and Math 307* State variable and input output descriptions of linear continuous time and discrete time systems Solution of linear dynamical equations Controllability and observability of linear dynamical systems Canonical descriptions of linear equations Irreducible realizations of rational transfer function matrices Canonical form dynamical equations State feedback State estimators Decoupling by state feedback Design of feedback systems Stability of linear dynamical systems

Aer E 578 Modern Control Systems II (Same as E E 578 Math 578 M E 578) (3 0) Cr 3 S *Prereq 577* Well posedness of nonlinear control systems Approximate analysis methods Poincaré perturbation method and describing function method Lyapunov stability theory Absolute stability of feedback systems Input-output stability Large scale systems

Aer E 579 Adaptive Control (Same as E E 579 Math 579 M E 579) (3 0) Cr 3 *Prereq 577* Fundamentals of adaptive control terminology parameter identification basic adaptive controller design techniques analysis of stability parameter convergence and robustness Nonlinear adaptive control Application examples

Aer E 590 Special Topics Cr 1 to 5
A Aero and/or Gas Dynamics
B Propulsion
C Aerospace Structures
D Flight Dynamics
E Spacecraft Systems
F Flight Control Systems
G Aeroelasticity
H Viscous Aerodynamics
I Design
J Hypersonics
K Computational Aerodynamics
L Optimization
M Non Destructive Evaluation
N Wind Engineering

Aer E 599 Creative Component Cr 1 to 5

Courses for Graduate Students

Aer E 620 Seminar (1 0) Cr 1

Aer E 631 Modern Flight Control Systems (3-0) Cr 3 F *Prereq 578* Applications of modern control theory to flight control Controller design based on optimal control techniques Nonlinear system theory applications Typical aerospace control methods such as model following load alleviation and flutter suppression Recent advances in aerospace vehicle control

Aer E 635 Optimization in Aerospace Engineering I (3 0) Cr 3 *Prereq 531 541 551* Applications of unconstrained and constrained parameter optimization dynamic programming and optimal control theory to problems in aerodynamics aerospace structures flight dynamics and control and aerospace design Special emphasis on numerical methods of optimization

Aer E 636 Optimization in Aerospace Engineering II (3 0) Cr 3 *Prereq 635* Applications of unconstrained and constrained parameter optimization dynamic programming and optimal control theory to problems in aerodynamics aerospace structures flight dynamics and control and aerospace design Special emphasis on numerical methods of optimization

Aer E 641 Hypersonic Gas Dynamics (3-0) Cr 3 Alt F offered 2004 *Prereq 532* High Mach number flows Newtonian theory small disturbance theory constant density solutions thin shock layers blunt body problems hypersonic boundary layers and viscous interactions thermally and calorically imperfect gases vibrational relaxing and chemically reacting flows

Aer E 646 Computational Methods for Internal and Low Speed Flows (Same as M E 646) (3 0) Cr 3 Alt F offered 2003 *Prereq 547* Emphasis is on algorithms suitable for low speed and internal flows at speeds up through transonic Topics include pressure based schemes pseudo-compressibility methods use of preconditioning to develop algorithms suitable for all speed regimes large eddy simulations algorithms for unstructured grids and finite elements in fluids

Aer E 647 Advanced High Speed Computational Fluid Dynamics (Same as M E 647) (3 0) Cr 3 Alt F offered 2004 *Prereq 547* An examination of current methods in computational fluid dynamics Differencing strategies Advanced solution algorithms Grid generation Construction of complex CFD algorithms Current applications Use of state of the art CFD codes

Aer E 650 Fluid Mechanics Seminar (Same as M E 650) (1-0) Cr 1 each time taken F *Prereq Permission of instructor* Special topics of current research interest to students and staff of departments concerned

Aer E 661 Perturbation Methods (3 0) Cr 3 Alt F offered 2003 *Prereq Math 267* Mathematical perturbation methods with applications to ordinary differential equations Perturbation expansions Order of magnitude and gauge functions Matched asymptotic expansions Boundary layer problems Multiple scales Resonance and mode coupling Solvability conditions for differential equations Physical and engineering applications

Aer E 662 Viscous Flow Asymptotic Theory (3 0) Cr 3 Alt S offered 2004 *Prereq 661 541* 1st and 2nd order boundary layer theory Coordinate expansions Triple deck theory Compressible boundary layers Two and three-dimensional steady and unsteady flow separation Internal and external flows Wave packet propagation in unsteady flows

Aer E 690 Advanced Topics Cr 1 to 5
A Aero and/or Gas Dynamics
B Propulsion
C Aerospace Structures
D Flight Dynamics
E Spacecraft Systems
F Flight Control Systems
G Aeroelasticity
H Viscous Aerodynamics
I Design
J Hypersonics
K Computational Aerodynamics
L *Non Destructive Evaluation*
M Wind Engineering

Aer E 697 Engineering Internship Cr R *Prereq Permission of DOGE (Director of Graduate Education) graduate classification* One semester and one summer maximum per academic year professional work period Offered on a satisfactory fail grading basis only

Aer E 699 Research

African American Studies

www iastate edu/~catalog/catalog/courses/african htm

(Interdepartmental Undergraduate Program)

Program Committee D Anderson R Baum J H Blake S Dunlap K Hickok D Rollins V Sheares G Tartakov Y Teshome

Undergraduate Study

African American Studies a cross disciplinary program in the College of Liberal Arts and Sciences offers an opportunity to explore African Americans contribu tions to American culture Analysis of the African American experience—in history literature art religion and society—provides students with skills sensitivities and information to help them function more effectively in today s diverse society

African American Studies at Iowa State University is an expanding program Most of the courses in the program satisfy general education requirements in the College of Liberal Arts and Sciences the human relations requirement for teachers and the university s diversity requirement At present students can minor or even design their own Interdisciplinary Studies major with an emphasis in African American Studies

A minor in African American Studies requires six courses in the program with a minimum of 18 credits including Introduction to African American Studies (Af Am 201) and Seminar in African American Culture (Af Am 460) The remaining credits must come from at least two departments with at least two courses taken at the junior level or above Independent study and internship opportunities are available for credit but do not count in the minimum requirements for the minor

Graduate Study

Courses open for nonmajor graduate credit 334 347 348 349 350 460 475

Courses Primarily for Undergraduate Students

Af Am 201 Introduction to African American Studies (3 0) Cr 3 F S An interdisciplinary introduction to the study of African American culture Includes history the social sciences literature religion and the arts as well as conceptual frameworks for investigation and analysis of the African American experience

Af Am 252 African American Theatre Production (Same as Thtre 252) See *Theatre*

Af Am 325 Peoples and Cultures of Africa (Same as Anthr 325) See *Anthropology*

Af Am 330 Ethnic and Race Relations (Same as Soc 330) See *Sociology*

Af Am 333 African American Ethnology (Same as Anthr 333) See *Anthropology*

Af Am 334 African American Religious Experience (Same as Relig 334) See *Religious Studies* Nonmajor graduate credit

Af Am 347 Survey of African American Literature (Same as Engl 347) See *English* Nonmajor graduate credit

Af Am 348 Contemporary African American Literature (Same as Engl 348) See *English* Nonmajor graduate credit

Af Am 350 African American Women (Same as W S 350) See *Women s Studies* Nonmajor graduate credit

Af Am 353 History of African Americans I (Same as Hist 353) See *History*

Af Am 354 History of African Americans II (Same as Hist 354) See *History*

Af Am 460 Seminar in African American Culture (3 0) Cr 3 S Intensive study of a selected topic in African American Studies in one or more disciplines Selected readings of various authors movements eras or genres Primary and secondary source materials Nonmajor graduate credit

Af Am 490 Independent Study Cr 1 to 3 each time taken maximum of 3 *Prereq 6 credits in African American Studies and permission of instructor and of the chair of the African American Studies Program*

Courses Offered by Other Departments

Engl 349 Selected Topics in Multicultural Literatures of the United States See *English* Available only when offered as a course in African American literature Nonmajor graduate credit

Relig 475 Seminar Issues in the Study of Religion See *Religious Studies* When content is appropriate may be taken as Relig 475 Nonmajor graduate credit

Agricultural Education and Studies

Robert A Martin Chair of Department

University Professors Williams

Professors Acker Carter Crawford Martin W Miller Trede

Professors (Emeritus) Gamon Gauger Hoerner Lawrence Parsons

Associate Professors Bogue Honeyman Jones G Miller

Associate Professors (Emeritus) Bruene

Assistant Professors Grudens Schuck Morris Polito

Assistant Professors (Adjunct) Brown

Undergraduate Study

For undergraduate curricula in agricultural education and agricultural studies leading to the degree bachelor of science see *College of Agriculture Curricula*

The department offers two curricula for students desiring to enter careers in agriculture and related fields These curricula are agricultural education and agricultural studies The agricultural education curriculum prepares persons for careers as agricultural education instructors and educational specialists for industry and governmental agencies The agricultural education curriculum has two options teacher certification and communications The agricultural studies curriculum prepares persons for careers in production agriculture and agricultural industry Graduates of both curricula accept positions in agricultural business industry agencies and production agriculture

Graduates are able to communicate effectively They have a broad base of agricultural knowledge They have the ability to live and work in a global society and have an understanding of today s technical society They are skilled in making decisions and have the ability to plan organize present and evaluate information

The department offers a minor in agricultural education which may be earned by completion of a minimum of 15 credits in agricultural education and studies courses with a minimum of two courses at the 400 level Courses that can be taken for a minor are 211 310 311 315 402 412 or 418 414 450 490 496 and 499

Visit our departmental website at www ageds iastate edu/

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with a major in agricultural education a specialization in agricultural extension education opportunities for emphasis in international agricultural education and minor work to students majoring in other curricula Graduate students who have earned a bachelor s degree in an agricultural discipline may plan a course of study that leads to teacher certification Candidates pursuing the master of science degree may do so by completing either a thesis or nonthesis program of study

Graduates have abilities in delivery systems learning theories and principles formative and summative evaluation philosophic models qualitative and quantitative research organizational leadership policy development assessing educational need organizing educational programs and developing international agricultural education programs

The department administers the interdepartmental graduate program in professional agriculture designed for off-campus students pursuing a master of agriculture degree see *Off Campus Credit Courses and Programs*

The department also cooperates in the international development studies option of the General Graduate Studies Program

Courses and workshops are offered both on and off campus for extension educators teachers and industry personnel

Courses open to students for nonmajor graduate credit 412 414 416 417 418 450 496

Courses Primarily for Undergraduate Students

AgEds 110 Orientation (1-0) Cr 0.5 F Orientation to the department Careers in agriculture
A Agricultural Education
B Agricultural Studies
C General Agriculture

AgEds 111 Orientation for Agricultural Excellence Scholars (1 0) Cr 1 each time taken maximum of 2 credits F *Prereq Enrollment as an agricultural excellence scholar* The roles of professionals in agriculture academic preparation for assuming the role of a professional in agriculture and meeting the demands of the scholar s curriculum

AgEds 112 Agriculture Biotechnology Colloquium (1 0) Cr 1 S *Prereq Enrollment as an agricultural excellence scholar* The scientific basis of biological and social sciences in agriculture

AgEds 211 Early Field Based Experience (1 0) Cr 1 each time taken maximum of 3 credits FS SS *Prereq 110* Five days on site in an agricultural setting observing competencies and issues in problem solving decision making initiative taking teamwork leadership written and oral communications critical thinking and creativity When students register it is their responsibility to make an appointment with the departmental coordinator (very early in the semester) to plan their experience
A High School Agriculture Program
B Extension
C Agricultural Industries and Agencies

AgEds 215 Career Seminar (1 0) Cr 1 FS *Prereq Sophomore classification* Overview of career opportunities Evaluation interests and accomplishments and setting career goals Development of job search and interviewing skills Establishing networks of job contacts

AgEds 282 EducatingYouthThrough Horticulture (Same as Hort 282) (2 3) Cr 3 S Planning developing and implementing science based educational programs in a public garden setting Through hands-on experiences at Reiman Gardens students will learn about horticulture learning theory and the application of science principles as they pertain to educating youth

AgEds 290 Special Problems in Agricultural Education and Studies Cr 1 3 each time taken maximum of 6 FS SS

AgEds 310 Foundations of Agricultural Education Programs (2 0) Cr 2 FS Historical development of agricultural education programs Philosophic premises program goals and objectives Educational and social issues impacting the implementation of agricultural education programs

AgEds 311 Presentation and Sales Strategies for Agricultural Audiences (3 0) Cr 3 FS Utilizing instructional methods techniques and problem solving presentation and sales strategies with agricultural audiences

AgEds 315 Personal and Professional Leadership in Agriculture (3 0) Cr 3 FS Develop leadership skills and learn leadership theories for personal and professional applications in agricultural education industry and communities

AgEds 401 Planning Agricultural Education Programs (Dual listed with 501) (3 0) Cr 3 F *Prereq 310* Responsibility of an agricultural education teacher curriculum development experiential learning opportunities including FFA and SAE and assessment and maintenance of program quality

AgEds 402 Methods ofTeaching in Agricultural Sciences/Agribusiness (Dual listed with 502) (3 0) Cr 3 S *Prereq 401* Topics include principles of teaching and learning individualized and group methods application of learning instructional management special populations and evaluation

AgEds 412 Internship in Agricultural Education and Studies 2 to 12 weeks Cr 2 to 6 each time taken maximum of 6 FS SS *Prereq 211 junior classification in AGEDS and permission of instructor* A supervised learning experience in an approved learning setting with application to educational agricultural and/or environmental practices and principles Nonmajor graduate credit

AgEds 414 Developing Agricultural Education Programs in Non Formal Settings (2 0) Cr 2 S *Prereq 211 and permission of instructor* Basic concepts in planning conducting and evaluating educational programs in non formal settings Includes programming for youth and adults in Extension agricultural industry and related agencies Nonmajor graduate credit

AgEds 416 Pre StudentTeaching Experience in Agricultural Education Cr 1 FS *Prereq 211 402 and admission to teacher education program* A one-week field based experience in an approved secondary agricultural education program Concurrent enrollment in 417 is required Nonmajor graduate credit

AgEds 417 SupervisedTeaching in Agricultural Education Programs Cr 12 FS *Prereq 211 402 and admission to teacher education program* Supervised teaching in public schools Nonmajor graduate credit

AgEds 418 Supervised Extension Experience Cr 2 to 8 May be repeated to a maximum of 16 credits FS SS *Prereq 211 junior classification permission of instructor* Supervised professional experience in an approved county area or state Cooperative Extension Service office Nonmajor graduate credit

AgEds 450 Farm Management and Operation (1-6) Cr 3 FS SS *Prereq Econ 135 Econ 330 junior classification* Participation in the management and operation of a diversified Iowa farm The class is responsible for the plans records and decisions for buying and selling the farm s livestock crops and equipment Special speakers on current topics May be taken for credit 3 times at different times of the year by permission of the instructor Nonmajor graduate credit

AgEds 490 Independent Study in Agricultural Education and Studies Cr 1 to 3 FS SS *Prereq Junior or senior classification permission of instructor* A maximum of 6 credits of 490 may be used toward the total of 128 credits required for graduation
A Philosophy Curriculum and Methods
B Leadership Evaluation and Administration
C Business Industry and Production Agriculture
D Extension and International Agriculture
E InstructionalTechnology
F Environmental Issues
H Honors
I Communications

AgEds 496 AgriculturalTravel Course Cr 1 to 3 each time taken FS SS *Prereq Permission of instructor* Limited enrollment Extended field trips to study agricultur and education related topics Location and duration of trips will vary Pre trip sessions arranged Trip expenses paid by students Nonmajor graduate credit
A International
B Domestic

AgEds 499 Undergraduate Research Cr arr FS SS *Prereq Permission of instructor adviser and departmental executive officer* Research experience in agricultural education and studies with application to selected problems

Courses Primarily for Graduate Students, open to qualified undergraduate students

AgEds 500 Short Course in Agricultural Education Cr 1 to 3 each time taken FS SS *Prereq Permission of instructor* Specific problems issues and content areas in agricultural education On and off campus on arranged basis

AgEds 501 Planning Agricultural Education Programs (Dual listed with 401) (3-0) Cr 3 F *Prereq 310* Responsibility of an agricultural education teacher curriculum development experiential learning opportunities including FFA and SAE and assessment and maintenance of program quality

AgEds 502 Methods ofTeaching in Agricultural Sciences/Agribusiness (Dual listed with 402) (3 0) Cr 3 S *Prereq 401* Topics include principles of teaching and learning individualized and group methods application of learning instructional management special populations and evaluation

AgEds 510 Introduction to Research in Agricultural Education (3 0) Cr 3 F *Prereq Permission of instructor* Determining your research focus developing research problems and objectives reviewing the literature and establishing a theoretical framework establishing procedures for data collection and analysis ethical issues The primary outcome is the development of a thesis dissertation or creative component proposal

AgEds 511 Instructional and Organizational Issues for BeginningTeachers of Agriculture Programs Cr 1 to 2 each time taken May be taken no more than 2 times F *Prereq Permission of instructor* Planning and conducting agricultural programs in secondary schools

AgEds 514 Organizing Agricultural Information for Professional and Scientific Meetings (1 2) Cr 2 S *Prereq Graduate classification in agriculture* Concepts and practices in planning preparing and presenting materials used in professional meetings and scientific papers by agriculturalists with special emphasis on computerized delivery methods

AgEds 520 Instructional Methods forTeaching in Agricultural Education (3 0) Cr 3 Alt F offered 2004 *Prereq Permission of instructor* Preparation of graduate students to become college or university instructors Addresses the principles of teaching and learning as they influence teaching activities psychological aspects of learning developing teaching plans laboratory teaching evaluating student learning motivating students examining personal teaching behaviors that influence learning and choosing appropriate teaching methods

AgEds 521 Leadership Development in Agricultural Education (3-0) Cr 3 Alt F offered 2004 *Prereq Permission of instructor* Principles and practices of leadership and group dynamics Designing organizing implementing and evaluating leadership programs for developing exemplary leaders of agricultural teams and groups

AgEds 524 Program Development and Evaluation in Agricultural Extension Education (3-0) Cr 3 Alt S offered 2004 *Prereq Permission of instructor* Theories and practice of program planning for extension agricultural education and other contexts for nonformal education Considers critical theories of planning to address power and interests in program development needs assessment and evaluation

AgEds 530 DistanceTeaching and Learning in Agriculture (3 0) Cr 3 Alt F offered 2003 *Prereq Permission of instructor* Understanding distance learners in agriculture and their educational needs and preferences Technology options to enhance distance teaching Methods of teaching at a distance and administrative issues

AgEds 538 Adult and Post-Secondary Education in Agriculture (3-0) Cr 3 Alt F offered 2004 *Prereq Permission of instructor* Theory and practice of adult learning and the delivery of formal and non formal programming for agriculturally related audiences Why and how adults learn differently than children Leading instruction from the point of learners first Reviews thinking whole brain concepts domains styles and levels of learning

AgEds 560 Role of Agricultural Education and Agricultural Extension inTechnologyTransfer (3 0) Cr 3 Alt S offered 2005 *Prereq Permission of instructor* Processes by which formal and informal Extension and other agricultural education programs influence introduction and acceptance of agricultural technology including strategies for technology transfer

AgEds 561 Agricultural and Extension Education in Developing Countries (3 0) Cr 3 Alt S offered 2004 *Prereq Permission of instructor* Utilizing systematic approaches to identifying analyzing and solving problems in international agricultural education with emphasis on the impact of agricultural education formal and nonformal on development

AgEds 590 SpecialTopics in Agricultural Education Cr 1 to 3 FS SS *Prereq 12 credits in agricultural education*
A Curriculum
B Methods
C Philosophy
D Evaluation
E Administration
F Leadership
G Guidance
I Instructional Technology
J Extension
K International Agriculture
L Program Planning

AgEds 593 Workshop in Agricultural Education Cr 1 to 3 each time taken FS SS *Prereq 12 credits in agricultural education*
A Curriculum
B Methods
C Evaluation
D Administration
E Leadership
F Extension
G Program Planning
H Instructional Technology
M Biotechnology Workshop

AgEds 599 Creative Component FS SS For nonthesis M S degree programs

Courses for Graduate Students

AgEds 604 Evaluation in Agricultural and Extension Education (3 0) Cr 3 Alt F offered 2004 *Prereq 401 or 524 and permission of instructor* Criteria and procedures for designing and facilitating evaluations of programs in agricultural and extension education Critique of evaluation theories Match quantitative and qualitative methods and instruments to evaluation contexts Evaluation reporting and utilization

AgEds 610 Curriculum Development in Agricultural Education (3-0) Cr 3 Alt F offered 2003 *Prereq 401 and permission of instructor* Analysis of social individual and subject matter needs in agriculture and their impact on agricultural curricula Application of new concepts and educational theory to curriculum planning in agricultural education

AgEds 615 Seminar in Agricultural Education (1 0) Cr 1 each time taken FS SS Offered on a satisfactory fail grading basis only

AgEds 617 Professional Internship for Agricultural Educators Cr 1 6 each time taken maximum of 6 FS SS *Prereq Permission of instructor* Analysis of the roles and activities of professionals in agricultural education Supervised professional field based experience in public and private settings

AgEds 620 Research Procedures in Agricultural Education (3 0) Cr 3 Alt S offered 2005 *Prereq 510 and a course in statistics* Procedures for carrying out thesis and dissertation research Designing descriptive associational and experimental research instrumentation analysis interpretation and reporting of research data evaluating reports of research

AgEds 625 Administration and Supervision of Agricultural Education Programs (3 0) Cr 3 Alt S offered 2005 *Prereq 521* Management principles and practices of planning organizing directing staffing and evaluating as applied to administration and supervision of programs in agricultural education

AgEds 630 Philosophy and Policymaking in Agricultural Education (3-0) Cr 3 Alt F offered 2003 *Prereq Permission of instructor* Basic philosophic premises in development of agricultural education programs The role of philosophy in policymaking Social and educational issues impacting philosophy and policymaking in agricultural education

AgEds 660 Participatory Evaluation in Agricultural and Extension Education (3-0) Cr 3 Alt S offered 2005 *Prereq Graduate course in qualitative research methods or evaluation or permission of instructor* Theory and practice of participatory program evaluation used in education by extension and non governmental organizations Students will critically reflect on impact of evaluation methodologies on democratic practice capacity building of communities and clients and sustainable development

AgEds 699 Research

Agricultural Engineering

(Administered by the Department of Agricultural and Biosystems Engineering)

Rameshwar Kanwar Chair of Department

University Professors Baker Bern

Professors Bundy Downing Hurburgh L Johnson Kanwar Melvin Misra Xin

Professors (Adjunct) Quick

Professors (Collaborators) Colvin Laflen

Distinguished Professors (Emeritus) H Johnson

Professors (Emeritus) Beer Bekkum Bockhop Buchele Hazen Hoerner Hull Keeney Lovely Mangold Marley Meyer Pedersen Smith

Associate Professors Batchelor Glanville Greiner Harmon Hoff Lorimor Mickelson Schwab Tim

Assistant Professors Birrell Brumm Freeman Powers Schilling Richard Steward

Assistant Professors (Adjunct) Shahan

Assistant Professors (Collaborators) Malone

Assistant Professors (Emeritus) Boyd

Undergraduate Study

For the undergraduate curriculum in agricultural engineering leading to the degree bachelor of science see *College of Engineering Curricula* This curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology

Agricultural Engineering Curriculum Educational Objectives The goal of the curriculum in agricultural engineering is to train men and women to integrate basic physical and biological sciences through application of engineering fundamentals and design to systems for production processing storage handling distribution and use of food feed fiber and other biomaterials and management of related natural resources worldwide

To achieve this goal the ABE Faculty with input from curriculum constituencies has established the following educational objectives for the agricultural engineering curriculum

1 To produce graduates competent in methods of analysis involving use of mathematics fundamental physical and biological sciences engineering sciences and in computational skills needed for their future practice of agricultural engineering

2 To produce graduates with the skills necessary in the design process including abilities necessary to think creatively to formulate problem statements to communicate effectively to synthesize information and to evaluate and implement problem solutions

3 To produce graduates capable of addressing issues of ethics safety professionalism cultural diversity globalization environmental impact and social and economic impact in engineering practice

4 To produce graduates prepared for successful careers and for continuous professional and personal growth

5 To produce graduates with an ability to gain knowledge and answer questions through experimentation

6 To produce graduates who can work collaboratively and who have people skills needed for a productive and satisfying life

Graduates find employment in diverse ag and bio-related industries and government agencies and work in engineering design development testing research manufacturing consulting sales and service Professional engineering services are performed in the agricultural equipment industries building and environmental control companies grain processing and handling firms soil and water resource agencies and biotechnology companies

Food industry employment is related to production of food products Food and process engineers design develop implement and evaluate food processing procedures and systems

The department has cooperative programs established for interested and qualified students The four year curriculum is extended over a five year period and interspersed with work periods at cooperating organizations This plan offers valuable practical experience and financial assistance during the years in college

The department offers an undergraduate curriculum and courses in agricultural systems technology see *College of Agriculture Curricula*

Well qualified juniors and seniors in Agricultural Engineering who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both B S and M S degrees Refer to Graduate Study for more information

Graduate Study

The department offers work for the degrees master of science master of engineering and doctor of philosophy with a major in agricultural engineering and minor work to students taking major work in other departments Within the major the student may specialize in soil and water resources agricultural power and machinery food and process engineering or agricultural structures and environmental systems engineering Minor work is also offered in agricultural systems technology for students in other graduate majors See *Agricultural Systems Technology*

Prerequisite to major graduate work is the completion of an undergraduate curriculum substantially equivalent to that required of agricultural engineering undergraduate students at this institution However because of the diversity of interests within the graduate programs in agricultural engineering a student may qualify for graduate study even though the undergraduate training has been in a discipline other than agricultural engineering Supporting work will be required depending on the student s background and area of interest with requirements defined by departmental guidelines

Well qualified juniors or seniors in Agricultural Engineering who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both B S and M S degrees Under concurrent enrollment students are eligible for assistantships and simultaneously take undergraduate and graduate courses

For the master of science program at least 30 credits of acceptable graduate work must be completed with a minimum of 22 credits of course work correspond ing numbers for the master of engineering program are 31 and 27 For the degree doctor of philosophy the corresponding numbers are 72 and 49 plus an additional 6 credits of coursework are required as an enrichment component in some important subject area apart from the major minor or other principle thrust area All graduate students are also expected to have some teaching/extension experience

The department also participates in the interdepartmental majors in water resources sustainable agriculture and toxicology (see *Index*)

Courses open for nonmajor graduate credit 342 363 403 405 413 415 416 447 480

Courses Primarily for Undergraduate Students

A E 110 Experiencing Agricultural and Biosystems Engineering (0-2) Cr 1 S Laboratory based team oriented experiences in a spectrum of topics common to the practice of agricultural and biosystems engineering Report writing co-ops internships careers registration planning

A E 203 Computer Applications and Systems Modeling (2-2) Cr 3 F *Prereq Engr 160 Math 166* Computer aided solution of agricultural engineering problems by use of numerical techniques and mathematical models Systems analysis and optimization applicable to agricultural and biological systems

A E 216 Fundamentals of Agricultural and Biosystems Engineering (2 2) Cr 3 S *Prereq 110 Engr 160 credit or enrollment in Math 166* Application of mathematics and engineering sciences to energy and mass balances in agricultural and biological systems Emphasis is on solving engineering problems in the areas of air and water vapor systems electrical systems grain systems food systems hydrologic systems and bioprocessing

A E 271 Engineering Applications of Parametric Solid Modeling (1 2) Cr 1 8 weeks FS *Prereq Engr 170 or AST 215 or equivalent* Creating editing organizing and documenting two dimensional and three-dimensional geometries

A E 272 Parametric Solid Models Drawings and Assemblies Using Pro/ENGINEER (1 2) Cr 1 8 weeks FS *Prereq Engr 170 or AST 215 or equivalent* Application of the Pro/ENGINEER software to create 3D solid models of parts and assemblies Utilizing the solid models to create design documentation standard drawing views dimensions and notes

A E 298 Cooperative Education Cr R FS SS *Prereq Permission of department coop coordinator* First professional work period in the cooperative education program Students must register for this course before commencing work

A E 340 Functional Analysis and Design of Agricultural Field Machinery (Dual listed with 540) (2 2) Cr 3 F *Prereq 110 203* Principles of operation design selection testing and evaluation of agricultural field machinery and systems Functional and mechanical performances Crop and soil interaction with machines Machine systems including land preparation crop establishment crop protection harvesting and post harvest materials handling systems

A E 342 Agricultural Tractor Power (2 3) Cr 3 S *Prereq M E 330* Thermodynamic principles and construction of tractor engines Fuels combustion and lubrication Kinematics and dynamics of tractor power applications drawbar power take-off and traction mechanisms Nonmajor graduate credit

A E 363 Agri Industrial Applications of Electric Power and Electronics (3 2) Cr 4 F *Prereq Phys 222* Single phase and three phase circuit design Electrical safety Electric motors and controls Programmable logic controllers Digital logic instrumentation and sensors Nonmajor graduate credit

A E 396 Summer Internship Cr R SS *Prereq Permission of department internship coordinator* Summer professional work period

A E 397 Engineering Internship Cr R FS *Prereq Permission of department internship coordinator* One semester maximum per academic year professional work period

A E 398 Cooperative Education Cr R FS SS *Prereq 298 permission of department coop coordinator Second professional work period in the* cooperative education program Students must register for this course before commencing work

A E 401 Senior Seminar (1 0) Cr 1 F *Prereq Senior classification* Preparation and presentation of papers on agricultural engineering subjects Discussion of engineering ethics and professionalism Career development

A E 403 Modeling and Controls for Agricultural Systems (Dual listed with 503) (3 0) Cr 3 Alt F offered 2005 *Prereq 363 or E E 441 Math 267* Modeling dynamic systems with ordinary differential equations Introduction to state variable methods of system analysis Analysis of mechanical electrical and fluid power systems for agricultural equipment Analytical and numerical solutions of differential equations and solution Introduction to classical control theory Feedback and stability examined in the s domain Frequency response as an analytical and experimental tool MATLAB will be used throughout the course for modeling Nonmajor graduate credit

A E 404 Instrumentation for Agricultural and Biosystems Engineering (Dual listed with 504) (2 2) Cr 3 F *Prereq 363 or Cpr E 210 or E E 441* Interfacing techniques for computer based data acquisition and control systems Basic interfacing components including A/D and D/A conversion signal filtering multiplexing and process control Sensors and theory of operation applied to practical monitoring and control problems

A E 405 GIS and Natural Resources Management (Dual listed with 505 same as EnSci 405) (2 2) Cr 3 F *Prereq Working knowledge of computers and Windows environment* Introduction to fundamental concepts and applications of GIS in natural resources management with specific focus on watersheds Topics include basic GIS technology data structures database management spatial analysis and modeling visualization and display of natural resource data Case studies in watershed and natural resource management using ArcView GIS In addition to other assignments graduate students will prepare research literature reviews on topics covered in class and develope enterprise applications

A E 413 Practical Fluid Power Circuits (Same as M E 413) (0 3) Cr 1 F *Prereq Credit or enrollment in 447 or M E 414* Properties of fluids Pump and motor efficiencies Analysis and assembly of fluid power systems and experimental investigation of appropriate control systems Application to hydrostatic transmissions Nonmajor graduate credit

A E 415 Agricultural Engineering Design I (1 2) Cr 2 FS *Prereq 271 or 272 E M 324* Identification of current design problems in agricultural engineering Development of alternate solutions using creativity and engineering analysis and synthesis techniques Nonmajor graduate credit

A E 416 Agricultural Engineering Design II (1 2) Cr 2 FS *Prereq 415* Selection of promising solutions to design problems identified in 415 for development by design teams Presentation of designs through oral and written reports and prototypes Nonmajor graduate credit

A E 421 Natural Resource Conservation Engineering (Dual listed with 521) (2 3) Cr 3 F *Prereq E M 378 or Ch E 356* Planning and design of systems to conserve and utilize natural resources in the agricultural environment Small watershed hydrology water movement and utilization in the soil plant atmosphere system agricultural water management best management practices for control of erosion and agricultural water quality

A E 441 Crop Harvesting Dynamics (Dual listed with 541) (2-3) Cr 3 Alt F offered 2003 *Prereq 203 Math 266 or equivalent* Physical principles behind the harvesting and handling of all types of crops grains and foods fuels biomass and fibers fragrances and fertilizers Technological principles practice performance analysis and design of engineered systems for harvesting crops with principal emphasis on grain harvesting Physical properties of grain forage fibers and other harvested biological materials Environmental factors that affect crop quality and influence machine operation and design Harvesting equipments design test operating and manufacturing criteria

A E 447 Power and Control Hydraulics (2-0) Cr 2 F *Prereq Credit or enrollment in E M 378 or M E 335 A E 215 or M E 270* Properties of hydraulic fluids Performance parameters of fixed and variable displacement pumps and motors Hydraulic circuits and systems Hydrostatic transmissions Characteristics of control valves Analysis and design of hydraulic systems for power and control functions Nonmajor graduate credit

A E 451 Food Process Engineering (Dual listed with 551) (2 3) Cr 3 Alt S offered 2004 *Prereq Ch E 357 or M E 436* Application of momentum heat and mass transfer in food processing Analysis of selected unit operations used in food processing Extrusion dehydration thermal processing

A E 465 Physical Properties of Biological Materials (Dual listed with 565) (2 2) Cr 3 Alt F offered 2004 *Prereq 216* Properties of agricultural and food materials needed in design application and evaluation of unit operations used in processing biological materials into finished products Rheological thermal viscoelastic hygroscopic aerodynamic and mechanical properties

A E 469 Grain Processing and Handling (Dual listed with 569) (2 3) Cr 3 Alt S offered 2005 *Prereq 216* Cereal grain and oilseed properties quality measurement processing and end use value Design of drying systems using computer simulation Corn wet and dry milling Soybean oil extraction Grain handling systems

A E 472 Design of Environmental Modification Systems for Biological Products (Dual-listed with 572) (4-0) Cr 4 S *Prereq 216 M E 330* Principles and design of animal and grain environmental control systems Insulation heat and mass transfer fans ventilation air distribution heating and cooling equipment duct design controls

A E 473 Manure Treatment and Bioconversion (Dual listed with 573) (3 0) Cr 3 Alt S offered 2004 *Prereq Chem 167 Ch E 356 or E M 378* Principles of chemistry microbiology and engineering applied to design of systems for treatment and utilization of livestock manures and other agricultural byproducts Bioenergetics of microbial processes Composting agricultural residues Odor measurement modeling and control

A E 478 Design of Agricultural Structures (Dual-listed with 578) (4-0) Cr 4 Alt F offered 2003 *Prereq 216 271 or 272 E M 324* International Building Code and ANSI Standard Analysis of wind snow dead and live loads Pressures from granular materials Design of light framed structures using cold formed steel and wood Wood structures will combine timber plywood and composite materials Application to grain agricultural buildings and equipment Finite element analysis

A E 480 Engineering Quantification of Biological Processes (Dual listed with 580) (2 2) Cr 3 S *Prereq 216 Math 266 Biol 109 or 201 or 202 M E 330* Prediction of biological systems behavior by computer simulation of mathematical system models Focus on mathematical representation of biological processes including population dynamics growth development diffusion bioenergetics enzyme kinetics Flow diagrams for representing systems and constructing mathematical models Finite difference techniques for continuous system simulation including examples of plant growth and soil water balances Students enrolled in A E 580 will be required to answer an additional final exam question to report on two journal articles and to complete a more comprehensive class project than students enrolled in A E 480

A E 490 Independent Study Cr 1 to 4
B Biosystems Engineering
C Computer aided Design
E Environmental Systems
F Food Engineering
H Honors
P Power and Machinery
Q Structures
R Process Engineering

S Environmental and Natural Resources Systems
U Waste Management

A E 498 Cooperative Education Cr R FS SS *Prereq 398 permission of department* Third and subsequent professional work periods in the cooperative education program Students must register for this course before commencing work

Courses Primarily for Graduate Students, open to qualified undergraduate students

A E 503 Modeling and Controls for Agricultural Systems (Dual listed with 403) (3-0) Cr 3 Alt S offered 2005 *Prereq 363 or E E 441 Math 267* Modeling dynamic systems with ordinary differential equations Introduction to state variable methods of system analysis Analysis of mechanical electrical and fluid power systems for agricultural equipment Analytical and numerical solutions of differential equations and solution Introduction to classical control theory Feedback and stability examined in the s domain Frequency response as an analytical and experimental tool MATLAB will be used throughout the course for modeling Individual and/or group projects required for graduate credit

A E 504 Instrumentation for Agricultural and Biosystems Engineering (Dual listed with 404) (2 2) Cr 3 F *Prereq 363 or Cpr E 210 or E E 441* Interfacing techniques for computer based data acquisition and control systems Basic interfacing components including A/D and D/A conversion signal filtering multiplexing and process control Sensors and theory of operation applied to practical monitoring and control problems Individual and group projects required for graduate credit

A E 505 GIS and Natural Resources Management (Dual listed with 405) (2 2) Cr 3 F *Prereq Working knowledge of computers and Windows environment* Introduction to fundamental concepts and applications of GIS in natural resources management with specific focus on watersheds Topics include basic GIS technology data structures database management spatial analysis and modeling visualization and display of natural resource data Case studies in watershed and natural resource management using ArcView GIS In addition to other assignments graduate students will prepare research literature reviews on topics covered in class and developm enterprise applications

A E 505I Watershed Modeling and GIS (Same as Ia LL 505I) See *Iowa Lakeside Laboratory*

A E 515 Integrated Crop and Livestock Production Systems (Same as Agron 515 AnSci 515 SusAg 515) (3-0) Cr 3 Alt F offered 2003 *Prereq SusAg 509* Managing productivity and minimizing ecological impacts of agricultural systems by understanding nutrient cycles crop residue and manure manage ment grazing systems and multispecies interactions Consideration of crop and livestock production within landscapes and watersheds

A E 520 Agricultural Water Quality Engineering (3 0) Cr 3 Alt S offered 2004 *Prereq Chem 163 or 167 Agron 154 or Geol 201 AST 324 or Agron 402 or C E 372* Physical and chemical properties and processes that affect the transport and fate of chemicals that occur in crop and livestock production Methods of measurement of chemical concentrations and loadings on the environment Modeling of chemical movement and fate Methods of control of nonpoint pollution in agriculture

A E 521 Natural Resource Conservation Engineer ing (Dual listed with 421) (2 3) Cr 3 F *Prereq E M 378 or Ch E 356* Planning and design of systems to conserve and utilize natural resources in the agricultural environment Small watershed hydrology water movement and utilization in the soil plant-atmosphere system agricultural water management best management practices for control of erosion and agricultural water quality Graduate students will prepare several research literatrue reviews on topics covered in the class in addition to the other assignments

A E 522 Drainage and Irrigation Engineering (2-3) Cr 3 Alt S offered 2005 *Prereq 422 or C E 372 Agron 154 or C E 360* Soil water plant relationships theory of infiltration and evapotranspiration saturated and unsaturated flow through soils movement of chemicals in the vadose zone Design of surface and subsurface drainage systems design of sprinkler trickle and subsurface irrigation systems Management of irrigation systems in developing countries

A E 523 Erosion and Sediment Transport (3 0) Cr 3 Alt F offered 2005 *Prereq 422 or C E 372 Math 266* Erosion processes Initiation of motion and overland flow Erosion models Flow in alluvial channels and theory of transport Surface soil and channel stability Wind erosion

A E 525 Geographic Information Science (2 3) Cr 3 Alt F offered 2004 *Prereq C R P 451* Introduction to geographic information science Advanced topics in GIS spatial and non-spatial data acquisition spatial data structures and algorithms GIS operations and applications Decision making in a GIS context GIS planning and implementation GIS standard GIS applications GIS policy ethical and legal issues Multimedia 3D intelligent and virtual GIS Emerging issues

A E 540 Functional Analysis and Design of Agricultural Field Machinery (Dual listed with 340) (2 2) Cr 3 F *Prereq 110 203 M E 324* Principles of operation design selection testing and evaluation of agricultural field machinery and systems Functional and mechanical performances Crop and soil interaction with machines Machine systems including land preparation crop establishment crop protection harvesting and post harvest materials handling systems Individual and group projects required for graduate credit

A E 541 Crop Harvesting Dynamics (Dual listed with 441) (2-3) Cr 3 Alt F offered 2003 *Prereq 203 and Math 266 or equivalent* Physical principles behind the harvesting and handling of all types of crops grains and foods fuels biomass and fibers fragrances and fertilizers Technological principles practice performance analysis and design of engineered systems for harvesting crops with principal emphasis on grain harvesting Physical properties of grains forage fibers and other harvested biological materials Environmental factors that affect crop quality and influence machine operation and design Harvesting equipment design test operating and manufacturing criteria Extra individual/team projects required

A E 551 Food Process Engineering (Dual listed with 451) (2 3) Cr 3 Alt S offered 2004 *Prereq Ch E 357 or M E 436* Application of momentum heat and mass transfer in food processing Analysis of selected unit operations used in food processing Extrusion dehydration thermal processing Individual and/or group projects required for graduate credit

A E 565 Physical Properties of Biological Materials (Dual listed with 465) (2 2) Cr 3 Alt F offered 2004 *Prereq 216* Properties of agricultural and food materials needed in design application and evaluation of unit operations used in processing biological materials into finished products Rheological thermal viscoelastic hygroscopic aerodynamic and mechanical properties Individual and/or group projects required for graduate credit

A E 569 Grain Processing and Handling (Dual listed with 469) (2 3) Cr 3 Alt S offered 2005 *Prereq 216* Cereal grain and oilseed preservation quality measurement and end use value Design of drying systems using computer simulation Corn wet and dry milling Soybean oil extraction Grain handling systems Individual and group projects required for graduate credit

A E 572 Design of Environmental Modification Systems for Biological Products (Dual listed with 472) (4 0) Cr 4 S *Prereq 216 M E 330* Principles and design of animal and grain environmental control systems Insulation heat and mass transfer fans ventilation air distribution heating and cooling equipment duct design and controls Individual and group projects required for graduate credit

A E 573 Manure Treatment and Bioconversion (Dual-listed with 473) (3-0) Cr 3 Alt S offered 2004 *Prereq Chem 167 Ch E 356 or E M 378* Principles of chemistry microbiology and engineering applied to design of systems for treatment and utilization of livestock manures and other agricultural byproducts Bioenergetics of microbial processes Composting agricultural residues Odor measurement modeling and control Individual and group projects required for graduate credit

A E 578 Design of Agricultural Structures (Dual-listed with 478) (4-0) Cr 4 Alt F offered 2003 *Prereq 216 271 or 272 E M 324* International Building Code and ANSI Standard Analysis of wind snow dead and live loads Pressures from granular materials Design of light framed structures using cold formed steel and wood Wood structures will combine timber plywood and composite materials Application to grain agricultural buildings and equipment Finite element analysis

A E 580 Engineering Quantification of Biological Processes (Dual listed with 480) (2 2) Cr 3 S *Prereq Math 266 Biol 109 or 201 M E 330* Prediction of biological systems behavior by computer simulation of mathematical system models Focus on math ematical representation of biological processes including population dynamics growth development diffusion bioenergetics enzyme kinetics Flow diagrams for representing systems and constructing mathematical models Finite difference techniques for continuous system simulation including examples of plant growth and soil water balances Students enrolled in A E 580 will be required to answer an additional final exam question to report on two journal articles and to complete a more comprehensive class project than students enrolled in A E 480

A E 581 Applied Crop Growth Modeling (3 0) Cr 3 Alt F offered 2004 *Prereq Math 165 Bot 320 Com S 205 or equivalent* Development of mathematical models and simulation techniques to describe physiological processes of crop growth including phenological development biomass accumulation (vegetative and reproductive) water and nutrient uptake and effects of biotic and abiotic stress Evaluation of existing models Criteria for selecting models

A E 590 Special Topics Cr 1 to 3
B Biosystems Engineering
F Food Engineering
P Power and Machinery
Q Structures and Environment
R Process Engineering
S Water and Environment
U Waste Management

A E 598 Technical Paper for Master s Degree Arr Cr 1 FS SS A technical paper draft based on M S thesis or creative component is required of all master s students This paper must be in a form that satisfies the requirements of some specific journal Offered on a satisfactory fail grading basis only

A E 599 Creative Component Cr var

Courses for Graduate Students

A E 610 Society and Technology in Sustainable Food Systems (Same as Anthr 610 Soc 610 SusAg 610) (3 0) Cr 3 Alt S offered 2005 *Prereq SusAg 509* Social and technological dimensions of sustainability in food systems Emphasis on ethics and strategies for evaluating existing and emerging options

A E 661 Seminar (1-0) Cr 1 F Discussion of research problems methods procedures and reports

A E 690 Advanced Topics Cr var

A E 694 Teaching Practicum Cr 1 to 3 each time taken FS SS *Prereq Graduate classification and permission of instructor* Graduate student experience in the agricultural and biosystems engineering departmental teaching program

A E 697 Engineering Internship Cr R *Prereq Permission of department chair graduate classifica tion* One semester and one summer maximum per

academic year professional work period Offered on a satisfactory fail grading basis only

A E 698 Technical Paper for a Doctoral Degree Arr Cr 1 FS SS A technical paper draft based on dissertation is required of all Ph D students This paper must be in a form that satisfies the require ments of some specific journal Offered on a satisfactory fail grading basis only

A E 699 Research
B Biosystems Engineering
C Computer aided Design
E Environmental Systems
F Food Engineering
P Power and Machinery
Q Structures
R Process Engineering
S Environment and Natural Resources
U Waste Management

Agricultural Systems Technology

(Administered by the Department of Agricultural and Biosystems Engineering)

Rameshwar Kanwar, Chair of Department

University Professors Baker Bern

Professors Bundy Downing Hurburgh L Johnson Kanwar Melvin Misra Xin

Professors (Adjunct) Quick

Professors (Collaborators) Colvin Laflen

Distinguished Professors (Emeritus) H Johnson

Professors (Emeritus) Beer Bekkum Bockhop Buchele Hazen Hoerner Hull Keeney Lovely Mangold Marley Meyer Pedersen Smith

Associate Professors Batchelor Glanville Greiner Harmon Hoff Lorimor Mickelson Schwab Tim

Assistant Professors Birrell Brumm Freeman Powers Schilling Richard Steward

Assistant Professors (Adjunct) Shahan

Assistant Professors (Collaborators) Malone

Assistant Professors (Emeritus) Boyd

Undergraduate Study

The Department of Agricultural and Biosystems Engineering offers the bachelor of science degree with a major in agricultural systems technology (see *College of Agriculture Curricula*)

The curriculum prepares men and women for careers requiring integration and application of agricultural and mechanical technology physical and biological sciences and business to manage human and natural resources environmental systems and systems for producing processing and marketing food and other biomaterials worldwide Graduates have the ability to apply science and technology to problems related to agriculture and manage complex agricultural systems for sustainability They are able to communicate effectively have problem solving skills and awareness of environmental issues Graduates have developed team building skills and computer proficiency Graduates find careers with agricultural machinery industries environmental organizations governmental agencies farm builders grain feed seed fertilizer and chemical companies or in production agriculture

The Department of Agricultural and Biosystems Engineering offers a minor in agricultural systems technology which may be earned by completing a minimum of 15 credits of agricultural systems technology courses which includes AST 115 AST 210 and at least two credits in 400 level courses Students may select courses to provide emphasis in areas such as
1 Machine technology
2 Livestock production systems
3 Soil and water resource management
4 Electrical systems
5 Grain operations
6 Environmental systems technology

For undergraduate curriculum in agricultural systems technology leading to the degree of bachelor of science see *College of Agriculture Curricula*

Visit our departmental website at www abe iastate edu

Graduate Study

The Department of Agricultural and Biosystems Engineering offers courses for nonmajor graduate credit in agricultural systems technology for students taking major work in other departments and cooperates in the interdepartmental programs in professional agriculture and biorenewable resources and technology A minor in agricultural systems technology is offered

Courses open for nonmajor graduate credit 420 425 435 460 462 474 475 476 490 493 496

Courses Primarily for Undergraduate Students

AST 110 Experiencing Agricultural Systems Technology (0 2) Cr 1 F *Prereq AST majors only* Laboratory-based team oriented experiences in a spectrum of topics common to the practice of agricultural systems technology Report writing internships careers competencies industry visits

AST 115 Solving Technology Problems (2 2) Cr 3 FS *Prereq Math 140 (can be taken concurrently)* Solving technology problems and presenting solutions through technical reports Graphing and curve fitting Use of SI units Significant digits Solutions of technology problems using Excel Presentation of technical information using Word and PowerPoint

AST 120 Introduction to Renewable Resources (Same as Agron 120 Env S 120 NREM 120) (3-0) Cr 3 FS Overview of soil water plants and animals as renewable natural resources in an ecosystems context History and organization of resource management Concepts of integrated resource management

AST 210 Fundamentals of Agricultural Systems Technology (3 0) Cr 3 F *Prereq 115 Math 140* Introduction to problem solving related to fundamental agricultural technology systems such as agricultural power and machinery environmental and natural resources structures and animal environment and electrical circuits Basic energy and force laws definitions and units

AST 215 Computer aided Graphics Applications (1 2) Cr 2 FS *Prereq 115* Computer aided graphics for agricultural systems using AutoCAD and other software Computer modeling and documentation of two and three-dimensional geometries Drawing organization and interfacing with other software Integration of CAD graphics with reports presenta tions and other media

AST 297 Work Experience in Agricultural Systems Technology Cr 2 FS SS *Prereq AST major and approval of instructor required prior to commencing work experience* Work experience must be related to career objectives Written report and oral presentation required on the work experience A maximum of 4 credits of 297 may be used toward the total of 128 credits required for graduation

AST 298 Cooperative Education in Agricultural SystemsTechnology Cr R FS SS *Prereq Sophomore classification in AST and approval of cooperative coordinator* All cooperative education students must register for this course prior to commencing each work period

AST 324 Soil and Water Conservation Manage ment (2 0) Cr 2 *FS Prereq Math 140* Introduction to engineering principles applied to the planning of erosion control systems water control structures water quality management drainage and irrigation systems and farm water resource development

AST 326 Conservation Surveying and Design (0 3) Cr 1 *F Prereq Credit or enrollment in 324* Agricultural surveys for field area measurement and mapping Handbook design of drainage systems and farm water control structures Layout of conservation structures

AST 330 Agricultural Machinery and Power Management (2-3) Cr 3 FS *Prereq 210 Math 142* Selection sizing and operational principles of tractors and machinery systems Cost analysis and computer techniques applied to planning and management of agricultural machine systems Principles operation and application of power sources

AST 333 Precision Farming Systems (2 2) Cr 3 FS (web based course spring semester) *Prereq Math 140 junior or senior classification* Geographic information systems and global positioning systems Sampling strategies for precision farming Building prescriptions and recommendations Systems for precision farming equipment software uses legal and social issues and economics

AST 335 Tractor Power (3 3) Cr 4 F *Prereq 210 Math 142* Theory and construction of tractor engines mechanical power trains and hydraulic systems Introduction to traction chassis mechanics and hydraulic power

AST 337 Fluid Power Systems for Agriculture (1 2) Cr 2 S *Prereq 210 335* Fundamental hydraulic principles Hydraulic fluid properties Function and performance of pumps valves actuators and hydrostatic transmissions Hydraulic circuits and systems

AST 358 Small Power Equipment (1 2) Cr 2 FS Principles of operation adjustment maintenance and repair of small internal-combustion engines and associated equipment

AST 360 Electric Power and Electronics for Agriculture (2 3) Cr 3 F *Prereq 210 Physics 106 or 111* Basic electricity Electrical safety wiring 3 phase service controls and motors for agricultural applications Programmable controller applications Planning lighting and electrical systems

AST 362 Preservation of Grain Quality (2-3) Cr 3 S *Prereq Math 140* Principles and management for grain quality preservation Grain drying and grain storage Psychrometrics Fan and airflow Grain handling methods and system planning Grain quality measurement and end use value analysis

AST 373 Animal Production Systems (3-0) Cr 3 F *Prereq 210* Response of animals to the thermal environment Environmental systems for animal production Water feed handling and waste management systems Planning confinement facilities for swine poultry beef and dairy production systems

AST 397 Internship in Agricultural Systems Technology Cr R FS SS *Prereq Sophomore classification in AST and approval of internship coordinator* A supervised work experience in an approved learning setting with application to agricultural systems practices and principles

AST 398 Cooperative Education in Agricultural SystemsTechnology Cr R FS SS *Prereq Junior classification in AST and approval of cooperative coordinator* All cooperative education students must register for this course prior to commencing each work period

AST 403 Senior Seminar (1 0) Cr 1 F *Prereq Senior classification* Development of professionalism and ethics Career search resume and cover letter preparation interviews Oral and written communica tion applications

AST 420 Land Drainage and Irrigation (2-0) Cr 2 Off campus Offered as demand warrants *Prereq 324 Agron 154* Technical economic and environmen tal aspects of the planning and management of farm field drainage and irrigation systems Application of theory from engineering soil science and plant science to the solution of real world problems Designed for master of agriculture program Nonmajor graduate credit

AST 425 Impacts of Agriculture on Water Quality (2 0) Cr 2 F *Prereq Math 140 one of the following 324 Agron 154* Relationship between agriculture and water quality chemical use erosion and conservation tillage water quality monitoring techniques animal waste and water quality nonpoint source pollution management systems to reduce chemical leaching to groundwater Nonmajor graduate credit

AST 435 Agricultural Safety (1-3) Cr 2 F *Prereq 115* Fundamentals of safety injury collection analysis and investigation risk assessment fault tree analysis and hazard communications applied to agricultural operations Exploration of noise indoor air quality chemicals machinery fire and confined space hazards identification and injury prevention interven tions Nonmajor graduate credit

AST 460 Agricultural Electronics (1 3) Cr 2 Alt S offered 2004 *Prereq 360* Electronics to sense monitor and control processes in power and machinery grain operations animal environment and natural resources Semiconductors digital logic circuits speed pressure position temperature and moisture sensors electrohydraulics programmable logic controllers Nonmajor graduate credit

AST 462 Post Harvest Grain Technology (2 0) Cr 2 Off campus offered as demand warrants *Prereq 6 credits in agricultural or biological science 3 credits in math* Grain drying and high moisture preservation methods with emphasis on corn Psychrometrics Fans and airflow Grain handling methods and system planning corn milling soybean processing Designed for master of agriculture program Nonmajor graduate credit

AST 474 Livestock Housing Systems (2 0) Cr 2 Off campus offered as demand warrants *Prereq 6 credits in agricultural or biological science 3 credits in math* Properties of moist air effects of environment on animal performance principles of environmental control feed handling systems manure management alternatives and planning total systems Designed for master of agriculture program Credit in only one of 373 or 474 may be used for graduation Nonmajor graduate credit

AST 475 Manure Management Systems for Livestock Production (3 0) Cr 3 Alt S offered 2004 (web-based course) *Prereq 6 credits in agricultural or biological sciences Math 140* Livestock manure production properties collection transport storage treatment and utilization Regulations and environmen tal impacts Systems for nutrient management and odor abatement Practical design criteria and procedures for planning livestock manure handling systems Nonmajor graduate credit

AST 476 Planning Agricultural Structures and Farmstead Systems (2 2) Cr 3 S *Prereq 373* Layout and organization of farmstead systems Planning farm shops machine sheds crop storage structures livestock production buildings and manure management systems Analysis of building plans and calculating building costs Building materials including timber concrete and steel construction methods and structural analysis Nonmajor graduate credit

AST 490 Independent Study Cr 1 to 3 *Prereq Junior or senior classification permission of instructor* A maximum of 4 credits of 490 may be used toward the total of 128 credits required for graduation Nonmajor graduate credit
A Animal Environment/Air Quality
C Computer Operations
E Electrical/Electronics
G Grain Operations
H Honors
I Safety and Human Factors
K Bioprocessing
L Livestock Production Systems
M Machine Systems
N Energy
S Soil and Water Resources
T Structures/Buildings
W Waste Management

AST 493 Workshop in Agricultural Systems Technology Cr 1 Offered as demand warrants *Prereq Permission of instructor* Nonmajor graduate credit
A Environment and Structures
B Waste Management
C Computer Operations
D Electricity and Electronics
E Metals Fabrication
F Grain Operations
G Safety and Human Factors
H Water Quality
I Erosion Control
J Tractor Power and Machine Systems
K Swine Production Systems

AST 491 Seed Science Internship Experience (Same as Agron 491 Hort 491) Cr 1-2 May be repeated once FS SS *Prereq Agron 338 advanced approval and participation of employer and instructor* A professional work experience and creative project for seed science secondary majors The project requires prior approval and participation of the employer and instructor The student must submit a written report

AST 496 Agricultural Systems Analysis and Planning (1-4) Cr 3 S *Prereq 12 credits in AST and senior classification in agriculture* Student teams prepare oral and written reports on term projects involving analysis and planning of systems for agriculture Team projects include problem solving solution evaluation cost analysis and use of computer decision aid and computer graphics to prepare plans and reports Nonmajor graduate credit

AST 498 Cooperative Education in Agricultural Systems Technology Cr R FS SS *Prereq Senior classification in AST and approval of cooperative coordinator* All cooperative education students must register for this course prior to commencing each work period

Agronomy

Steven L Fales, Chair of Department

Distinguished Professors Fehr

Professor Anderson Arritt Barnhart Blackmer Campbell Cianzio Cruse Fales Fenton Gutowski Hartzler Horton Killorn Lamkey Lee Liebman Loynachan Miller Moore Mullen Owen P Peterson Sandor Schnable Tabatabai Takle Taylor Whigham

Professors (Collaborators) Hatfield Jaynes Karlen Kaspar Palmer Shoemaker

Distinguished Professors (Emeritus) Bremner Frey Hallauer Pesek Russell Shaw

Professors (Emeritus) I Anderson M Anderson Atkins Benson Burris I Carlson R Carlson George Green Hodges Imsande Keeney Larson Pearce Schafer Schaller A Scott Shibles Shrader Skrdla Stritzel H Thompson L Thompson Troeh Voss Wedin Woolley Yarger

Associate Professors Brummer Burras Dekker Knapp Mallarino Manu T Peterson Salvador Sawyer M Thompson Wang Westgate Wiedenhoeft

Associate Professors (Collaborators) Cambardella Grant Kovar Laird Logsdon Moorman Olson Pollak M Scott

Assistant Professors Al Kaisi Becraft Bhattacharyya Delate Gibson Goggi Gu Halverson Henning Jannink Muenchrath Polito

Assistant Professors (Adjunct) Heuchelin Todey

Assistant Professors (Collaborators) Gardner Guan Sauer Widrlechner

Instructors Ziegler

Undergraduate Study

For undergraduate curriculum in agronomy see *College of Agriculture Curricula*

The Department of Agronomy provides a curriculum for students interested in crop science soil science agricultural meteorology and environmental science

Students selecting agronomy as a major will elect an option in general agronomy environmental science or science

Graduates have the theoretical and practical knowledge needed for efficient and sustainable production of food feed and fiber They have a broad understanding of the role and diversity of plants soils and climates of the world Graduates are skilled in communications critical thinking problem solving and working effectively with others Students develop these skills in our required courses They understand the ethical cultural and environmental dimensions of issues facing professionals in agriculture and natural resources

An agronomy major prepares students for employ ment in agricultural business and industry agricultural service organizations crop production and soil management environmental and natural resource management farm management and governmental agencies Graduates pursue careers in the seed fertilizer and agricultural chemical industries as field agronomists crop and soil management specialists research technicians sales and marketing specialists and production managers State and federal agencies employ agronomists as extension specialists county extension directors environmental and natural resource specialists research associates soil surveyors soil conservationists and in regulatory agencies as plant food and grain inspectors Additional areas of work open to agronomists include integrated pest management land appraisal agricultural finance turfgrass management and the home lawn care industry

The department offers a minor in agronomy Students are required to complete an approved minor program that includes Agron 114 154 212 354 and 6 additional credits of which a minimum of 3 credits must be at the 300+ level A minimum of 15 credits for the agronomy major and 9 credits for the agronomy minor must be earned at Iowa State Students work with an agronomy advisor to select courses in crops soils and meteorology that are appropriate to their career goals A list of approved courses is available from an agronomy advisor

Students can also design a strong basic science education in crop science soil science agricultural meteorology or biotechnology to prepare themselves for science based jobs graduate study or for research careers

Graduate Study

The department offers the degrees master of science and doctor of philosophy with majors in agricultural meteorology crop production and physiology with optional specializations in seed science and weed science plant breeding and soil science with specialization in soil chemistry soil fertility soil management soil microbiology and biochemistry soil morphology and genesis or soil physics Minor work is offered for students with majors in other depart ments A M S nonthesis option is available for students desiring a general degree program with additional coursework and a written creative component substituting for thesis research The nonthesis option is not intended to prepare students for entering a Ph D program

Graduates have a broad knowledge base germane to their area of study They are trained to integrate and apply knowledge to different situations Students develop skills in scientific reasoning organization and logical presentation of ideas

A master of science degree in agronomy designed for the continuing education of professional agronomists is offered by the department The program is taught at a distance using computer-based instructional media It is a nonthesis degree requiring completion of a written creative component

The department cooperates in the interdepartmental program in professional agriculture interdepartmental

majors in ecology and evolutionary biology genetics MCDB (molecular cellular and developmental biology) plant physiology sustainable agriculture and water resources

Prerequisite to major work in this department is completion of an undergraduate degree program with emphasis on agronomic biological and physical sciences The foreign language requirement if any for the Ph D degree is established on an individual basis by the program of study committee appointed to guide the work of the student

Courses open for nonmajor graduate credit 306 334 342 351 351L 354 356 402 402I 404 406 421 434 473 473I 485 493

Courses Primarily for Undergraduate Students

Agron 105 Leadership Experience Cr R FS SS Staff A participatory experience in activities or completion of a course that enhances the development of leadership and group-dynamic skills See adviser for departmental requirements

Agron 110 Professional Development in Agronomy Orientation (1 0) Cr 0 5 F Pogranichniy Orientation to college life the profession of agronomy and the agronomy curriculum

Agron 114 Principles of Agronomy (2 3 to 4 individualized study) Cr 3 FS Mullen A foundation course in crop production and soil management principles for the basic agronomic crops Includes introductory concepts of plant soil tillage pest environmental and sustainable aspects of crop production Off campus version offered through internet by interactive computer courseware

Agron 120 Introduction to Renewable Resources (Same as AST 120 Env S 120 NREM 120) (3 0) Cr 3 FS Overview of soil water plants and animals as renewable natural resources in an ecosystem context History and organization of resource management Concepts of integrated resource management

Agron 154 Fundamentals of Soil Science (2 2 to 4 individualized study) Cr 3 FS Off-campus version offered in Spring semester *Prereq Chem 163* Manu Introduction to physical chemical and biological properties of soils their formation classification and distribution Use of soil survey and computer databank information in balancing agronomic economic and environmental concerns in soil management Credit for only one of 154 155 or 156 may be applied toward graduation not both

Agron 155 Soils for Horticultural Scientists (2 2 to 4 individualized study) Cr 3 FS *Prereq Chem 163* Restricted to students in Horticulture Manu Physical chemical and biological properties of natural and manufactured soils Use of soil information when producing plants on natural and manufactured soils Credit for only one of 154 155 or 156 may be applied toward graduation

Agron 156 Soils for Urban Use (2 2 to 4 individualized study) Cr 3 FS Restricted to students outside the College of Agriculture Manu Fundamental properties of soils and their application to urban settings Development of a site plan for area of land using data from soil survey and computerized data bank information Field trip Credit for only one of 154 155 or 156 may be applied toward graduation not both

Agron 206 Introduction to Meteorology (Same as Mteor 206) (3 0) Cr 3 FS R Taylor or Cervato Basic concepts in meteorology including atmospheric measurements radiation stability precipitation winds fronts forecasting and severe weather Applied topics include global warming ozone depletion El Nino world climates weather safety and atmospheric optics Self study laboratory assignments utilize interactive computerized exercises worksheets and computerized real time forecasting Self study section available to distant education students all semesters

Agron 210 Professional Development in Agronomy Career Planning (1 0) Cr 1 FS *Prereq Sophomore classification* Pogranichniy Sandor Career planning résumé and cover letter preparation and interviewing techniques Career orientation through invited speakers

Agron 212 Grain and Forage Crops (3 2) Cr 4 FS *Prereq 114* Gibson Production and management practices for corn soybean small grain and forage crops common to Midwestern U S agriculture Emphasis on growth and development plant characteristics management practices crop use quality and problem solving

Agron 230 Crop Structure Function Relationships (3 0) Cr 3 FS *Prereq Biol 202* Salvador Basic principles concerning the growth development and production of crop communities in relation to their environment

Agron 260 Soils and Environmental Quality (3 0) Cr 3 FS *Prereq 154* Burras Role of soils in environmental quality and natural resources management Emphasis on soil erosion and conservation water quality and environmental planning Saturday field trip

Agron 283 Pesticide Application Certification (Same as Ent 283) See *Entomology*

Agron 298 Cooperative Education Cr R each time taken FS SS *Prereq Permission of department cooperative education coordinator sophomore classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Agron 306 Use of Weather Data in Agriculture (Same as Mteor 306) (1 1) Cr 1 S *Prereq 206* Arritt Instrumentation collection and analyses of weather data relative to crop production in the Midwest Weather parameters are analyzed using computer applications Nonmajor graduate credit

Agron 310 Professional Development in Agronomy Internship Cr R FS SS Staff Professional work experience in agronomy See adviser for departmental requirements

Agron 317 Principles of Weed Science (Same as P M 317 Pl HP 317) (2 2) Cr 3 FS *Prereq Biol 201 and 202* Gibson Liebman Hartzler Identification biology and ecology of weeds Principles and practices of integrated weed management systems Herbicide mechanisms classification and fate in plants and soils

Agron 320 Genetics, Agriculture and Biotechnology (Same as Gen 320) (3 0) Cr 3 FS *Prereq Biol 201 and 202* Transmission genetics with an emphasis on applications in agriculture the structure and expression of the gene how genes behave in populations and how recombinant DNA technology can be used to improve agriculture Credit for graduation will not be allowed for more than one of the following Gen 260 301 320 and Biol 301 and 301L

Agron 330 Crop and Seed Identification Laboratory (0-4) Cr 2 S *Prereq 114* Staff Identification agronomic and binomial classification of crops weeds and diseases Analysis of crop seed samples for contaminants of weed and other crop seeds

Agron 331 Intercollegiate Crop Identification Seed Analysis and Grain Grading (0-6) Cr 2 F *Prereq 330 permission of instructor* Staff Intensive training in crop weed and disease identification seed analysis and grain grading for intercollegiate competition in regional and national crops contests

Agron 332 Crop Quality Traits and Utilization (1-2) Cr 2 S *Prereq 212 Chem 163* Mullen Characteristics uses and processing of agronomic crops Factors affecting quality and utilization Commercial grading and evaluation One 1-day and one one half day field trips are required

Agron 334 Forage Crop Management (2 0) Cr 2 S *Prereq 114* Wiedenhoeft Management of forage crop legume and grass species as related to climate soils and utilization for harvested hay/silage pasture and soil conservation Production and management concepts applied to yield quality stand persistence and use of forage species Nonmajor graduate credit

Agron 338 Seed Science and Technology (Same as Hort 338) (2 2) Cr 3 S *Prereq 114 or Hort 221 Biol 201* Knapp Seed production maturation dormancy vigor deterioration and related aspects of enhancement conditioning storage and quality evaluation Aspects of the seed industry and regulation of seed marketing

Agron 342 World Food Issues Past and Present (Same as Env S 324 FS HN 342 T SC 342 U St 342) (3-0) Cr 3 S Salvador World food problems in context of historical development of agriculture in major cradles of civilization Emphasis on population trends and socioeconomic policies to understand disparities between potential agricultural production and present energy and nutritional deficiencies in key areas of the developing world Team projects Nonmajor graduate credit
H Honors Section (For students in the University Honors Program only)

Agron 351 Turfgrass Establishment and Management (Same as Hort 351) See *Horticulture* Nonmajor graduate credit

Agron 351L Turfgrass Establishment and Management Laboratory (Same as Hort 351L) See *Horticulture* Nonmajor graduate credit

Agron 354 Soils and Plant Growth (Same as Pl HP 354) (3-0) Cr 3 FS *Prereq 154 and Biol 109 or 202* Killorn or Loynachan Effects of chemical physical and biological properties of soils on plant growth with emphasis on nutritive elements pH organic matter maintenance and rooting development Nonmajor graduate credit

Agron 354L Soils and Plant Growth Laboratory (Same as Pl HP 354L) (0 3) Cr 1 F S *Prereq Credit or enrollment in 354* Henning Laboratory exercises in soil testing that assess a soil s ability to support nutritive requirements for plant growth

Agron 356 Soil, Fertilizer and Water Management (3 2) Cr 4 F *Prereq 354 Recommended 114* Polito Killorn Integration of crop tillage drainage erosion fertility and fertilizer information in management decisions Economic and environmental implications of these decisions on long term sustainability Suitability and accuracy of soil evaluation methods Handling characteristics and soil reactions of organic and mineral fertilizers An in depth farm plan will be developed for a client Nonmajor graduate credit

Agron 360 Environmental Soil Science (Same as EnSci 360) (2 3) Cr 3 S *Prereq Agron 260 or Geol 100 or 201* Burras and Killorn Application of soil science to contemporary environmental problems comparison of the impacts that different management strategies have on short and long term environmental quality and land development Emphasis on participatory learning activities

Agron 370 Field Experience in Soil Description and Interpretation (0 3) Cr 1 Can be taken four times FS *Prereq 154 and permission of instructor* Sandor Description and interpretation of soils in the field and laboratory emphasizing hands on experience Evaluation of soil information for land use Students may participate in intercollegiate judging contests

Agron 392 Systems Analysis in Crop and Soil Management (2-3) Cr 3 FS *Prereq 230 354* Wiedenhoeft Management strategies at the level of the farm field Emphasis will be on participatory learning activities

Agron 398 Cooperative Education Cr R each time taken FS SS *Prereq Permission of department cooperative education coordinator junior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Agron 402 Watershed Hydrology and Surficial Processes (Same as EnSci 402 For 402 Geol 402) (3 3) Cr 4 F *Prereq Credit or enrollment in EnSci 330 or Geol 100 or 201 Math 165 or 181* Simpkins Examination of watersheds as systems wherein

biological and physical factors control hydrology soil formation and nutrient transport Laboratory emphasizes field investigation of watershed scale processes Nonmajor graduate credit

Agron 402I Watershed Hydrology and Surficial Processes (Same as Ia LL 402I) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

Agron 404 Global Change (Same as EnSci 404 Env S 404 Mteor 404) (3 0) Cr 3 S *Prereq Four courses in physical or biological sciences or engineering* Takle Recent changes in global biogeochemical cycles and climate models of future changes in climate system impacts of global change on agriculture water resources and human health ethical issues of global environmental change Nonmajor graduate credit

Agron 406 Climate of the Continents (Same as Mteor 406) (2 0) Cr 2 F *Prereq Agron/Mteor 206* Arritt The major climate controls and how they affect the world climate Climate classification Combining controls and classification to explain the pattern of climates of the different continents and the world Semester project and in-class presentation required Nonmajor graduate credit

Agron 407 Mesoscale Meteorology (Dual listed with 507 same as Mteor 407) (3-0) Cr 3 S *Prereq Math 166 and Mteor 454* Arritt Gallus The physical nature and practical consequences of mesoscale atmospheric phenomena Mesoscale convective systems fronts terrain forced circulations Observation analysis and prediction of mesoscale atmospheric structure

Agron 410 Professional Development in Agronomy Senior Forum (1-0) Cr 1 FS *Prereq Senior classification* Staff Development of an appropriate content for professionalism Topics include professional certification ethics and maintaining an active network of information sources and professional contacts in support of lifelong learning Student interpretation writings presentations and discussions

Agron 421 Introduction to Plant Breeding (3-0) Cr 3 F *Prereq 320 or Biol 301* Campbell Breeding methods used in the genetic improvement of self pollinated cross pollinated and asexually reproducing agronomic crops Applications of molecular techniques and biotechnological advancements as breeding tools in the development of improved cultivars and transgenic plants Nonmajor graduate credit

Agron 434 Forage Utilization (2-0) Cr 2 F *Prereq 334* Barnhart Systems of forage utilization including grazing hay and silage Nutritional chemistry of forage plants and the genetic environmental and post harvest factors that influence their use Students enrolling for graduate credit will be expected to complete an additional class project Nonmajor graduate credit

Agron 446 World Agronomic Systems (3-0) Cr 3 S *Prereq 114 154 206* Muenchrath Interdisciplinary study and comparison of agricultural systems around the world including analysis of biophysical social economic and political determinants of the systems Emphasis on the interrelationships among system determinants Analysis of system constraints and solution strategies Evaluation of the productivity and sustainability of the systems Team project and report

Agron 450 Issues in Sustainable Agriculture (Same as Env S 450) (2 0) Cr 2 F Salvador Agricultural science as a human activity contemporary agricultural issues from agroecological perspective Comparative analysis of intended and actual consequences of development of industrial agricultural practices

Agron 457 Agronomic Applications of Site Specific Management (2 2) Cr 3 F *Prereq 212 354 Stat 101 or 104 or 105* Staff Introduction and exploration of agronomic applications of site specific management for improved resource management and environmental quality Emphasis on developing a better understanding of the evolving technologies that are applicable to production agriculture and how these technologies can contribute to an improved environment

Agron 459 Environmental Soil and Water Chemistry (Dual listed with 559 same as EnSci 459) (3-0) Cr 3 Alt F offered 2003 *Prereq Agron 354 or EnSci 401 Chem 210 or 211* An introduction to the chemical properties of soils chemical reactions and transformations occurring in the soils and their impact on the environment Topics include composition of soils acid base equilibria buffer systems mineral dissolution and precipitation speciation ion exchange redox reactions adsorption phenomena soil pollution and chemical equilibria computer programs

Agron 460 Agroforestry Systems (Dual listed with 560 same as For 460) See *Forestry*

Agron 473 Soil Genesis and Landscape Relationships (Same as EnSci 473) (2 3) Cr 4 S *Prereq 154 or 402* Sandor Relationships between soil formation geomorphology and environment Soil description classification geography mapping and interpretation for land use Two weekend field trips Nonmajor graduate credit Credit for only 473 or 473I may be applied for graduation not both

Agron 473I Soil Genesis and Landscape Relationships (Same as EnSci 473I Ia LL 473I) Cr 4 Alt SS offered 2004 at Lakeside Laboratory *Prereq Agron 154 or 402 or 402I* Burras Relationships between soil formation geomorphology and environment Soil description classification geography mapping and interpretation for land use Credit for only 473 or 473I may be applied for graduation not both Nonmajor graduate credit

Agron 485 Soil Microbial Ecology (Same as EnSci 485 Micro 485) (2 3) Cr 3 F *Prereq 154 or 402 Micro 201 (Micro 203 recommended)* Loynachan The living organisms in the soil and what they do Emphasis on soil plant-microbial relationships and environmental issues Nonmajor graduate credit

Agron 490 Independent Study Cr 1 to 3 each time taken 4 cr maximum allowed toward the total of 128 credits required for graduation FS SS *Prereq Junior or senior classification with at least 8 credits in agronomy permission of instructor in specialty area after consultation* Selected studies in crops soils or agricultural meteorology according to the needs and interests of the student
H Honors

Agron 491 Seed Science Internship Experience (Same as AST 491 Hort 491) Cr 1 to 2 May be repeated once FS SS *Prereq 338 advanced approval and participation of employer and instructor* Staff A professional work experience and creative project for seed science secondary majors The project requires the prior approval and participation of the employer and instructor The student must submit a written report

Agron 492 Agronomic Issues Science Policy and Resource Management (2 0) Cr 2 FS *Prereq Senior classification* Knapp Objective investigation of current agricultural issues from multiple perspectives Students will develop positions on or solutions to current agricultural issues by investigating the scientific technical economic environmental and social ramifications of agriculture and agricultural policy

Agron 493 Workshop in Agronomy Cr arr each time taken maximum of 4 *Prereq Permission of instructor* Staff Workshop experience in crops soils or agricultural meteorology Nonmajor graduate credit

Agron 495 Agricultural Travel Course Preparation (0 1) Cr R May be repeated FS *Prereq Permission of instructor* Limited enrollment Students enrolled in this course intend to register for Agron 496 the following term Topics will include the agricultural industries climate crops culture economics geography history livestock marketing soils and preparation for travel to locations to be visited

Agron 496 Agricultural Travel Course Cr arr May be repeated *Prereq Permission of instructor* Limited enrollment Tour and study of production methods in major crop and livestock regions of the world Influence of climate economics geography soils landscapes markets and other factors on crop and livestock production Location and duration of tours will vary Tour expenses paid by students Check with department for current offerings
A International Tour
B Domestic Tour

Agron 497 Agroecology Summer Field Course Cr 3 SS *Prereq Jr or Sr classification with at least 8 credits in Agronomy* A one week intensive summer class offered off-campus Student will visit farms within the Midwest and analyze the sustainability of each farm

Agron 498 Cooperative Education Cr R each time taken FS SS *Prereq Permission of department cooperative education coordinator senior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Courses Primarily for Graduate Students, open to qualified undergraduate students

Agron 500 Orientation Seminar (2-0) Cr 1 F *Prereq International agronomy graduate students only* Pesek and staff An introduction to Iowa and U S agriculture for international scholars in agronomic majors Field trips when possible Departmental role in the functioning of research teaching and extension in fulfilling the charge given the land-grant university Offered on a satisfactory-fail grading basis only

Agron 501 Crop Growth and Development (2 0) Cr 2 F *Prereq 114 Math 140 Chem 163 Biol 109* Muenchrath Westgate Physiological processes in crop growth development and yield photosynthesis respiration water relations mineral nutrition assimilate partitioning seedling vigor light interception and canopy growth root growth reproduction and yield Required course for the Master of Science in Agronomy degree program Restricted to graduate students enrolled in degree programs at Iowa State University

Agron 502 Chemistry Physics and Biology of Soils (2 0) Cr 2 F *Prereq 114 154 Biol 109 Chem 163 and Math 140* Burras Soil chemical physical and biological properties that control processes within the soil their influence on plant/soil interactions and soil classification Basic concepts in soil science and their applications Required course for the Master of Science in Agronomy degree program Restricted to graduate students enrolled in degree programs at Iowa State University

Agron 503 Climate and Crop Growth (2 0) Cr 2 F *Prereq 114 and Math 140* Taylor Applied concepts in climate and agricultural meteorology with emphasis on the climate agriculture relationship and the microclimate agriculture interaction Required course for the Master of Science in Agronomy degree program Basic meteorological principles are also presented to support these applied concepts Restricted to graduate students enrolled in degree programs at Iowa State University

Agron 504 Global Change (Dual listed with 404 same as Mteor 504) See *Geological and Atmospheric Sciences Meteorology*

Agron 505 Biometeorology (Same as Mteor 505) (3 0) Cr 3 F *Prereq Agron/Mteor 206* Arritt Energy mass and momentum exchange near the ground Radiation turbulence conductance and evaporation as components of the heat balance Temperature wind and humidity conditions in the microclimate Modification of the microclimate Computer modeling of biophysical processes Semester project required

Agron 507 Mesoscale Meteorology (Dual listed with 407 same as Mteor 507) (3-0) Cr 3 S *Prereq Math 166 and Mteor 454* Arritt Gallus The physical nature and practical consequences of mesoscale atmospheric phenomena Mesoscale convective systems fronts terrain forced circulations Observation

analysis and prediction of mesoscale atmospheric structure Semester project and in-class presentation required

Agron 508 Biophysical Crop Ecology (3 0) Cr 3 Alt S offered 2004 *Prereq 505* Taylor Principles of resource capture (light and water) applied to growth and development Ecological implications of radiation temperature moisture and the biological properties of size shape resistance to water vapor loss and absorptivity to solar and thermal radiation Physiological stress in the soil plant atmosphere continuum

Agron 509 Agroecosystem Analysis (Same as Anthr 509 Soc 509 SusAg 509) (3 0) Cr 3 F *Prereq 6 credits in social sciences 6 credits in natural biological or engineering sciences and senior or above classification* Salvador Butler Field study of commercial farming systems within the context of global energy flows and biogeochemical cycles including ecological agronomic and social perspectives

Agron 511 Crop Improvement (2-0) Cr 2 S *Prereq 114 Math 140 Chem 163 Biol 109* Campbell Basic principles in the genetic improvement of crop plants Methods of cultivar development in self-pollinated and cross pollinated crop species Required course for the Master of Science in Agronomy degree program Restricted to graduate students enrolled in degree programs at Iowa State University

Agron 512 Soil Plant Environment (2 0) Cr 2 S *Prereq 502 Recommended 501* Loynachan Soil properties and their impact on soil/plant relationships Soil structure aeration moisture and nutrients will be discussed in the context of soil fertility and environmental quality management Required course for the Master of Science in Agronomy degree program Restricted to graduate students enrolled in degree programs at Iowa State University

Agron 513 Quantitative Methods for Agronomy (2 0) Cr 2 S *Prereq Math 140 Stat 104* Heuchelin Quantitative methods for analyzing and interpreting agronomic information Principles of experimental design hypothesis testing analysis of variance regression correlation and graphical representation of data Use of spreadsheets for manipulating analyzing and presenting data Required course for the Master of Science in Agronomy degree program Restricted to graduate students enrolled in degree programs at Iowa State University

Agron 514 Integrated Pest Management (2-0) Cr 2 SS *Prereq 114 501 Math 140 Chem 163 Biol 109 Recommended 502 503* Heuchelin Principles and practices of weed science entomology and plant pathology applied to crop production systems Biology ecology and introductory principles of crop pest management Required course for the Master of Science in Agronomy degree program Restricted to graduate students enrolled in degree programs at Iowa State University

Agron 515 Integrated Crop and Livestock Production Systems (Same as A E 515 SusAg 515 An S 515) (3-0) Cr 3 Alt F offered 2003 *Prereq 509* Richard Russell Wiedenhoeft Managing productivity and minimizing ecological impacts of agricultural systems by understanding nutrient cycles crop residue and manure management and multi species interactions Consideration of crop and livestock production within landscapes and watersheds The course includes a significant off-campus component with teams analyzing Iowa farms

Agron 516 Crop Physiology (3-0) Cr 3 S *Prereq Bot 320* Westgate Physiological and biochemical processes determining crop growth reproductive development and grain yield

Agron 517 Weed Biology and Ecology (3 0) Cr 3 Alt S offered 2004 *Prereq 317 Bot 484* Dekker Weed evolution and biodiversity for exploitation of disturbed and managed habitats Selection and adaptation of weeds in agronecosystems soil weed seed banks population shifts and crop weed interactions The genetic basis of colonizing plant species

Agron 519 Herbicide Physiology and Biochemistry (2-0) Cr 2 Alt S offered 2005 *Prereq 317 Bot 320* Owen Herbicide mechanisms of action selectivity uptake and translocation Specific sites of herbicide action as they affect plant physiology Herbicide resistance in weeds and crops Implications of herbicides on weed management

Agron 521 Principles of Cultivar Development (3 0) Cr 3 F *Prereq 421 Stat 401* Brummer Theoretical and practical analysis of alternative breeding methods to improve crop plants Strategies to incorporate germplasm resources develop populations maximize genetic gain and use marker assisted selection Relationship of breeding methods to commercial seed production

Agron 522 Field Methods in Plant Breeding (0-6) Cr 2 SS *Prereq 521* Staff Field experience in planning and conducting plant breeding research for cross-pollinated and self pollinated crops Offered on a satisfactory fail basis only

Agron 526 Field Plot Technique (3-0) Cr 3 S *Prereq Stat 401* Moore Planning experiments for agricultural research analysis of data and concepts in data interpretation

Agron 527 Plant Genetics (3-0) Cr 3 S *Prereq Gen 410* Bhattacharyya Fundamental genetic and cytogenetic concepts from plant perspective including recombination linkage analysis genetic and molecular mapping male sterility self incompatibility apomixis and polyploid evolution

Agron 530 Ecologically Based Pest Management Strategies (Same as SusAg 530 Ent 530 Pl P 530) (3 0) Cr 3 Alt F offered 2004 *Prereq SusAg 509* Liebman Obrycki Gleason Durable least toxic strategies for managing weeds pathogens and insect pests with emphasis on underlying ecological processes

Agron 531 Crop Ecology and Management (2 0) Cr 2 F *Prereq 501 502 503* Muenchrath Environmental factors affecting crop growth and yield Climatic and edaphic adaptation of crop species Management systems for crops with an emphasis on row and forage crops Required course for the Master of Science in Agronomy degree program Restricted to graduate students enrolled in degree programs at Iowa State University

Agron 532 Soil Management (2-0) Cr 2 F *Prereq 501 503 512 Recommended 513* Cruse Evaluates the impact of various soil management practices on soil and water resources Combines and applies basic information gained in Agron 502 and Agron 512 Emphasizes the agronomic economic and environmental effects of soil management strategies Required course for the Master of Science in Agronomy degree program Restricted to graduate students enrolled in degree programs at Iowa State University

Agron 533 Crop Protection (2 0) Cr 2 F *Prereq 514* Heuchelin Integrated management systems for important crop pests Cultural biological and chemical management strategies applicable to major crops grown in the Midwest Required course for the Master of Science in Agronomy degree program Restricted to graduate students enrolled in degree programs at Iowa State University

Agron 537 Environmental Stress Physiology (Same as Hort 537) See *Horticulture*

Agron 538 Seed Physiology (2-0) Cr 2 Alt F offered 2004 *Prereq 338 BBMB 301 or Chem 331* Goggi Physiological aspects of seed development maturation longevity dormancy and germination Emphasis on current literature and advanced methodology

Agron 541 Applied Agricultural Meteorology (2 0) Cr 2 FS SS Available on and off campus *Prereq 206 or upper division Biological Science* Taylor Applied concepts in agricultural meteorology Basic concepts of weather and of crop/climate relationships influencing production protection yield and associated production risk factors Credit for only one of 503 or 541 may be applied toward graduation not both Self study sections are available to resident and to distant education students all semesters

Agron 542 Advanced Crop Management (2 0) Cr 2 Off campus offered as demand warrants *Prereq 230* Staff Basic concepts in plant-soil climate relationships with emphasis on recent advances in crop culture and management Designed for the master of agriculture program

Agron 544 Soil Management (2 0) Cr 2 Off campus offered as demand warrants *Prereq 354* Blackmer Cruse Basic concepts of soil management with emphasis on how various tillage and fertilization practices influence plant growth Designed for the master of agriculture program

Agron 546 Organizational Strategies for Diversified Farming Systems (Same as Soc 546 Hort 546 SusAg 546) (3-0) Cr 3 Alt S offered 2004 *Prereq 509* Bell Liebman Organization and operation of complex diversified farming systems Topics include systems analysis ecological diversity agronomic diversity economic diversity social diversity analytical frames for evaluating farming system sustainability and problem solving Participation in several field trips to Iowa farms is required

Agron 550 Advanced Issues in Sustainable Agriculture (2-2) Cr 3 F Salvador *Prereq Two of 114 154 212 516 and permission of instructor* Agricultural science as a human activity contemporary agricultural issues for agroecological perspective Comparative analysis of intended and actual consequences of development of industrial agricultural practices Individual study and group analysis of environmental literature and scientific reports

Agron 551 Growth and Development of Perennial Grasses (Same as Hort 551) See *Horticulture*

Agron 553 Soil Plant Relationships (3-0) Cr 3 F *Prereq 354* Blackmer Composition and properties of soils in relation to the nutrition and growth of plants

Agron 554 Advanced Soil Management (2-0) Cr 2 Alt F offered 2003 *Prereq 354 Math 165* Cruse Implications of soil management on the soil environment and root activity Effect of soil physical properties on soil erosion

Agron 555 Soil Clay Mineralogy (Same as Geol 555) (3 0) Cr 3 Alt F offered 2003 *Prereq 473 Chem 164 Recommend Geol 311* Thompson Structure and behavior of clay minerals in soil environments with emphasis on layer silicates and on Fe Mn and Al oxides

Agron 555L Soil Clay Mineralogy Laboratory (Same as Geol 555L) (0 3) Cr 1 Alt F offered 2003 *Prereq Credit or enrollment in 555* Thompson Application of X ray diffraction thermal analysis infrared spectroscopy and chemical analyses to identification and behavior of clay minerals in soils

Agron 558 Laboratory Methods in Soil Chemistry (2 3) Cr 3 Alt F offered 2003 *Prereq 354 and Chem 210 or 211* Tabatabai Experimental and descriptive inorganic and organic analyses Operational theory and principles of applicable instruments including spectrophotometry atomic and molecular absorption and emission spectroscopy mass spectrometry X ray diffraction and fluorescence gas and ion chromatography and ion selective electrodes

Agron 559 Environmental Soil and Water Chemistry (Dual listed with 459) (3 0) Cr 3 Alt F offered 2003 *Prereq 354 Chem 210* Tabatabai An introduction to the chemical properties of soils chemical reactions and transformations occurring in the soils and their impact on the environment Topics include composition of soils acid base equilibria buffer systems mineral dissolution and precipitation speciation ion exchange redox reactions adsorption phenomena and soil pollution

Agron 560 Agroforestry Systems (Dual listed with 460 same as For 560) See *Forestry*

Agron 561 Population and Quantitative Genetics for Breeding (Same as An S 561) (4-0) Cr 4 F *Prereq Stat 401* Jannink Population and quantitative genetics for plant and animal breeding Topics include forces that change gene frequency covariance between relatives response to artificial selection inbreeding depression heterosis cross breeding genotype-by-environment interaction linkage analysis mapping of quantitative trait loci and marker assisted selection

Agron 565 Professional Practice in the Life Sciences (Same as PL P 565) See *Plant Pathology*

Agron 575 Soil Morphology, Genesis and Classification (3 0) Cr 3 Alt F offered 2004 *Prereq 459 473 Geol 100* M Thompson Synthesis of how landscapes water organisms and chemical reactions determine the morphology mineralogy and spatial distribution of soils

Agron 577 Soil Physics (3-0) Cr 3 S *Prereq 354 Recommended Math 166* Horton The physical soil system the soil components and their physical interactions transport processes involving water air and heat

Agron 578 Laboratory Methods in Soil Physics (0 3) Cr 1 S *Prereq 577 concurrent* Horton Methods of measuring soil physical properties such as texture density and water content and transport of heat water and gases

Agron 585 Soil Microbiology and Biochemistry (Same as Micro 585) (2-0 or 2 3) Cr 2 or 3 Alt S offered 2004 *Prereq 485 one course in biochemistry* Loynachan Ecological and environmental consider ations of soil microorganisms organic matter enzymes carbon and other nutrient cycles Laboratory emphasizes creative component

Agron 590 Special Topics Cr arr *Prereq 15 credits in agronomy* Literature reviews and conferences on selected topics in crops soils or agricultural meteorology according to needs and interest of student

Agron 591 Agronomic Systems Analysis (3 0) Cr 3 S *Prereq 511 513 531 532 533* Wiedenhoeft Analysis of cropping systems from a problem solving perspective Case studies will be used to develop the students ability to solve agronomic problems Required course for the Master of Science in Agronomy degree program Restricted to graduate students enrolled in degree programs at Iowa State University

Agron 592 Current Issues in Agronomy (3-0) Cr 3 S *Prereq 501 503 511 512 514* Knapp Study and discussion of topics of current interest to the field of agronomy While Agron 591 deals with agronomics at the farm and landscape level Agron 592 seeks to address issues on a broader scale including off-farm agricultural impacts Required course for the Master of Science in Agronomy degree program Restricted to graduate students enrolled in degree programs at Iowa State University

Agron 593 Workshop in Agronomy Cr arr each time taken *Prereq Graduate classification*
A Crops
B Soils
C Agricultural Meteorology
D Microcomputers in Agronomy
E Seed Science
F Weed Science
G Agronomy Field Laboratory

Agron 594 Workshop in Agronomy (0 1) Cr 1 SS *Prereq 501 502 503 514 (or current enrollment) Recommended 511 512 513* Heuchelin Hands-on field and laboratory experience including integrated pest management climatology soils crops and statistics Required course for the Master of Science in Agronomy degree program Restricted to graduate students enrolled in degree programs at Iowa State University

Agron 599 Creative Component Cr arr *Prereq Nonthesis M S option only* A written report based on research library readings or topics related to the student s area of specialization and approved by the student s advisory committee
A Agricultural Meteorology
B Crop Production and Physiology
C Plant Breeding
D Soil Chemistry
E Soil Fertility
F Soil Management
G Soil Microbiology and Biochemistry
H Soil Morphology and Genesis
I Soil Physics
K Seed Science
L Weed Science
M Agronomy

Courses for Graduate Students

Agron 600 Seminar (1 0) Cr 1 each time taken Reports and discussion of recent literature and research
A Plant Breeding M Lee (F) K Lamkey (S)
B Soils FS Staff
C Crop Production and Physiology FS Staff
600C offered on a satisfactory-fail grading basis only

Agron 609 Agricultural Meteorology Conference (1-0) Cr 1 each time taken FS SS *Prereq Permission of instructor* Staff Literature reviews and conferences with instructor on special problems relating to agricultural meteorology beyond the scope of current courses offered

Agron 616 Advanced Topics in Crop Physiology and Biochemistry (4 0) Cr 4 Alt S offered 2004 *Prereq 516 Bot 511 513 BBMB 404 permission of instructor* Westgate An in depth treatment of physiological biochemical and molecular processes and regulating plant growth and development Emphasis on individual study followed by in-class presentations and discussion

Agron 621 Advanced Plant Breeding (3-0) Cr 3 S *Prereq 521 526 561 Gen 410* Lamkey Estimation and interpretation of genetic effects and variances of plant populations analysis of mating designs heritability estimation intra and interpopulation selection methods prediction of genetic gain inbreeding and heterosis classification and development of parental materials selection indices and combining ability analysis

Agron 625 Genetic Strategies in Plant Breeding (3 0) Cr 3 Alt S offered 2005 *Prereq 521 Gen 410 Bot 545* Lee Evaluation of genetic molecular and cellular approaches to crop improvement gene transfer methods Application and role of basic plant biology in breeding programs and processes genome structure and function gene isolation expression regulation and modification Integration of molecular and cellular methods in breeding strategies analysis of alternative breeding methods regulatory and ethical issues

Agron 629 Colloquium in Plant Breeding and Cytogenetics (1-0) Cr 1 each time taken Alt S offered 2004 *Prereq Gen 410 and permission of instructor* Peterson Presentation of papers and informal discussion of related literature in plant breeding and cytogenetics

Agron 634 Forage Research Methodology (2-0) Cr 2 Alt F offered 2004 *Prereq 434 Stat 402 or equivalent* Staff Research methodology used to evaluate forage production and quality Advanced concepts in the design and analysis of forage experiments

Agron 655 Advanced Soil Fertility (2 0) Cr 2 Alt S offered 2005 *Prereq 553* Blackmer Evaluation of soil fertility and fertilizers theory and applications

Agron 658 Environmental Surface Chemistry (3-0) Cr 3 Alt S offered 2005 *Prereq 559 or 555 Chem 321 and 322* Principles of surface and colloidal chemistry applied to minerals and organic matter in soils sediments and aquifers Emphasis on understanding control and mathematical description of interactions at the solid/liquid interface relevant to movement of agrochemicals heavy metals and organic pollutant chemicals in the environment

Agron 675 Advanced Soil Genesis and Classification (2-0) Cr 2 Alt S offered 2005 *Prereq 575* Fenton Processes reactions and theories in soil formation landscape evolution principles of soil classification

Agron 677 Advanced Soil Physics (2 0) Cr 2 Alt F offered 2004 *Prereq 577 Math 266 267 Recommended Com S 207* Horton The flow and distribution of water chemicals and heat in soils Physical principles and applications

Agron 685 Advanced Soil Biochemistry (Same as Micro 685) (2 0) Cr 2 Alt S offered 2004 *Prereq 585* Tabatabai Chemistry of soil organic matter and biochemical transformations brought about by microorganisms and enzymes in soils

Agron 696 Seminar in Plant Physiology and Molecular Biology (Same as Bot 696) See *Botany*

Agron 698 Agronomy Teaching Practicum Cr 1 to 2 each time taken FS SS *Prereq Graduate classification in agronomy and permission of instructor* Staff Graduate student experience in the agronomy teaching program Offered on a satisfactory fail grading basis only

Agron 699 Research
A Agricultural Meteorology
B Crop Production and Physiology
C Plant Breeding
D Soil Chemistry
E Soil Fertility
F Soil Management
G Soil Microbiology and Biochemistry
H Soil Morphology and Genesis
I Soil Physics
J Plant Physiology
K Seed Science
L Weed Science

Air Force Aerospace Studies

www.iastate.edu/~airforce/

Michael J. Artese, Chair of Department

Professors Artese

Assistant Professors (Adjunct) Barclay

Instructors (Adjunct) Greenfield

Undergraduate Study

The objectives of the Department of Air Force Aerospace Studies are to provide qualified students the opportunity to earn a commission as an officer in the active duty Air Force and to build better citizens for those not interested in joining the Air Force

The curriculum is divided into two basic phases the general military course (GMC) and the professional officer course (POC) The GMC is introductory and consists of four consecutive 1 hour courses normally taken during the freshman and sophomore years GMC completion is not a prerequisite for entry into the POC although it is recommended by the department

Prior to entry into the POC most students complete field training at an Air Force base Students who have completed the GMC participate in a 4-week program which provides a concentrated experience in the Air Force environment The training program includes junior officer training aircraft and aircrew orientation career orientation survival training an introduction to typical base functions and physical training A 5 and 7 week training program is provided for those students entering the POC who did not complete the GMC This program includes all that is offered in the 4 week program plus academic and leadership laboratory experiences included in the on-campus GMC courses

Selection for the professional officer course is on a competitive basis and cadets enrolling in this course must meet certain academic mental physical and moral standards Qualified cadets may be selected as flight candidates and receive flight instruction prior to attending Undergraduate Pilot Training (UPT) Upon enrollment in the POC all cadets are required to

Agron 561 Population and Quantitative Genetics for Breeding (Same as An S 561) (4-0) Cr 4 F *Prereq Stat 401* Jannink Population and quantitative genetics for plant and animal breeding Topics include forces that change gene frequency covariance between relatives response to artificial selection inbreeding depression heterosis cross breeding genotype-by-environment interaction linkage analysis mapping of quantitative trait loci and marker assisted selection

Agron 565 Professional Practice in the Life Sciences (Same as PL P 565) See *Plant Pathology*

Agron 575 Soil Morphology, Genesis and Classification (3 0) Cr 3 Alt F offered 2004 *Prereq 459 473 Geol 100* M Thompson Synthesis of how landscapes water organisms and chemical reactions determine the morphology mineralogy and spatial distribution of soils

Agron 577 Soil Physics (3-0) Cr 3 S *Prereq 354 Recommended Math 166* Horton The physical soil system the soil components and their physical interactions transport processes involving water air and heat

Agron 578 Laboratory Methods in Soil Physics (0 3) Cr 1 S *Prereq 577 concurrent* Horton Methods of measuring soil physical properties such as texture density and water content and transport of heat water and gases

Agron 585 Soil Microbiology and Biochemistry (Same as Micro 585) (2-0 or 2 3) Cr 2 or 3 Alt S offered 2004 *Prereq 485 one course in biochemistry* Loynachan Ecological and environmental consider ations of soil microorganisms organic matter enzymes carbon and other nutrient cycles Laboratory emphasizes creative component

Agron 590 Special Topics Cr arr *Prereq 15 credits in agronomy* Literature reviews and conferences on selected topics in crops soils or agricultural meteorology according to needs and interest of student

Agron 591 Agronomic Systems Analysis (3 0) Cr 3 S *Prereq 511 513 531 532 533* Wiedenhoeft Analysis of cropping systems from a problem solving perspective Case studies will be used to develop the students ability to solve agronomic problems Required course for the Master of Science in Agronomy degree program Restricted to graduate students enrolled in degree programs at Iowa State University

Agron 592 Current Issues in Agronomy (3-0) Cr 3 S *Prereq 501 503 511 512 514* Knapp Study and discussion of topics of current interest to the field of agronomy While Agron 591 deals with agronomics at the farm and landscape level Agron 592 seeks to address issues on a broader scale including off-farm agricultural impacts Required course for the Master of Science in Agronomy degree program Restricted to graduate students enrolled in degree programs at Iowa State University

Agron 593 Workshop in Agronomy Cr arr each time taken *Prereq Graduate classification*
A Crops
B Soils
C Agricultural Meteorology
D Microcomputers in Agronomy
E Seed Science
F Weed Science
G Agronomy Field Laboratory

Agron 594 Workshop in Agronomy (0 1) Cr 1 SS *Prereq 501 502 503 514 (or current enrollment) Recommended 511 512 513* Heuchelin Hands-on field and laboratory experience including integrated pest management climatology soils crops and statistics Required course for the Master of Science in Agronomy degree program Restricted to graduate students enrolled in degree programs at Iowa State University

Agron 599 Creative Component Cr arr *Prereq Nonthesis M S option only* A written report based on research library readings or topics related to the student s area of specialization and approved by the student s advisory committee
A Agricultural Meteorology
B Crop Production and Physiology
C Plant Breeding
D Soil Chemistry
E Soil Fertility
F Soil Management
G Soil Microbiology and Biochemistry
H Soil Morphology and Genesis
I Soil Physics
K Seed Science
L Weed Science
M Agronomy

Courses for Graduate Students

Agron 600 Seminar (1 0) Cr 1 each time taken Reports and discussion of recent literature and research
A Plant Breeding M Lee (F) K Lamkey (S)
B Soils FS Staff
C Crop Production and Physiology FS Staff
600C offered on a satisfactory-fail grading basis only

Agron 609 Agricultural Meteorology Conference (1-0) Cr 1 each time taken FS SS *Prereq Permission of instructor* Staff Literature reviews and conferences with instructor on special problems relating to agricultural meteorology beyond the scope of current courses offered

Agron 616 Advanced Topics in Crop Physiology and Biochemistry (4 0) Cr 4 Alt S offered 2004 *Prereq 516 Bot 511 513 BBMB 404 permission of instructor* Westgate An in depth treatment of physiological biochemical and molecular processes and regulating plant growth and development Emphasis on individual study followed by in-class presentations and discussion

Agron 621 Advanced Plant Breeding (3-0) Cr 3 S *Prereq 521 526 561 Gen 410* Lamkey Estimation and interpretation of genetic effects and variances of plant populations analysis of mating designs heritability estimation intra and interpopulation selection methods prediction of genetic gain inbreeding and heterosis classification and development of parental materials selection indices and combining ability analysis

Agron 625 Genetic Strategies in Plant Breeding (3 0) Cr 3 Alt S offered 2005 *Prereq 521 Gen 410 Bot 545* Lee Evaluation of genetic molecular and cellular approaches to crop improvement gene transfer methods Application and role of basic plant biology in breeding programs and processes genome structure and function gene isolation expression regulation and modification Integration of molecular and cellular methods in breeding strategies analysis of alternative breeding methods regulatory and ethical issues

Agron 629 Colloquium in Plant Breeding and Cytogenetics (1-0) Cr 1 each time taken Alt S offered 2004 *Prereq Gen 410 and permission of instructor* Peterson Presentation of papers and informal discussion of related literature in plant breeding and cytogenetics

Agron 634 Forage Research Methodology (2-0) Cr 2 Alt F offered 2004 *Prereq 434 Stat 402 or equivalent* Staff Research methodology used to evaluate forage production and quality Advanced concepts in the design and analysis of forage experiments

Agron 655 Advanced Soil Fertility (2 0) Cr 2 Alt S offered 2005 *Prereq 553* Blackmer Evaluation of soil fertility and fertilizers theory and applications

Agron 658 Environmental Surface Chemistry (3-0) Cr 3 Alt S offered 2005 *Prereq 559 or 555 Chem 321 and 322* Principles of surface and colloidal chemistry applied to minerals and organic matter in soils sediments and aquifers Emphasis on understanding control and mathematical description of interactions at the solid/liquid interface relevant to movement of agrochemicals heavy metals and organic pollutant chemicals in the environment

Agron 675 Advanced Soil Genesis and Classification (2-0) Cr 2 Alt S offered 2005 *Prereq 575* Fenton Processes reactions and theories in soil formation landscape evolution principles of soil classification

Agron 677 Advanced Soil Physics (2 0) Cr 2 Alt F offered 2004 *Prereq 577 Math 266 267 Recommended Com S 207* Horton The flow and distribution of water chemicals and heat in soils Physical principles and applications

Agron 685 Advanced Soil Biochemistry (Same as Micro 685) (2 0) Cr 2 Alt S offered 2004 *Prereq 585* Tabatabai Chemistry of soil organic matter and biochemical transformations brought about by microorganisms and enzymes in soils

Agron 696 Seminar in Plant Physiology and Molecular Biology (Same as Bot 696) See *Botany*

Agron 698 Agronomy Teaching Practicum Cr 1 to 2 each time taken FS SS *Prereq Graduate classification in agronomy and permission of instructor* Staff Graduate student experience in the agronomy teaching program Offered on a satisfactory fail grading basis only

Agron 699 Research
A Agricultural Meteorology
B Crop Production and Physiology
C Plant Breeding
D Soil Chemistry
E Soil Fertility
F Soil Management
G Soil Microbiology and Biochemistry
H Soil Morphology and Genesis
I Soil Physics
J Plant Physiology
K Seed Science
L Weed Science

Air Force Aerospace Studies

www.iastate.edu/~airforce/

Michael J. Artese, Chair of Department

Professors Artese

Assistant Professors (Adjunct) Barclay

Instructors (Adjunct) Greenfield

Undergraduate Study

The objectives of the Department of Air Force Aerospace Studies are to provide qualified students the opportunity to earn a commission as an officer in the active duty Air Force and to build better citizens for those not interested in joining the Air Force

The curriculum is divided into two basic phases the general military course (GMC) and the professional officer course (POC) The GMC is introductory and consists of four consecutive 1 hour courses normally taken during the freshman and sophomore years GMC completion is not a prerequisite for entry into the POC although it is recommended by the department

Prior to entry into the POC most students complete field training at an Air Force base Students who have completed the GMC participate in a 4-week program which provides a concentrated experience in the Air Force environment The training program includes junior officer training aircraft and aircrew orientation career orientation survival training an introduction to typical base functions and physical training A 5 and 7 week training program is provided for those students entering the POC who did not complete the GMC This program includes all that is offered in the 4 week program plus academic and leadership laboratory experiences included in the on-campus GMC courses

Selection for the professional officer course is on a competitive basis and cadets enrolling in this course must meet certain academic mental physical and moral standards Qualified cadets may be selected as flight candidates and receive flight instruction prior to attending Undergraduate Pilot Training (UPT) Upon enrollment in the POC all cadets are required to

complete a contractual agreement with the Air Force which obligates them to 4 years of active duty as an officer in the United States Air Force Air Force active duty commitment is 10 years for pilots and 6 years for navigators Uniforms and AFROTC texts are supplied to the cadets and those in the POC receive a subsistence allowance between $350 $400 per month

Students who fail to observe the contract terms may be called to active duty in an enlisted grade or be required to repay monies received from the Air Force

Air Force ROTC scholarships are available and provide payment of full tuition and fees In addition Scholarship cadets receive between $250 $400 monthly subsistence allowance and $510 per year book allowance Upon acceptance of a scholarship the student executes a contract with the Air Force Scholarships can be awarded for periods of 2 3 or 4 years with up to 1 additional year for qualified applicants in selected majors To determine eligibility and initiate application procedures for the scholarship program interested students should contact the department

Entry into the program is not dependent on departmental major or year in the university The AFROTC program is open to both male and female students

The College of Liberal Arts and Sciences offers a minor in military studies Requirements for the minor include taking a minimum of 15 credit hours of ROTC instruction which may be taken from one or a number of the ROTC programs At least 6 credit hours must be in courses numbered 300 or above

Courses Primarily for Undergraduate Students

AFAS 101 Leadership Laboratory I (0 2) Cr 1 F Air Force customs and courtesies drill and ceremonies issuing military commands instructing directing and evaluating the preceding skills studying the environment of an Air Force officer and learning about areas of opportunity available to commissioned officers This laboratory is required if taking AFAS 141 and considering application in the POC Leadership Laboratory is open to students who are members of the Reserve Officer Training Corps or are eligible to pursue a commission as determined by the professor of aerospace studies Offered on a satisfactory fail grading basis only

AFAS 102 Leadership Laboratory I (0 2) Cr 1 S Air Force customs and courtesies drill and ceremonies issuing military commands instructing directing and evaluating the preceding skills studying the environment of an Air Force officer and learning about areas of opportunity available to commissioned officers This laboratory is required if taking AFAS 142 and considering application in the POC Leadership Laboratory is open to students who are members of the Reserve Officer Training Corps or are eligible to pursue a commission as determined by the professor of aerospace studies Offered on a satisfactory fail grading basis only

AFAS 141 The United States Air Force Today (1 0) Cr 1 F Survey course designed to introduce cadets to the United States Air Force and Air Force Reserve Officer Training Corps Featured topics include mission and organization of the Air Force officership and professionalism military customs and courtesies Air Force officer opportunities and an introducation to communication skills Leadership Laboratory is mandatory for AFROTC cadets and complements this course by providing cadets with followership experiences

AFAS 142 The United States Air Force Today (1-0) Cr 1 S Survey course designed to introduce cadets to the United States Air Force and Air Force Reserve Officer Training Corps Featured topics include mission and organization of the Air Force officership and professionalism military customs and courtesies Air Force officer opportunities and an introduction to communication skills Leadership Laboratory is mandatory for AFROTC cadets and complements this course by providing cadets with followership experiences

AFAS 201 Leadership Laboratory II (0 2) Cr 1 F Air Force customs and courtesies drill and ceremonies issuing military commands instructing directing and evaluating the preceding skills the environment of an Air Force officer and learning about areas of opportunity available to commissioned officers Continued military training related to wearing the uniform engaging in military customs and courtesies and participating in military ceremonies This laboratory is required if taking AFAS 241 and applying for the POC Leadership Laboratory is open to students who are members of the Reserve Officer Training Corps or are eligible to pursue a commission as determined by the professor of aerospace studies Offered on a satisfactory fail grading basis only

AFAS 202 Leadership Laboratory II (0-2) Cr 1 S Air Force customs and courtesies drill and ceremonies issuing military commands instructing directing and evaluating the preceding skills the environment of an Air Force officer and learning about areas of opportunity available to commissioned officers Continued military training related to wearing the uniform engaging in military customs and courtesies and participating in military ceremonies This laboratory is required if taking AFAS 242 and applying for the POC Leadership Laboratory is open to students who are members of the Reserve Officer Training Corps or are eligible to pursue a commission as determined by the professor of aerospace studies Offered on a satisfactory fail grading basis only

AFAS 241 The Development of Air Power (1 0) Cr 1 F Examines the general aspects of air and space power through a historical perspective Utilizing this perspective the course covers a time period from the first balloons and dirigibles to the space-age global positioning systems of the Persian Gulf War Historical examples are provided to extrapolate the development of Air Force capabilities (competencies) and missions (functions) to demonstrate the evolution of what has become today s USAF air and space power

AFAS 242 The Development of Air Power (1 0) Cr 1 S Examines the general aspects of air and space power through a historical perspective Utilizing this perspective the course covers a time period from the first balloons and dirigibles to the space age global positioning systems of the Persian Gulf War Historical examples are provided to extrapolate the development of Air Force capabilities (competencies) and missions (functions) to demonstrate the evolution of what has become today s USAF air and space power

AFAS 301 Leadership Laboratory III (0 3) Cr 1 F Advanced leadership experiences involving the planning and controlling of the military activities of the AFROTC cadet corps the preparation and presenta tion of briefings and other oral and written communi cations and the providing of interviews guidance and information that will increase the understanding motivation and performance of other cadets This lab is required if taking AFAS 341 and pursuing a commission Leadership Laboratory is open to students who are members of the Reserve Officer Training Corps or are eligible to pursue a commission as determined by the professor of aerospace studies Offered on a satisfactory fail grading basis only

AFAS 302 Leadership Laboratory III (0-3) Cr 1 S Advanced leadership experiences involving the planning and controlling of the military activities of the AFROTC cadet corps the preparation and presenta tion of briefings and other oral and written communi cations and the providing of interviews guidance and information that will increase the understanding motivation and performance of other cadets This lab is required if taking AFAS 342 and pursuing a commission Leadership Laboratory is open to students who are members of the Reserve Officer Training Corps or are eligible to pursue a commission as determined by the professor of aerospace studies Offered on a satisfactory fail grading basis only

AFAS 341 Air Force Management and Leadership (3 0) Cr 3 F A study of leadership management fundamentals professional knowledge Air Force personnel and evaluation systems leadership ethics and the communication skills required of an Air Force junior officer Case studies are used to examine Air Force leadership and management situations as a means of demonstrating and exercising practical application of the concepts being studied

AFAS 342 Air Force Management and Leadership (3 0) Cr 3 S A study of leadership management fundamentals professional knowledge Air Force personnel and evaluation systems leadership ethics and the communication skills required of an Air Force junior officer Case studies are used to examine Air Force leadership and management situations as a means of demonstrating and exercising practical application of the concepts being studied

AFAS 401 Leadership Laboratory IV (0-3) Cr 1 F Advanced leadership experiences involving the planning and controlling of the military activities of the AFROTC cadet corps the preparation and presenta tion of briefings and other oral and written communi cations and the providing of interviews guidance and information that will increase the understanding motivation and performance of other cadets This lab is required if taking AFAS 441 and pursuing a commission Leadership Laboratory is open to students who are members of the Reserve Officer Training Corps or are eligible to pursue a commission as determined by the professor of aerospace studies Offered on a satisfactory fail grading basis only

AFAS 402 Leadership Laboratory IV (0 3) Cr 1 S Advanced leadership experiences involving the planning and controlling of the military activities of the AFROTC cadet corps the preparation and presenta tion of briefings and other oral and written communi-cations and the providing of interviews guidance and information that will increase the understanding motivation and performance of other cadets This lab is required if taking AFAS 442 and pursuing a commission Leadership Laboratory is open to students who are members of the Reserve Officer Training Corps or are eligible to pursue a commission as determined by the professor of aerospace studies Offered on a satisfactory fail grading basis only

AFAS 441 National Security Forces in Contemporary American Society (3 0) Cr 3 F *Prereq 342 or permission of instructor* Examines the national security process regional studies advanced leadership ethics and Air Force doctrine Special topics of interest focus on the military as a profession officership military justice civilian control of the military preparation for active duty and current issues affecting military professionalism Within this structure continued emphasis is given to refining communication skills

AFAS 442 National Security Forces in Contempo rary American Society (3 0) Cr 3 S *Prereq 342 or permission of instructor* Examines the national security process regional studies advanced leadership ethics and Air Force doctrine Special topics of interest focus on the military as a profession officership military justice civilian control of the military preparation for active duty and current issues affecting military professionalism Within this structure continued emphasis is given to refining communication skills

American Indian Studies

(Interdepartmental Undergraduate Minor)

Program Director Sidner Larson

The American Indian Studies Program is a cross-disciplinary program in the College of Liberal Arts and Sciences which offers an opportunity to learn more about the cultural heritage of American Indians their historical relationship with non-Indians and their participation in contemporary American society This program emphasizes perspectives from American Indian Studies anthropology art history literature political science and sociology

The courses in the American Indian Studies Program provide added background for students whose career interests may include multicultural education human services legal services or public administration

Within the College of Liberal Arts and Sciences courses in American Indian studies can be used as electives in a minor or in an interdisciplinary studies major (for details see *Index Interdisciplinary Studies*) Students majoring in another college who wish to use these courses should consult with their advisers

A minor in the College of Liberal Arts and Sciences must include at least 15 credits of courses in the field A minor in American Indian studies must include 210 two courses chosen from among the following 310 322 332 and 346 and two additional courses chosen from the program courses listed below The American Indian Studies Program Committee will upon application by the student and review of the program certify that the student has completed a minor in American Indian Studies

Because course offerings vary from year to year any student interested in a minor in American Indian Studies should contact the American Indian Studies office for advising (See *Index LAS Cross Disciplinary Programs*)

Courses open for nonmajor graduate credit 346

Courses Primarily for Undergraduate Students

Am In 210 Introduction to American Indian Studies (3-0) Cr 3 FS Introduction to the multidisciplinary aspects of American Indian studies Topics include literature the arts history anthropol ogy sociology education and contemporary Indian politics Guest lectures media presentations and discussion of assigned readings

Am In 240 Introduction to American Indian Literature (Same as Engl 240) See *English*

Am In 310 Topics in American Indian Studies (3 0) Cr 3 each time taken maximum of 6 FS Issues within specific topical areas of American Indian society and culture such as social work with Indian families tribal government and environmental policy

Am In 315 Archaeology of North America (Same as Anthr 315) See *Anthropology*

Am In 322 Peoples and Cultures of Native North America (Same as Anthr 322) See *Anthropology*

Am In 323 Peoples and Cultures of Latin America (Same as Anthr 323) See *Anthropology*

Am In 328 American Indian Religions (Same as Relig 328) See *Religious Studies*

Am In 346 American Indian Literature (Same as Engl 346) See *English* Nonmajor graduate credit

Am In 380 North American Indian Art Same as Art H 380) See *Art and Design*

Am In 420 Cultural Continuity and Change on the Prairie Plains (Same as Anthr 420) See *Anthropology*

Am In 432 Current Issues in Native North America (Same as Anthr 432) See *Anthropology*

Am In 490 Independent Study Cr var *Prereq 6 credits in American Indian studies permission of instructor* Designed to meet the needs of students who wish to study in areas other than those in which courses are offered No more than 9 credits in Am In 490 may be counted toward graduation

Courses Offered by Other Departments

Anthr 428 Archaeological Laboratory Methods and Techniques See *Anthropology*

Anthr 429 Archaeological Field School See *Anthropology*

C I 280C Native American Tutoring See *Curriculum Instruction*

Hist 370 History of Iowa See *History*

Hist 465 The American West See *History*

Pol S 312 Minicourse in American Government and Politics See *Political Science* Acceptable only when offered as a course in American Indian tribal government and political theory

Soc 330 Ethnic and Race Relations See *Sociology*

Animal Science

www ans iastate edu/

Susan J Lamont, Chair of Department

Distinguished Professors Anderson Beitz Rothschild Trenkle

University Professors Kenealy Sebranek

Professors Berger Brant Cordray Dekkers Dickson Fernando Harris Hoffman Jurgens Kilmer Lamont Loy Mabry Marple Morrical Nissen Prusa Robson Rouse Russell Scanes Spike Stahly Strohbehn Stromer Tuggle

Professors (Collaborators) Acker Clutter Horst Olson Quigley Reinhardt

Distinguished Professors (Emeritus) Freeman Jacobson Sell Willham

University Professors (Emeritus) Parrish

Professors (Emeritus) Backelsberg Ewan Foreman Haynes Holden Kiser Owings Rust Self Speer Stevermer Topel Voelker Wickersham Wilson Wunder Young Zimmerman Zmolek

Associate Professors Ahn Auwerda Cunnick Faust Honeyman Hulatt Skaar Timms Tyler Youngs

Associate Professors (Collaborators) Goff Nonnecke

Assistant Professors Baas Komar E Lonergan S Lonergan Powers-Schilling Reecy Stahl

Assistant Professors (Adjunct) Amin Ramsey

Assistant Professors (Collaborators) Rasmussen Rathmacher

Undergraduate Study

The Department of Animal Science Undergraduate Program intends for its graduates to be able to detail the symbiotic relationship of animals and humans to solve the complex problems of animal enterprise management and to apply their knowledge and skills in a technically demanding global community To enable learners to pursue a wide array of career interests the department offers learning experiences ranging from the basic to the applied sciences The department s undergraduate degree program has 10 major program goals They are to provide a compre hensive animal science education in (1) science (2) animal management and (3) agri business In addition our program strives to create an environment developing (4) effective communication skills (5) skills enabling students to gather and integrate information to solve problems (6) self learners (7) leaders and team builders and (8) awareness of domestic and global issues driving changes in the animal industries Our program also works to (9) provide career skills appropriate to job market needs and (10) provide superior counseling for fulfilling individual student objectives

Learner outcomes for each of these goals for each of our courses and other information defining the program can be found at our web site www iastate edu/ans/

The department offers the degrees bachelor of science in animal science bachelor of science in dairy science and complementary work toward admission to schools of law medicine and veterinary medicine in either curriculum This may be done while satisfying requirements for the degree bachelor of science in animal science or dairy science (see Index) A combined bachelor of science and master of science in animal science is also offered The department offers a minor in Animal Science The 16-credit minor includes 114 114L 214 214L plus courses from a list maintained in the department Students interested in the minor should contact an Animal Science advisor

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with majors in animal breeding and genetics animal nutrition meat science animal physiology animal science and molecular cellular and developmental biology Minor work is offered in these areas to students taking major work in other departments

A strong undergraduate program is required for those students interested in graduate study Fundamental training in biology chemistry mathematics and statistics is requisite to a satisfactory graduate program Graduate programs in animal science include supporting work in areas such as agronomy anatomy microbiology biochemistry chemistry economics food science and human nutrition genetics physics physiology *and statistics Students may* choose graduate programs involving a co major with one of these areas Graduate work in meat science is offered as a co-major in animal science and food science and human nutrition

The department also cooperates in the interdepart-mental program in professional agriculture and interdepartmental majors in genetics immunobiology MCDB (molecular cellular and developmental biology) and toxicology (see *Index*)

The foreign language requirement if any is established on an individual basis by the program-of-study committee appointed to guide the work of the student

Courses open for nonmajor graduate credit 319 331 333 334 352 353 360 415 419 423 424 425 426 429 434 470 493

Courses Primarily for Undergraduate Students

An S 110 Orientation in Animal Science and ISU (1-0) Cr R F Orientation to the university and Department of Animal Science Challenges and opportunities available to the professional animal agriculturalist Professional goal setting portfolio development and development of interpersonal skills in the context of pursuing a career in animal science

An S 114 Survey of the Animal Industry (2-0) Cr 2 FS SS Ways domestic animals serve the basic needs of humans for food shelter protection fuel and emotional well-being Terminology basic structures of the industries surrounding the production care and marketing of domestic animals in the U S

An S 114L Working with Animals (0-3) Cr 1 FS *Prereq Credit or concurrent enrollment in 114* A hands-on introductory course in skills for proper care and management of domestic animals Husbandry skills including health observation animal movement identification management procedures and environmental assessment are covered

An S 115 Horsemanship and Equitation (0-4) Cr 1 FS SS Beginning intermediate and advanced English equitation and western horsemanship Can be taken for a maximum of three times for credit Offered on a satisfactory fail grading basis only

An S 211 Issues Facing Animal Science (0-2) Cr 1 FS *Prereq 114 sophomore classification* Overview of the factors that define contemporary ethical and scientifically based issues facing animal agriculture Life skill development (including interactive skills communication ability organization information gathering and leadership skills) emphasized in the context of issues study Offered on a satisfactory fail grading basis only

An S 214 Domestic Animal Physiology (3-0) Cr 3 FS *Prereq Biol 201 Chem 163 or 177* Introduction to anatomy and physiology of the neural circulatory respiratory immune endocrine reproductive and digestive systems of domestic animals

An S 214L Domestic Animal Anatomy and Physiology Lab (0-2) Cr 1 FS *Prereq Concurrent enrollment in An S 214* Basic anatomy of domestic animals

An S 216 Equine Science (2 2) Cr 3 F *Prereq Course in biology* Introduction to contemporary concepts and basic practices and decisions necessary when managing horses through stages of their lives

An S 224 Companion Animal Science (2 2) Cr 3 S *Prereq Course in biology* Introduction of students to contemporary concepts and basic practices and decisions necessary when caring for the companion animal through stages of its life

An S 235 Dairy Cattle Performance (1 2) Cr 2 F *Prereq 114* Origin and development of breeds Improvement and expansion programs Comparison of types and performance Influences affecting commercial use and adaptability of types and breeds Marketing of dairy cattle and milk

An S 250 Food Animal Science (2 2) Cr 3 FS *Prereq 114 114L course in biology* Introduction to contemporary practices and decisions necessary when managing beef dairy poultry sheep and swine through stages of their respective production cycles

An S 270 Foods of Animal Origin (2 2) Cr 3 FS *Prereq Biol 201 Chem 163 or 177* Principles practices and issues impacting the production processing and preservation of safe wholesome nutritious and palatable meat dairy and egg products Product evaluation classification value and utilization

An S 305 Livestock Evaluation (0 6) Cr 3 F *Prereq Junior classification 250 270 recommended* Fall semester leads to 475A or D Breeding animal and market animal evaluation of beef swine and sheep using contemporary techniques and tools Communi cation and decision making skills are practiced in the context of making selection decisions

An S 311 Career Preparation in Animal Science (0 2) Cr 1 FS *Prereq Junior classification in An S* Life skill development emphasized in the context of career preparation Assist students with career goal clarification interview skills resume preparation Internship development job shadowing and exploration of career option Offered on a satisfactory fail grading basis only

An S 313 Exercise Physiology of Animals (2 0) Cr 2 S *Prereq 214 Biol 201 one course in chemistry* Interaction of physiological development relative to athletic performance in domestic animals primarily equine performance

An S 316 Training the Horse (0-6) Cr 3 F *Prereq 115 216 and permission of instructor* Modifying the behavior of the horse for performance objectives through bitting longeing saddling and riding

An S 319 Animal Nutrition (2-2) Cr 3 FS SS *Prereq 214 course in organic chemistry or biochemis try* Fundamentals of nutrition Essential nutritive requirements of domestic animals sources of nutrients composition and identification of feeds diet formulation and feeding recommendations Nonmajor graduate credit

An S 320 Livestock Feeding Program Design (0-4) Cr 2 FS *Prereq 319* Advanced diet formulation and feeding recommendations Evaluation of alternate feeding programs and diets in the context of case studies

An S 331 Animal Reproduction (3-0) Cr 3 FS *Prereq Course in physiology* Comparative anatomy physiology and endocrinology of animal reproduction Techniques for the control and manipulation of reproductive processes Nonmajor graduate credit

An S 332 Laboratory Methods in Animal Reproduction (0-4) Cr 2 FS *Prereq Credit or enrollment in 331* Comparative reproductive anatomy with emphasis on the physiology of normal reproductive function ways to control and improve reproduction principles of artificial insemination in farm animals and selected laboratory exercises with written report

An S 333 EmbryoTransfer and RelatedTechnolo gies (2-0) Cr 2 F *Prereq 331 or 332* Application of embryo transfer and related technologies to genetic improvement of mammalian livestock Techniques for control of female reproduction embryo collections and transfer embryo cryopreservation and embryo manipulation Economic and genetic aspects of embryo transfer Nonmajor graduate credit

An S 334 EmbryoTransfer Laboratory (0 3) Cr 1 F *Prereq Credit or concurrent enrollment in 333* Selected laboratory exercises related to embryo transfer such as superovulation embryo evaluation microscopy aseptic techniques in vitro fertilization and embryo manipulation technologies will be demonstrated and/or performed Nonmajor graduate credit

An S 335 Dairy Cattle Selection (0-6) Cr 2 S *Prereq Sophomore classification* Selection of breeding animals for dairy herds Comparative terminology decision making and presentation of oral reasons Trips to dairy cattle farms Livestock handling

An S 336 Livestock Behavior and Well Being (2-2) Cr 3 F *Prereq One course in physiology* Principles of behavior relative to animal care management and environmental design to ensure animal well being Examination of basic neural-endocrine mechanisms involved in the animal s response to its environment

An S 337 Lactation (2-0) Cr 2 S *Prereq 214* The structure development and evolution of the mammary gland Mammary metabolism milk synthesis neural and endocrine regulation of mammary function Immune function and health of the mammary gland

An S 345 Growth Related to Value Based Marketing (2-2) Cr 3 S *Prereq 214 270* Application of principles of growth and development related to value based marketing Postnatal growth and development of fat muscle and bone of food animals Techniques to evaluate carcass composition and value

An S 352 Livestock ImprovementThrough Animal Breeding (2 2) Cr 3 FS SS *Prereq One course in statistics Biol 201 course in genetics* Principles of qualitative and quantitative genetics applied to creating change in domestic animals Impact of selection and mating schemes in achieving breeding program goals Applications and impacts of biotechnological advancements in genetic manipula tion Nonmajor graduate credit

An S 353 Animal Breeding Programs Design (0 4) Cr 2 S *Prereq 352* Evaluation of alternate breeding programs and genetic improvement techniques in the context of case study Experiential and cooperative learning techniques employed Nonmajor graduate credit

An S 360 Fresh Meats (2 2) Cr 3 F *Prereq 270 a course in organic or biochemistry* Impact of muscle structure composition rigor mortis inspection fabrication handling packaging and cooking on the palatability nutritional value yields market value and safety of fresh meat Nonmajor graduate credit

An S 371 Meat for Food Service (1 2) Cr 2 S *Prereq 270 or FS HN 211* Meat and poultry for hotel restaurant and institutional use Structure composi tion cutting preparation selection sanitation portion control cooking and carving

An S 399 Animal Science Internship
A Graded Internship Experience Cr 2 to 6 May be repeated FS SS *Prereq Permission of the instructor* Practical experience related to animal science Creative component
B Supervised Internship Experience Cr **R** May be repeated FS SS *Prereq Permission of internship coordinator* Supervised learning activity consisting of one work period in production agriculture or the agriculture related industry Offered on a satisfactory fail grading basis only

An S 411 Addressing Issues in Animal Science (0 2) Cr 1 FS *Prereq Senior classification in An S* Life skill development emphasized in the context of exploring one s perspective of the most pressing moral and scientific issues facing animal agriculture Clarification and communication of personal conclusions in small and large group settings expected

An S 415 Equine Systems Management (2-2) Cr 3 S *Prereq 216 319 331* Application of advanced horse management techniques Advertising and business management practices Computer-aided management of a commercial horse operation Explore topics of current concern in the horse industry Computer aided study Nonmajor graduate credit

An S 419 Advanced Animal Nutrition (2 0) Cr 2 F *Prereq 214 319* Detailed consideration of digestion metabolism and assimilation of nutrients Recent advances and developments in basic nutrition Nonmajor graduate credit

An S 423 Poultry Systems Management (2-2) Cr 3 F *Prereq 319 331 352* Decisions facing the administrator of a poultry enterprise Financial and production goal identification problem clarification and resource allocation to manage the poultry enterprise Computer aided study Nonmajor graduate credit

An S 424 Companion Animal Systems Manage-ment (2-2) Cr 3 S *Prereq 224 319 331 352* Decisions facing the administrator of a companion animal enterprise Financial and business goal identification problem clarification and resource allocation to manage the companion animal system Nonmajor graduate credit

An S 425 Swine Systems Management (2-2) Cr 3 FS *Prereq 270 319 331 352* Decisions facing the administrator of a swine enterprise Financial and production goal identification problem clarification and resource allocation to manage the swine enterprise Computer aided study Nonmajor graduate credit

An S 426 Beef Cattle Systems Management (2 2) Cr 3 FS *Prereq 270 319 331 352* Decisions facing the administrator of a beef cow-calf or feedlot enterprise Financial and production goal identification problem clarification and resource allocation to manage the beef enterprise Computer aided study Nonmajor graduate credit

An S 429 Sheep Systems Management (2 2) Cr 3 S *Prereq 270 319 331 352* Decisions facing the administrator of a sheep enterprise Financial and production goal identification problem clarification and resource allocation to manage the sheep enterprise Computer aided study Nonmajor graduate credit

An S 434 Dairy Systems Management (2 2) Cr 3 FS *Prereq 235 319 331 337 352* Decisions facing the administrator of a dairy enterprise Financial and production goal identification problem clarification and resource allocation to manage the dairy enterprise Computer aided study Nonmajor graduate credit

An S 440 Computer Applications (2-0) Cr 2 S *Prereq 319 331 352* Introduction to electronic spreadsheets database management computer communications and other approaches to problems in animal science Beginning elements of livestock systems analysis

An S 451 Animal Molecular Biology (Dual listed with 551) (2 3) Cr 3 F *Prereq 352 BBMB 221 or organic chemistry Biol 301* Introduction to use of molecular biology techniques in domestic animal research and production Restriction endonuclease mapping gene mapping gene cloning DNA sequencing and amplification and analysis of genetic differences at the molecular level

An S 470 Processed Meats (2 2) Cr 3 S *Prereq 270* Physical chemical and biological properties of meat important to processed meat product characteristics Ingredients technology and equipment used for cured meats loaf products and fresh cooked dry and semi-dry sausages products Nonmajor graduate credit

An S 475 Intercollegiate Judging Training and Competition A B C E Cr 1 to 5 May be repeated FS D Cr 2 S *Prereq Admission by invitation* Special topics in Animal Science

A Meat Animals
B Dairy Cattle
C Meats
D Meat Animal Evaluation Specialized training in evaluating and grading live animals and carcasses
E Horses

An S 489 Issues in Food Safety (Same as FS HN 489 HRI 489 VDPAM 489) (1-0) Cr 1 Alt S offered 2003 *Prereq Credit or enrollment in FS HN 101 or 272 or HRI 233 FS HN 419 or 420 FS HN 403* Capstone seminar for the food safety minor Case discussions and independent projects about safety issues in the food system from a multidisciplinary perspective

An S 490 Independent Study Cr 1 to 3 FS SS *Prereq Permission of the instructor* A maximum of 6 credits of 490 may be used toward the total of 128 credits required for graduation Open to juniors and seniors in animal science and dairy science showing satisfactory preparation for problems chosen Individual topic conference and preparation of report
A Animal Science
B Dairy Science
C Meat Science
D Senior Seminar
G Poultry Science
H Honors

An S 493 Workshop in Animal Science (Dual listed with 593) Cr 1 to 3 May be repeated Offered as demand warrants *Prereq Permission of instructor* Workshop in livestock production Includes current concepts in breeding nutrition reproduction meats and technologies that impact the animal industry Nonmajor graduate credit

An S 495 Agricultural Travel Course Preparation (0-1) Cr R May be repeated FS *Prereq Permission of instructor* Limited enrollment Students enrolled in this course will also register for Agron 495 and intend to register in Agron 496 and An S 496 the following term Topics will include the agricultural industries climate crops culture history livestock marketing soils and preparation for travel to locations to be visited Information normally available 9 months before departure

An S 496 Agricultural Travel Course Cr arr May be repeated (approx one half credit per week traveled in each An S 496 and Agron 496) *Prereq Permission of instructor 30 college credits* Limited enrollment Students enroll in both An S 496 and Agron 496 Tour and study of production methods in major crop and livestock regions of the world Influence of climate economics geography soils landscapes markets and other factors on livestock and crop production Locations and duration of tours will vary Summer tour will usually visit a northern location and winter tour will usually visit a southern location Information usually available 9 months before departure Tour expenses paid by students
A International tour
B Domestic tour

Courses Primarily for Graduate Students, open to qualified undergraduate students

An S 500 Computer Techniques for Biological Research (2-0) Cr 1 F Introduction to UNIX and SAS for solving research problems including organization of data files transfer of files between workstations developing models and techniques for analysis of designed experiments Introduction to matrix algebra for solving animal breeding problems using MATLAB and computer simulation
A (1st half of semester) UNIX and SAS
B (2nd half of semester) Problem solving using matrix algebra

An S 501 Survey of Animal Disciplines (1-0) Cr 1 F Required for Animal Science graduate students Orientation to departmental and graduate school policies and procedures Discussion of programs of research and outreach in Animal Science Issues impacting the animal industry Offered on a satisfactory fail grading basis only

An S 503 Seminar in Animal Production (1-0) Cr 1 May be repeated F *Prereq Permission of instructor* Discussion and evaluation of current topics in animal production and management

An S 505 Introductory Techniques in Nutrition Experimentation (2 3) Cr 3 Alt S offered 2005 *Prereq Stat 401* Planning execution interpretation and communication of nutrition research

An S 510 Applied Animal Breeding (2 0) Cr 2 Off campus offered as demand warrants *Prereq 352 Stat 493* Principles of animal breeding application to improvement of domestic animals Heritability genetic and phenotypic correlations selection index sire and dam evaluation and breeding program design Designed for master of agriculture program

An S 511 Applied Ruminant Nutrition (2-0) Cr 2 Off campus offered as demand warrants *Prereq 319* Procedures and theories in beef dairy and sheep nutrition Feeding programs and requirements for lactation growth and reproduction Designed for master of agriculture program

An S 512 Applied Non Ruminant Nutrition (2 0) Cr 2 Off campus offered as demand warrants *Prereq 319* Recent developments and application of basic nutritional concepts for swine and poultry production Selected aspects and concepts of computer diet formulation Designed for master of agriculture program

An S 515 Integrated Crop and Livestock Production Systems (Same as A E 515 Agron 515 SusAg 515) (3 0) Cr 3 Alt F offered 2003 *Prereq SusAg 509* Managing productivity and minimizing ecological impacts of agricultural systems by understanding nutrient cycles crop residue and manure management and multispecies interactions Consideration of crop and livestock production with landscapes and watersheds The course includes a significant off campus component with teams analyzing Iowa farms

An S 518 Digestive Physiology and Metabolism of Non Ruminants (3 0) Cr 3 F *Prereq 419* Digestion and metabolism of nutrients Nutritional requirements and current research and feeding programs for poultry and swine

An S 519 Digestive Physiology and Metabolism of Ruminants (2-2) Cr 3 S *Prereq 419* Digestive physiology and nutrient metabolism in ruminant and preruminant animals

An S 533 Physiology and Endocrinology of Animal Reproduction (2 0) Cr 2 Alt S offered 2005 *Prereq General physiology course* Development of structure and function of the reproductive system Physiologic and endocrine aspects including puberty gametogenesis estrous cycle pregnancy parturition interaction of environment thyroid and adrenal function and nutrition with these processes

An S 536 Perinatology (3-0) Cr 3 S *Prereq One course in physiology* Regulation of metabolism and development in the mammalian fetus and neonate will be explored in a comparative manner Emphasis will be on the dynamic changes in these relationships at birth Classes will incorporate maximal student participation and development of critical thinking skills

An S 540 Livestock Immunogenetics (Same as Micro 540 V MPM 540) (2-0) Cr 2 Alt F offered 2003 *Prereq 561 or Micro 575 or V MPM 520* Basic concepts and contemporary topics in genetic regulation of livestock immune response and disease resistance

An S 547 Biological Applications of Microscopy (2 0) Cr 2 Alt S offered 2005 *Prereq 6 credits in biological science permission of instructor* Principles and types of information obtained from light and electron microscopy techniques Photomicrography and photomacrography Demonstrations and structural data analysis with various biosystems

An S 549 Advanced Vertebrate Physiology I (Same as BMS 549) See *Biomedical Sciences*

An S 551 Animal Molecular Biology (Dual listed with 451) (2 3) Cr 3 F *Prereq 352 BBMB 221 or organic chemistry Biol 301* Introduction to use of molecular biology techniques in domestic animal research and production Restriction endonuclease mapping gene mapping gene cloning DNA sequencing and amplification and analysis of genetic differences at the molecular level

An S 552 Advanced Vertebrate Physiology II (Same as BMS 552) (4-0) Cr 4 *Prereq Zool 355 credit or enrollment in BBMS 420 or 404* Cardiovascular renal respiratory and digestive physiology

An S 552L Advanced Vertebrate Physiology Laboratory (Same as BMS 552L) (0 3) Cr 1 *Prereq Credit or enrollment in BMS 552* Laboratory for cardiovascular renal respiratory and digestive physiology

An S 553 Biochemical and Physiological Basis of Nutrition Macronutrients (Same as FS HN 553) (3 0) Cr 3 S *Prereq BBMB 420 or BBMB 404 and credit or enrollment in BBMB 405* Integration of the molecular cellular and physiologic aspects of macronutrient and energy metabolism in mammalian systems Dietary energy carbohydrates fiber lipids proteins nutritional interactions and metabolic consequences

An S 554 Biochemical and Physiological Basis of Nutrition Vitamins and Minerals (Same as FS HN 554) (3-0) Cr 3 F *Prereq BBMB 420 or BBMB 404 and credit or enrollment in BBMB 405* Integration of the molecular cellular and physiologic aspects of vitamin and mineral metabolism in mammalian systems Interactions among nutrients metabolic consequences of deficiencies or excesses relevant polymorphisms and current topics related to micronutrients and non nutrient components

An S 556 Current Topics in Genome Analysis (3 0) Cr 3 Alt S offered 2004 *Prereq Biochem 405 or Gen 510* Introduction to principles and methodology of molecular genetics useful in analyzing and modifying large genomes Survey of statistical methods and computer programs for bioinformatics linkage mapping radiation hybrid mapping and mapping quantitative trait loci

An S 561 Population and Quantitative Genetics for Breeding (Same as Agron 561) (4 0) Cr 4 F *Prereq Stat 401* Population and quantitative genetics for plant and animal breeding Topics include forces that change gene frequency covariance between relatives response to artificial selection inbreeding depression heterosis cross breeding genotype by environment interaction linkage analysis mapping of quantitative trait loci and marker assisted selection

An S 562 Methodologies for Population/ Quantitative Genetics (4 0) Cr 2 S *Prereq 561 Stat 402* Basic theory for genetic analysis of animal breeding data Course A (1st half semester) covers *linear models selection index methods and basic* theory for best linear unbiased prediction Course B (2nd half semester) best linear unbiased prediction including genetic groups environmental adjustment repeated records multiple trait models maternal effects models and theory for maximum likelihood estimation of genetic parameters
A Linear Models and Genetic Prediction
B Advanced Genetic Prediction and Paramater Estimation

An S 565 Professional Practice in the Life Sciences (Same as Pl P 565) See *Plant Pathology*

An S 570 Advanced Meat Science and Applied Muscle Biology (2-2) Cr 3 S *Prereq 470* Ante and postmortem factors impacting composition structure and chemistry of red meat and poultry muscle/meat the conversion of muscle to meat and the sensory and nutritional attributes of fresh meats Oral research reports and a research proposal

An S 571 Advanced Meat Processing Principles and Technology (2 2) Cr 3 F *Prereq 470 or 570* Physical/chemical relationships during processing Effects of modern technology non meat additives and preservation techniques on quality and safety of processed meat Laboratory demonstration of principles and technology

An S 580 Sustainable Agriculture Seminar (Same as A E 580 Ent 580 For 580) (1 0) Cr 1 May be repeated S Issues opportunities and research associated with production systems for sustainable agriculture

An S 590 Special Topics Cr 1 to 3 FS SS *Prereq Permission of instructor* Special topics in the animal sciences offered on demand and may be conducted by guest professors
A Animal Breeding
B Animal Nutrition
C Meat Animal Production
D Dairy Production
E Meat Science
F Physiology of Reproduction
G Muscle Biology
H Poultry Nutrition
I Poultry Products
J Experimental Surgery
K Professional Topics
L Teaching
M Molecular Biology

An S 593 Workshop in Animal Science (Dual listed with 493) Cr 1 to 3 May be repeated Offered as demand warrants *Prereq Permission of instructor* Graduate workshops in animal science and the technologies that impact the animal industry

An S 599 Creative Component Cr 1 8 FS SS Prereq Nonthesis M S A written report based on research library readings or topics related to the student s area of specialization and approved by the student s advisory committee
A Animal Breeding and Genetics
B Animal Nutrition
C Animal Physiology
D Animal Science
E Meat Science

Courses for Graduate Students

An S 603 Seminar in Animal Nutrition (1 0) Cr 1 May be repeated FS *Prereq Permission of instructor* Discussion of current literature preparation and submission of abstracts

An S 618 Advanced Nutrition and Metabolism—Minerals and Vitamins (3 0) Cr 3 Alt F offered 2003 *Prereq BBMB 405* Role of vitamins and minerals in mammalian intermediary metabolism Integration of cellular biochemistry and physiology of vitamins and minerals

An S 619 Advanced Nutrition and Metabolism—Protein (2 0) Cr 2 Alt F offered 2003 *Prereq BBMB 405* Digestion absorption and intermediary metabolism of amino acids and protein Regulation of protein synthesis and degradation Integration of cellular biochemistry and physiology of mammalian protein metabolism

An S 620 Advanced Nutrition and Metabolism—Energy (3 0) Cr 3 Alt S offered 2005 *Prereq BBMB 405* Energy constituents of feedstuffs and energy needs of animals as related to cellular biochemistry and physiology Interpretations of classical and current research

An S 633 Seminar in Animal Reproduction (1 0) Cr 1 May be repeated F *Prereq Permission of instructor* Discussion of current literature and preparation of reports on selected topics concerning physiology of reproduction

An S 652 Animal Breeding Strategies (4 0) Cr 2 S *Prereq 561 562* Basic concepts and methods for design and evaluation of genetic improvement programs for livestock Course A (1st half semester) Prediction of response to selection breeding goals gene flow methods and crossbreeding programs Course B (2nd half semester Alt S offered 2002) Advanced concepts in animal breeding programs modeling response to selection inbreeding optimization and use of molecular and reproductive technologies
A Breeding Goals and Response to Selection
B Design and Evaluation of Animal Breeding Programs

An S 653 Applied Animal Breeding Strategies (2 0) Cr 2 S *Prereq 652* Industrial applications of breeding systems selection methods and new genetic technologies One or more field trips to an industry breeding company to define a class project
A Swine and Poultry (Alt S offered 2005)
B Beef and Dairy (Alt S offered 2004)

An S 655 Advanced Computational Methods in Animal Breeding and Genetics (3 1) Cr 2 Alt F offered 2003 *Prereq 500 562 Com S 207* Computational methods and strategies for analysis of large data sets with animal breeding data for use in research and industry applications Course A (1st half semester) Strategies for handling large sets and for prediction using best linear unbiased prediction using a formal language and utility programs Course B (2nd half semester) Strategies for estimation of genetic parameters and for use of non linear models for genetic analysis of categorical and survival type data
A Computational Strategies for Predicting Breeding Values
B Computational Strategies for Genetic Parameter Estimation

An S 656 Statistical Methods for Mapping Quantitative Trait Loci (2 0) Cr 2 Alt S offered 2004 *Prereq 562 Stat 447* Statistical methods for mapping quantitative trait loci in out bred populations Methods based on modeling covariances between relatives Likelihood based methods using half sib and full sib families and extended pedigees Bayesian methods applied

An S 657 Advanced Methodologies for Population/Quantitative Genetics (3 0) Cr 3 Alt S offered 2005 *Prereq 562* Advanced topics in best linear unbiased prediction and an introduction to nonlinear models and methods for animal breeding This will include the use of Bayesian methods and Markov Chain Monte Carlo techniques for estimation of genetic parameters and prediction of breeding values

An S 658 Seminar in Animal Breeding and Genetics (1 0) Cr 1 May be repeated FS *Prereq Permission of instructor* Discussion of current research recent publications and seminars by visiting scientists

An S 670 Molecular Biology of Muscle (3 0) Cr 3 Alt F offered 2004 *Prereq BBMB 405 420 or 502* Ultrastructure of muscle chemistry structure function and molecular biology of muscle proteins Molecular aspects of muscle contraction development and turnover Cytoskeletal proteins and dynamics

An S 680 Modern Views of Nutrition (Same as FS HN 680) (2-0) Cr R May be repeated S Current concepts in nutrition and related fields Required for all graduate students in nutrition

An S 684 Seminar in Meat Science (1 0) Cr 1 May be repeated S *Prereq Permission of instructor* Discussion and evaluation of current topics in research publications in meat science

An S 685 Seminar in Muscle Biology (1 0) Cr 1 May be repeated S *Prereq Permission of instructor* Reports and discussion of recent literature and current investigations

An S 698 Seminar in Molecular, Cellular and Developmental Biology (Same as MCDB 698) See *Molecular Cellular and Developmental Biology*

An S 699 Research
A Animal Breeding
B Animal Nutrition
C Meat Animal Production
D Dairy Production
E Meat Science
F Physiology of Reproduction
G Muscle Biology
H Poultry Nutrition
I Poultry Products

Anthropology

www public iastate edu/~anthr info/anthropology/ homepage html

Shu Min Huang Chair of Department

Professors Butler Huang Whiteford

Professors (Emeritus) Bower Gradwohl

Associate Professors Coinman

Associate Professors (Collaborators) Lange

Associate Professors (Emeritus) Schuster Wolff

Assistant Professors Ilahiane Kessel Natrajan Pruetz Wagner

Instructors (Adjunct) Johnsen

Undergraduate Study

An undergraduate major in anthropology can serve as the nucleus for a general liberal education or as the prerequisite for graduate training qualifying a person for positions in (1) college and university teaching (2) research and (3) administrative and applied positions in government development organizations museums and private businesses or corporations

Anthropology graduates develop a well rounded professional education in four fields of anthropology cultural anthropology linguistic anthropology archaeology and biological anthropology They learn what it means to be human through the study of culture and social relations human biology and evolution languages music art architecture and through the study of past human communities Graduates learn the important historical and contemporary issues of our subdisciplines and they learn what it means to be a modern anthropologist and a citizen in an international and global community Graduates develop an appreciation of the value of cultural diversity at the local national and international level They acquire a particular holistic vision that requires using a repertoire of methods in order to forge a deeper understanding of cultural contexts both past and present Undergraduate students may obtain experience in archaeological ethnological research and primate behavior and ecology

Anthropology majors may choose either a bachelor of arts or a bachelor of science degree both of which require 33 credits in anthropology A bachelor of arts degree is obtained by fulfilling the college general education requirements plus 6 additional credits in Groups I II and/or IV A bachelor of science degree is obtained by fulfilling the college general education requirements plus 6 additional credits in Group III

Undergraduate students with majors in anthropology are required to take the following anthropology core courses 306 307 308 and 309 One course in statistics is required

Undergraduates majoring in anthropology are required to have a minor or a second major A minor usually consists of 15 credits minimum A minor in anthropology consists of at least 15 credits and must include 306 or 309 and 307 or 308 and at least 6 other credits in courses numbered 300 or above

English proficiency requirement The department requires that a student earn a grade of C or better in Engl 105 and either English 302 or 309 or 314

The principal subdisciplines of anthropology are represented by the following

1 General cultural anthropology and ethnology 201 230 257 306 313 322 323 325 326 333 335 340 411 412 417 418 431 432 434 436 439 442 444 450 490B

2 Archaeology 202 308 315 321 337 414 416 420 428 429 450 471I 490A

3 Linguistic anthropology 309 490D

4 Biological anthropology 202 307 319 424 441 445 490C

Graduate Study

The department offers the degree master of arts with a major in anthropology Graduate courses are offered in the areas of biological anthropology archaeology cultural anthropology linguistic anthropology history and theory and methodology Competence in one foreign language and in statistics must be demonstrated A thesis generally based on original fieldwork is required

Courses open for nonmajor graduate credit 427I

Courses Primarily for Undergraduate Students

Anthr 201 Introduction to Cultural Anthropology (3 0) Cr 3 FS SS Comparative study of culture as key to understanding human behaviors in different societies Using a global cross-cultural perspective patterns of family life economic and political activities religious beliefs and the ways in which cultures change are examined

Anthr 202 Introduction to Biological Anthropology and Archaeology (3 0) Cr 3 FS Human biological and cultural evolution survey of the evidence from fossil forms and archaeology as well as living primates and traditional cultures Introduction to methods of study in archaeology and biological anthropology

Anthr 230 Globalization and the Human Condition (3 0) Cr 3 FS An introduction to understanding key global issues in the contemporary world Focuses on social relations cultural practices and political economic linkages among Africa the Americas Asia Europe and the Pacific

Anthr 257 Introduction to Museums (Same as T C 257) (3 0) Cr 3 F *Prereq Sophomore standing* History and theory of museums Overview of museums in modern society careers in museums and future needs

Anthr 306 Comparative Studies of World Cultures (3 0) Cr 3 S *Prereq 201 recommended* A survey of similarities and differences in the world s major societal types examination of social institutions in hunting and gathering agricultural pastoral and industrial societies techniques of cross-cultural comparison

Anthr 307 Biological Anthropology (2 2) Cr 3 S *Prereq 202* Human evolution as known from fossil evidence comparative primate studies and genetic variations in living populations Laboratory tutorial sessions include study and discussion of human osteology fossil hominids simple Mendelian traits and bio ethics in applied biological anthropology

Anthr 308 Archaeology (2 2) Cr 3 F *Prereq 202* Methods and techniques for the recovery and interpretation of archaeological evidence its role in *reconstructing human behavior and past environments* Laboratory sessions include experience in the interpretation of archaeological evidence the use of classification systems and prehistoric technologies such as ceramics and stone tools Field trips

Anthr 309 Linguistic Anthropology (Same as Ling 309) (2 2) Cr 3 F *Prereq 201 recommended* Language as a human attribute language versus animal communication human communication in cultural context paralanguage kinesics proxemics *artifacts as communication language and culture* cross cultural sociolinguistics ethnoscience and language policies Participatory lab focus on analysis of a non Western language and communication system

Anthr 313 The Family and Kinship in Cross Cultural Perspective (Dual listed with 513) (3-0) Cr 3 S *Prereq 201 recommended* Comparative and historical study of the family and kinship systems in cross cultural perspective discussion of the structure cycle and functioning of family and kinship systems in ethnography including the family in Western culture theoretical issues in contemporary family and kinship studies

Anthr 315 Archaeology of North America (Dual listed with 515 same as Am In 315) (3 0) Cr 3 Alt S offered 2005 *Prereq 308* Prehistory and early history of North America as reconstructed from archaeological evidence peopling of the New World culture-historical sequences of major culture areas linkages of archaeological traditions with selected ethnohistorically known Native American groups

Anthr 319 Skeletal Biology *(Dual listed with 519)* (2 2) Cr 3 Alt F offered 2004 *Prereq Anthr 202 307 or college level biology recommended* Comprehensive study of the skeletal anatomy physiology genetics growth development and population variation of the human skeleton Applications to forensic anthropology paleopathology and bioarchaeology are introduced

Anthr 321 World Prehistory (Dual listed with 521) (3 0) Cr 3 S *Prereq 202 recommended* An introduction to archaeological sites from around the world including the Near East Africa Europe Mesoamerica and North and South America Emphasis is on the interpretation of material cultural remains in reconstructing past societies

Anthr 322 Peoples and Cultures of Native North America (Dual-listed with 522 same as Am In 322) (3 0) Cr 3 FSS *Prereq 201 or Am In 210* Origin distribution and traditional life of native peoples of North America Survey of culture areas ecology and subsistence language kinship life cycle political economic and religious systems impact of European contact

Anthr 323 Peoples and Cultures of Latin America (Dual-listed with 523 same as Am In 323) (3-0) Cr 3 S *Prereq 201 or 306 recommended* Origin and distribution of native populations blending of Old and New World cultures theoretical problems of peasant and tribal societies discussion of economic social political and religious systems processes of change

Anthr 325 Peoples and Cultures of Africa (Dual listed with 525 same as Af Am 325) (3 0) Cr 3 Alt F offered 2005 *Prereq 201 or 306 recommended* Origins and distribution of peoples of Africa geographical characteristics as related to culture types including early civilizations a comparative examination of economic subsistence language social and political organization and religious systems throughout the continent change processes the impact of colonialism and the nature of contemporary African societies

Anthr 326 Peoples and Cultures of East and Southeast Asia (Dual listed with 526) (3 0) Cr 3 Alt F offered 2004 *Prereq 201 or 306 recommended* Origin and development of early civilizations on the western rim of the Pacific including China Japan and mainland and insular Southeast Asia Survey of current issues in ecological historical and ideological contexts

Anthr 333 African American Ethnology *(Dual listed with 533 same as Af Am 333)* (3-0) Cr 3 Alt F offered 2004 *Prereq 201 or 306 recommended* Ethnographic approaches to the study of African Americans in a cross cultural and historical perspective race relations in the Americas

Anthr 335 Peoples and Cultures of the Middle East (3 0) Cr 3 Alt F offered 2004 *Prereq 201 or 306 recommended* Anthropological approaches to the study of Middle East cultures Survey of major culture areas discussion of economic political and social and religious issues and systems Examination of contemporary social movements

Anthr 337 Andean Archaeology (3 0) Cr 3 Alt F offered 2004 *Prereq 202 or 321 recommended* Survey of prehistoric Andean cultures of Peru Bolivia and Ecuador the archaeology of the Incas and their ancestors Emphasis on prehistoric economic religious and political organization the rich material culture recovered through archaeological records and the use of ethnohistoric texts and modern ethnographies to reconstruct the prehistory of Andean societies

Anthr 340 Magic Witchcraft, and Religion (Dual listed with 540 same as Relig 340) (3 0) Cr 3 S *Prereq 201 or 306* Origin and development of indigenous magico religious systems myth and ritual therapeutic aspects symbols and meanings religion and sociocultural change including acculturation nativistic and revitalization movements

Anthr 411 Culture Change and Applied Anthropology *(Dual listed with 511)* (3-0) Cr 3 F *Prereq 201 or 306* Theoretical and practical considerations of human cultural development Examination of theories of cultural change culture contact and acculturation Dynamics of directed change in contemporary world cultures Principles theories and ethics of international development projects from a sociocultural perspective

Anthr 412 Psychological Anthropology (Dual listed with 512) (3-0) Cr 3 Alt F offered 2003 *Prereq 201 or 306 Relationship of cultural social and personality* factors in human behavior Cross-cultural comparisons of child rearing practices cognitive development mental health deviancy ethno-psychiatry altered states of consciousness and psychological dimensions of culture change

Anthr 414 Southwestern Archaeology (Dual listed with 514) (3 0) Cr 3 Alt F offered 2004 *Prereq 202 or 308 or 315 or 321* Prehistory of the American Southwest as reconstructed from archaeological evidence Includes an introduction to the intellectual frameworks of Southwestern archaeology and surveys the Paleoindian and Archaic cultural periods the adoption of agriculture and the emergence of pueblo societies and regional cultures

Anthr 416 Environmental Archaeology (Dual listed with 516) (3 0) Cr 3 Alt S offered 2004 *Prereq 308* Examination of relationships between the biophysical environment and socio-cultural organization in the archaeological record Survey of methods used in environmental sciences by archaeologists to understand the human ecosystem

Anthr 418 Global Culture, Consumption and Modernity (Dual listed with 518) (3-0)Cr 3 Alt F offered 2003 *Prereq Anthr 201 or 306 recommended* Cross cultural study of the impact of globalization with an emphasis on economic consumption and the movement of goods ideas and peoples across cultural and national boundaries

Anthr 420 Cultural Continuity and Change in the Prairie Plains (Dual-listed with 520 same as Am In 420) (3 0) Cr 3 Alt S offered 2004 *Prereq 315 or 322* Ecological adaptations sociocultural changes and continuities of traditions among Prairie and Plains Indian groups through time impacts of Euro-American society and technology on Indians of the Great Plains perspectives from ecology archaeology ethnology history and contemporary literary sources

Anthr 424 Forensic Anthropology (Dual-listed with 524) (3 0) Cr 3 Alt S offered 2004 *Prereq Anthr 307 and 319 recommended* Comprehensive study of forensic anthropology a specialized subfield of biological anthropology Emphasis is placed on personal identifications from extremely fragmentary comingled burnt cremated and incomplete skeletal remains All parameters of forensic study are included as they pertain to anthropology including human variation taphonomy entomology archaeology pathology epidemiology genetics and the non biological forensic disciplines An appreciation for the wide range of medicolegal and bioethical issues will also be gained

Anthr 427I Archaeology (Same as Ia LL 427I) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

Anthr 428 Archaeological Laboratory Methods and Techniques (Dual listed with 528) (3 0) Cr 3 Alt S offered 2005 *Prereq 308* Laboratory processing and analysis of archaeological materials experiments in technologies such as stone tools and ceramics the organization and interpretation of archaeological data Laboratory sessions emphasize the methods and techniques of analyzing and recording various categories of material culture

Anthr 429 Archaeological Field School (Dual listed with 529) Cr 4 or 6 SS 4 or 6 weeks *Prereq 308 permission of instructor* Summer field school for training in archaeological reconnaissance and excavation techniques documentation and interpretation of archaeological evidence

Anthr 432 Current Issues in Native North America (Dual listed with 532 same as Am In 432) (3-0) Cr 3 Alt S offered 2004 *Prereq 201 or 306 322 or Am In 210 recommended* Conditions and issues of contemporary Native Americans historical background of eighteenth and nineteenth century Indian-White relationships examination of legal status the reservation system treaty violations Indian militancy education and urbanization self determination social impact of resource development and other current concerns

Anthr 434 Internship Cr 2-6 FS SS *Prereq Junior or senior standing* Supervised practice in government agencies museums and business organizations Not more than 6 credits of internship experience may count towards the major No credits in Anthr 434 may be used to satisfy Anthropology core courses for majors or for the Anthropology minor Offered on a satisfactory fail grading basis only

Anthr 436 Development Anthropology (Dual listed with 536) (3 0) Cr 3 Alt S offered 2004 *Prereq Anthr 201 or 306* Historical and theoretical basis of the practices of development applied and economic anthropology Covers a wide range of topics such as the role of aid institutions of development indigenous knowledge rural development projects organization of production migration health and environment

Anthr 439 Medical Anthropology (Dual listed with 539) (3 0) Cr 3 Alt S offered 2004 *Prereq 201 or 306* Study of human health in cultural and environmental context comparison of health and disease patterns of western and non western populations healing systems use of epidemiological models in understanding illness and disease etiologies cross culturally interrelationship between diet and culture

Anthr 442 Ecological Anthropology (Dual listed with 542) (3 0) Cr 3 Alt S offered 2005 *Prereq Anthr 201 or 306 recommended* Human interactions with the physical environment Western and non Western theories and methods of natural resource use and management institutional scientific and linguistic views of nature contemporary issues of global significance

Anthr 444 Sex and Gender in Cross cultural Perspective (Dual listed with 544 same as W S 444) (3 0) Cr 3 Alt S offered 2005 *Prereq 201 306 recommended* Cross-cultural examination of the social construction of genders out of the biological fact of sex Emphasis on non western societies Topics presented through examination of ethnographic data will include the range of gender variation status and roles the institution of marriage and symbols of gender valuation

Anthr 445 Biological Field School (Dual listed with 545) Cr 4 or 6 SS 4 or 6 weeks *Prereq Anthr 202 or Biol 109 and permission of instructor* Summer field school for training in behavioral and ecological methods for primatologists Proposal data collection and analyses and presentation of research topic in primatology

Anthr 450 Survey of Historical and Theoretical Approaches in Anthropology (3 0) Cr 3 Alt F offered 2004 *Prereq Senior classification Anthr majors or consent of instructor* Examination of topical and current research directions in the field assessment and preparation for a career in anthropology graduate school and employment opportunities discussed

Anthr 490 Independent Study Cr 1 to 5 each time taken *Prereq 9 credits in anthropology* No more than 9 credits of Anthr 490 may be counted toward graduation
A Archaeology
B Cultural Anthropology
C Biological Anthropology
D Linguistic Anthropology (Same as Ling 490D)
H Honors
I Undergraduate Independent Study (Same as Ia LL 490I)

Courses Primarily for Graduate Students, open to qualified undergraduate students

Anthr 500 Language and Culture (Same as Ling 500) (3-0) Cr 3 Alt S offered 2005 Approaches to the study of the relationship between language structure world view and cognition social and structural linguistic variation cross cultural aspects of verbal and non-verbal communication linguistic change contemporary applications of linguistic anthropology

Anthr 503 Biological Anthropology (3 0) Cr 3 Alt F offered 2003 *Prereq 307* Survey of the history of biological anthropology current developments and theoretical issues in evolution human variation and adaptation population studies primates and primate behavior and paleoanthropology

Anthr 509 Agroecosystems Analysis (Same as Agron 509 Soc 509 SusAg 509) (3-0) Cr 3 F *Prereq 6 credits in social sciences 6 credits in natural biological or engineering sciences and senior or above classification* Salvador Butler Field study of commercial farming systems within the context of global energy flows and biogeochemical cycles including ecological agronomic and social perspectives

Anthr 510 Theoretical Dimensions of Cultural Anthropology (3-0) Cr 3 Alt F offered 2004 *Prereq 6 credits in anthropology* Survey of historical and current developments in topical and theoretical approaches to sociocultural anthropology Examination and assessment of controversies new research directions and theoretical approaches

Anthr 511 Culture Change and Applied Anthropology (Dual listed with 411) (3 0) Cr 3 F *Prereq 6 credits in anthropology 201 or 306* Theoretical and practical considerations of cultural development Examination of theories cultural change culture contact and acculturation Dynamics of directed change in contemporary world cultures Principles theories and ethics of international development projects from a sociocultural perspective

Anthr 512 Psychological Anthropology (Dual-listed with 412) (3-0) Cr 3 Alt F offered 2003 *Prereq 201 or 306* Relationship of cultural social and personality factors in human behavior Cross-cultural comparisons of child rearing practices cognitive development mental health deviancy ethno-psychiatry altered states of consciousness and psychological dimensions of culture change

Anthr 513 The Family and Kinship in Cross Cultural Perspective (Dual listed with 313) (3 0) Cr 3 S *Prereq 6 credits in anthropology 201 recommended* Comparative and historical study of the family and kinship systems in cross-cultural perspective discussion of the structure cycle and functioning of family and kinship systems in ethnography including the family in Western culture theoretical issues in contemporary family and kinship studies

Anthr 514 Southwestern Archaeology (Dual listed with 414) (3 0) Cr 3 Alt F offered 2004 *Prereq 202 or 308 or 315 or 321* Prehistory of the American Southwest as reconstructed from archaeological evidence Includes an introduction to the intellectual frameworks of Southwestern archaeology and surveys the Paleoindian and Archaic cultural periods the adoption of agriculture and the emergence of pueblo societies and regional cultures

Anthr 515 Archaeology of North America (Dual listed with 315) (3 0) Cr 3 Alt S offered 2005 *Prereq 308* Prehistory and early history of North America as reconstructed from archaeological evidence peopling of the New World culture-historical sequences of major culture areas linkages of archaeological traditions with selected ethnohistorically known Native American groups

Anthr 516 Environmental Archaeology (Dual listed with 416) (3-0) Cr 3 Alt S offered 2004 *Prereq 308* Examination of relationships between the biophysical environment and socio cultural organization in the archaeological record Survey of methods used in environmental sciences by archaeologists to understand the human ecosystem

Anthr 518 Global Culture, Consumption and Modernity (Dual-listed with 418) (3 0) Cr 3 Alt F offered 2003 *Prereq Anthr 201 or 306 recommended* Cross cultural study of the impact of globalization with an emphasis on economic consumption and the movement of goods ideas and peoples across cultural and national boundaries

Anthr 519 Skeletal Biology (Dual-listed with 319) (2 2) Cr 3 Alt F offered 2004 *Prereq Anthr 202 307 or college level biology recommended* Comprehensive study of the skeletal anatomy physiology genetics growth development and population variation of the human skeleton Applications to forensic anthropology paeopathology and bioarchaeology are introduced

Anthr 520 Cultural Continuity and Change in the Prairie Plains (Dual listed with 420) (3 0) Cr 3 Alt S offered 2004 *Prereq 315 or 322* Ecological adaptations sociocultural changes and continuities of traditions among Prairie and Plains Indian groups through time impacts of Euro American society and technology on Indians of the Great Plains perspectives from ecology archaeology ethnology history and contemporary literary sources

Anthr 521 World Prehistory (Dual listed with 321) (3 0) Cr 3 S *Prereq 202 recommended* An introduction to archaeological sites from around the world including the Near East Africa Europe Mesoamerica and North and South America Emphasis is on the interpretation of material cultural remains in reconstructing past societies

Anthr 522 Peoples and Cultures of Native North America (Dual listed with 322) (3-0) Cr 3 F SS *Prereq 201 or Am In 210* Origin distribution and traditional life of native peoples of North America Survey of culture areas ecology and subsistence language kinship life cycle political economic and religious systems impact of European contact

Anthr 523 Peoples and Cultures of Latin America (Dual listed with 323) (3 0) Cr 3 S *Prereq 6 credits in anthropology 201 or 306 recommended* Origin and distribution of native populations blending of Old and New World cultures theoretical problems of peasant and tribal societies discussion of economic social political and religious systems processes of change

Anthr 524 Forensic Anthropology (Dual listed with 424) (3 0) Cr 3 Alt S offered 2004 *Prereq Anthr 307 and 319 recommended* Comprehensive study of forensic anthropology a specialized subfield of biological anthropology Emphasis is placed on personal identifications from extremely fragmentary comingled burnt cremated and incomplete skeletal remains All parameters of forensic study are included as they pertain to anthropology including human variation taphonomy entomology archaeology pathology epidemiology genetics and the non biological forensic disciplines An appreciation for the wide range of medicolegal and bioethical issues will also be gained

Anthr 525 Peoples and Cultures of Africa (Dual-listed with 325) (3 0) Cr 3 Alt S offered 2005 *Prereq 201 or 306 recommended* Origins and distribution of peoples of Africa geographical characteristics as related to culture types including early civilizations a comparative examination of economic subsistence language social and political organization and religious systems throughout the continent change processes the impact of colonialism and the nature of contemporary African societies

Anthr 526 Peoples and Cultures of East and Southeast Asia (Dual listed with 326) (3 0) Cr 3 Alt F offered 2004 *Prereq 6 credits in anthropology 201 or 306 recommended* Origin and development of

early civilizations on the western rim of the Pacific including China Japan and mainland and insular Southeast Asia Survey of current issues in ecological historical and ideological contexts

Anthr 528 Archaeological Laboratory Methods and Techniques (Dual listed with 428) (3 0) Cr 3 Alt S offered 2005 *Prereq 308* Laboratory processing and analysis of archaeological materials experiments in technologies such as stone tools and ceramics the organization and interpretation of archaeological data Laboratory sessions emphasize the methods and techniques of analyzing and recording various categories of material culture

Anthr 529 Archaeological Field School (Dual listed with 429) Cr 4 or 6 SS 4 or 6 weeks *Prereq 308 permission of instructor* Summer field school for training in archaeological reconnaissance and excavation techniques documentation and interpreta tion of archaeological evidence

Anthr 530 Ethnographic Field Methods Cr 3 Alt F offered 2004 *Prereq 6 credits in anthropology permission of instructor* Field training experience in ethnography Problems emphasizing field studies in the contemporary societies of the world Focus on techniques of data gathering and analysis

Anthr 532 *Current Issues in Native North America* (Dual listed with 432) (3-0) Cr 3 Alt S offered 2004 *Prereq 6 credits in anthropology 201 or 306 322 or Am In 210 recommended* Conditions and issues of contemporary Native Americans historical background of eighteenth and nineteenth century Indian White relationships examination of legal status the reservation system treaty violations Indian militancy education and urbanization self determination social impact of resource development and other current concerns

Anthr 533 African American Ethnography (Dual listed with 333) (3 0) Cr 3 Alt F offered 2004 *Prereq 6 credits in anthropology 201 or 306 recommended* Ethnographic approaches to the study of African Americans in a cross cultural and historical perspective race relations in the Americas

Anthr 535 Peoples and Cultures of the Middle East (3-0) Cr 3 Alt F offered 2004 *Prereq 201 or 306 recommended* Anthropological approaches to the study of Middle East cultures Survey of major culture areas Discussion of economic political and social and religious issues and systems Examination of contemporary social movements

Anthr 536 Development Anthropology (Dual listed with 436) (3 0) Cr 3 Alt S offered 2004 *Prereq Anthr 201 or 306* Historical and theoretical basis of the practices of development applied and economic anthropology Covers a wide range of topics such as the role of aid institutions of development indigenous knowledge rural development projects organization of production migration health and environment

Anthr 537 Andean Archaeology (3 0) Cr 3 Alt F offered 2004 *Prereq 202 or 321 recommended* Survey of prehistoric Andean cultures of Peru Bolivia and Ecuador the archaeology of the Incas and their ancestors Emphasis on prehistoric economics religious and political organization the rich material culture recovered through archaeological records and the use of ethnohistoric texts and modern ethnogra phies to reconstruct the prehistory of Andean societies

Anthr 539 Medical Anthropology (Dual listed with 439) (3-0) Cr 3 Alt S offered 2004 *Prereq 6 credits in anthropology 201 or 306 recommended* Study of human health in cultural and environmental context comparison of health and disease patterns of western and non western populations healing systems use of epidemiological models in understanding illness and disease etiologies cross-culturally interrelationship between diet and culture

Anthr 540 Magic, Witchcraft and Religion (Dual listed with 340) (3 0) Cr 3 S *Prereq 6 credits in anthropology 201 or 306 recommended* Origin and development of indigenous magico-religious systems myth and ritual therapeutic aspects symbols and meanings religion and socio-cultural change including acculturation nativistic and revitalization movements

Anthr 542 Ecological Anthropology (Dual listed with 442) (3 0) Cr 3 Alt S offered 2005 *Prereq Anthr 201 or 306 recommended* Human interactions with the physical environment Western and non Western theories and methods of natural resource use and management institutional scientific and linguistic views of nature contemporary issues of global significance

Anthr 544 Sex and Gender in Cross cultural Perspective (Dual listed with 444 same as W S 544) (3 0) Cr 3 Alt S offered 2005 *Prereq 201 306 recommended* Cross-cultural examination of the social construction of genders out of the biological fact of sex Emphasis on non western societies Topics presented through examination of ethno graphic data will include the range of gender variation status and roles the institution of marriage and symbols of gender valuation

Anthr 545 Biological Field School (Dual listed with 445) Cr 4 or 6 SS 4 or 6 weeks *Prereq Anthr 202 or Biol 109 and permission of instructor* Summer field school for training in behavioral and ecological methods for primatologists Proposal data collection and analyses and presentation of research topic in primatology

Anthr 555 Seminar in Archaeology (3 0) Cr 3 Alt S offered 2004 *Prereq 308 or 429 permission of instructor* Examination of the history of anthropologi cal archaeology and current issues and debates concerning methods theories and the ethics of modern archaeology

Anthr 590 Special Topics Cr 1 to 5 *Prereq 10 credits in anthropology senior or graduate classifica tion*
I Iowa Lakeside Laboratory (Same as Ia LL 590I)

Courses for Graduate Students

Anthr 610 Society and Technology in Sustainable Food Systems (Same as SusAg 610) See *Sustain able Agriculture*

Anthr 699 Research
I Iowa Lakeside Laboratory (Same as Ia LL 699I)

Architecture

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Calvin F Lewis Chair of Department

Professors Block Engelbrecht Lewis Osterberg Palermo Shao

Professors (Emeritus) Findlay Heemstra Kamlaun Kitzman McKeown Shank Stone

Associate Professors Bassler Becherer Cardinal Pett Chan Horwitz Schwennsen

Associate Professors (Adjunct) Masterson

Assistant Professors Alread Bermann Leslie Maves Muecke Naegele Paxson Robinson Squire Stankard

Undergraduate Study

The undergraduate program in architecture is a five-year curriculum leading to the bachelor of architecture degree The program provides opportunities for general education as well as preparation for professional practice and/or graduate study An optional one semester foreign study program is offered to fourth year students

The undergraduate curriculum includes one year of preprofessional coursework and four years of professional coursework Admission to the profes sional degree program is based on the applicant s performance in the completed preprofessional curriculum previous high school record (or transfer record where applicable) portfolio and essay evaluations and on available departmental resources

Objectives of the Bachelor of Architecture program The Department is committed to the study of architecture as a cultural discipline in which issues of practice of the multiplicity of social formations in which buildings exist and of environmental effect are enfolded with the subject matter of building design construction space material form and use Architecture arises from the aspirations that diverse individuals and groups have for their physical environment and from the social enterprise of designing and fabricating the landscape we inhabit It involves individual and multiple buildings the spaces within them and the exterior landscape

It is our intent that our students develop the skills with which to critically assess and research architectural questions and to invent architectural designs through which those questions are addressed that they develop a working method for designing and that they have the communication graphic modeling and computational skills to support design exploration and to represent their design ideas to others that they gain knowledge of architectural technologies through which buildings are given form of which they are constructed and by which they are environmentally tempered that they understand architectural history that they understand the theoretical and diverse cultural underpinnings of the discipline of architecture that they are able to reference architectural precedents and know how to utilize all of these in the development of their ideas and that they have grounding in the ethical and practical aspects of the architectural profession in society

For students entering the professional program the department highly recommends purchase or lease of a laptop/notebook computer and appropriate software See the *Undergraduate Academic Advising Handbook* in the departmental office or the departmental web pages for hardware and software specifications

For a more complete undergraduate program description see *College of Design Curricula*

Graduate Study

The graduate program in architecture offers opportunities for both professional and post professional study leading to the master of architec-ture and master of science degrees In each of its options the program emphasizes the relationship between professional education and architectural research culminating in a thesis as a demonstration of both professional competence and a deep understand-ing of the discipline of architecture

Objectives of the Graduate Architecture Program Graduate students are asked to pursue architecture as a critical practice Technical artistic theoretical and historical aspects of the discipline are studied in an inventive and interconnected manner with an emphasis on developing a cogent and comprehensive body of architectural knowledge that is rooted in critical thinking Students are expected to learn how to bring their knowledge and critical capacity to bear on the construction of buildings the evaluation of sites materials and assemblies the use of technologies the analysis of cultural issues implicit in architectural work universal and sustainable design and the eventual pursuit of normative or experimental professional practices

The M Arch (100) option is designed for individuals with an undergraduate degree other than architecture Students explore a full range of architectural subjects through seminars an intensive sequence of design studios and thesis One hundred credits are required including 40 graduate credits

The M Arch (60) option is for individuals with a preprofessional undergraduate major in architecture Applicants are given advanced standing in the M Arch (100) option based on a review of their academic record Following the completion of the requisite professional courses the student is expected to develop an individualized course of study leading to the thesis Sixty credits are required including 30 graduate credits

For students entering the professional program the department highly recommends purchase or lease of

a laptop/notebook computer and appropriate software See the Coordinator or the departmental web pages for hardware and software specifications

The M Arch (30) option is a post professional course of study leading to the master of architecture and is designed for individuals a professional degree in architecture The post professional option affords the opportunity for advanced study in architectural theory and design leading to the thesis Thirty graduate credits are required

The graduate program also offers a course of study leading to the degree master of science in architec tural studies This course of study is designed for students without architecture backgrounds and students with previous degrees in architecture wishing to conduct specialized graduate level research in architecture Students work closely with faculty who are engaged in high level research and scholarship Thirty graduate credits are required

Double degree programs are currently offered with the Department of Community and Regional Planning (M Arch /M C R P) and the College of Business (M Arch /M B A)

Financial support in the form of teaching and research assistantships is available

Contact the department office for specific curricula

Courses open for nonmajor graduate credit 420 422 423 424 425 427 434 437 467 471

Courses Primarily for Undergraduate Students

Arch 102 Pre Architecture Design (1 6) Cr 4 FS A studio course focused on three-dimensional design and drawing with emphasis on creative conceptualization exploration of materials and analytical thinking Includes study of architectural precedents and exercises to develop ability to communicate about form and space

Arch 132 Two Dimensional Studio (0-6) Cr 2 FS *Prereq Enrollment in the preprofessional program* Introduction to free hand drawing concepts and practices Course will engage in an exploration of the sketch as a means of inquiry conceptualization and representation of form and space Exercises focus on acquiring proficiency in the perceptual and experiential aspects of drawing Various media subjects and environmental contexts

Arch 182 An Introduction to Architecture (3-0) Cr 3 S *Prereq Open to non majors* Through the study of architects buildings and theories this course is designed to introduce the discipline of architecture presenting architectural process and architectural works as culturally grounded events and artifacts

Arch 201 Architectural Design I (1-15) Cr 6 F *Prereq Completion of the preprofessional program and admission into the professional program* Introduction to architectural design An exploration of fundamental architectural ideas form space meaning through studio projects that focus on human inhabitation of the material environment Introduction to design processes research invention problem solving visualization and communication Opportunities to develop design media skills Special emphasis on materials and methods of building construction

Arch 202 Architectural Design II (1 15) Cr 6 S *Prereq 201* A continuation of 201 Studio projects demand more sophisticated exploration of the relations between ideas and materiality and of the complex cultural interrelations within which we design Further development of design process skills with a special emphasis on the relations between design media and design processes

Arch 221 History of Western Architecture I (Same as Dsn S 221) (3 0) Cr 3 F Introductory survey with emphasis on the cultural visual natural and constructed context Ancient through Renaissance

Arch 222 History of Western Architecture II (Same as Dsn S 222) (3 0) Cr 3 S Introductory survey with emphasis on the cultural visual natural and constructed context Renaissance to present

Arch 230 Design Communications I (0-6) Cr 2 F *Prereq Admission to the professional program* Investigations of various design media including computer graphics and freehand drawing and their applications to design specifically to the course work in 201 Exercises to develop manual skill and perceptual sensitivity

Arch 232 Design Communications II (0-6) Cr 2 S *Prereq 230* Advanced study of various design media including computer graphics and their applications to design specifically to the coursework in 202 Exercises to develop manual skill and perceptual sensitivity

Arch 240 Materials and Assemblies I (3 1) Cr 4 F *Prereq Completion of the preprofessional program and admission into the professional program* Introduction to common architectural materials their physical properties and integration into light construction subsystems Model building codes gravitational and climactic forces and simplified methods of analysis for the preliminary design of building systems

Arch 242 Architectural Structures I (3 1) Cr 4 S *Prereq 240* Structural performance and preliminary design of residential scale wood frame members and systems principles of equilibrium and material behavior

Arch 271 Human Behavior and Environmental Theory (3 0) Cr 3 F *Prereq Completion of the preprofessional program and admission into the professional program* Exploration of theories that describe social structure and order and the manner in which individuals and societies organize themselves and structure their environment

Arch 301 Architectural Design III (1 15) Cr 6 F *Prereq 202* A consideration of landscape as a constructed cultural artifact Projects address the perceptual aspects and strategies of situation and location examination of environmental phenomena and patterns of use and settlement as revealed and affected by the architectural artifact Development of a critical design process is stressed

Arch 302 Architectural Design IV (1-15) Cr 6 S *Prereq 301 and minimum 2 0 GPA in previous studio courses* A continuation of 301 examining housing in the urban situation diverse scales of use and occupation within the city as shaped by cultural tendencies Projects examine collective and individual identities related by the condition of adjacency the ability to consider varieties of scale within a project and a further development of critical and technical methods

Arch 310 Practical Experience Cr R *Prereq Permission of department chair* Students must register for this course prior to commencing each period Available only to students taking course loads of eleven credits or less

Arch 334 Computer Applications in Architecture (2 2) Cr 3 FS SS *Prereq 201 230 and 232* Current and potential applications of digital computers in architecture Projects employing computer graphic methods Awareness of programming languages related to applications

Arch 335 Three Dimensional Studio (Same as ArtIS 335) (0 6) Cr 2 each time taken up to a maximum of 8 credits for 335 and 535 combined FS Investigation of basic sculptural media modeling in clay wood carving stone carving casting in plaster and metal welding and other constructing techniques

Arch 344 Architectural Structures II (2 1) Cr 3 F *Prereq 242* Structural performance and preliminary design of low to medium rise steel frame members and systems long span steel systems and masonry walls and systems Principles of equilibrium and material behavior

Arch 346 Architectural Structures III (2-1) Cr 3 S *Prereq 344* Structural performance and preliminary design of low to medium rise reinforced concrete and prestressed concrete members and systems Wind and seismic lateral forces and the principles of equilibrium and material behavior

Arch 351 Solar Home Design (Same as Dsn S 351) (3 0) Cr 3 S *Prereq 202* Architectural design and technical analysis of residential structures with emphasis on energy construction and solar energy utilization

Arch 357 Environmental Forces in Architecture (3 0) Cr 3 F *Prereq Completion of the preprofessional program and admission into the professional program* Introduction to environmental forces that describe the function of buildings in terms of human comfort and patterns of occupancy Emphasis on analytical rules of thumb and calculation methods that contribute to design synthesis A design process is developed utilizing building climatology control of thermal luminous and acoustic environments

Arch 372 Design Inquiry (3 0) Cr 3 S *Prereq 271* An overview of methods of inquiry in design Different ways of thinking about design and design processes in architecture associating appropriate programming and design activities with project objectives planning and implementing an effective process to meet those objectives

Arch 401 Architectural Design V (1 15) Cr 6 F *Prereq 302* A rigorous examination of architecture s relationship with culture and technology Studio projects stress the interpretation and integration of contextual and historical considerations as well as structural environmental and communication systems in a comprehensive design proposal

Arch 402 Architectural Design VI (1 15) Cr 6 S *Prereq 401 and minimum 2 0 GPA in previous studio courses* An examination of the relationship between architecture and the city Studio projects stress analysis and interpretation of the diverse forces and conditions that impact and inform architecture in the urban environment Urban design project Study abroad option

Arch 403 Architectural Design VII (1 15) Cr 6 F *Prereq 402* Advanced forum for student initiated architectural research and design Experimentation and innovation are encouraged

Arch 404 Architectural Design VIII (1 15) Cr 6 S *Prereq 403 485* Advanced forum for architectural research and/or design Various Option Studios

Arch 420 History of American Architecture (Dual listed with 520) (3 0) Cr 3 S *Prereq Junior classification* A survey of the historical development of American architecture Nonmajor graduate credit

Arch 422 Topics in Medieval Architecture (Dual listed with 522) (3 0) Cr 3 F *Prereq Junior classification* The history theory and principles of medieval architecture and urban design considering relationships to the culture visual arts site and surroundings Nonmajor graduate credit

Arch 423 Topics in Renaissance to Mid Eighteenth Century Architecture (Dual listed with 523) (3 0) Cr 3 S *Prereq Junior classification* The history theory and principles of renaissance to mid eighteenth century architecture and urban design considering relationships to the culture visual arts site and surroundings Nonmajor graduate credit

Arch 424 Topics in Nineteenth Century Architec ture (Dual listed with 524) (3-0) Cr 3 F *Prereq Junior classification* The history theory and principles of nineteenth century architecture and urban design considering relationships to the culture visual arts site and surroundings Nonmajor graduate credit

Arch 425 Topics in Twentieth Century Architecture (Dual listed with 525) (3 0) Cr 3 F *Prereq Junior classification* The history theory and principles of twentieth century architecture and urban design considering relationships to the culture visual arts site and surroundings Nonmajor graduate credit

Arch 427 History Theory, and Criticism of Chinese Architecture (Dual listed with 527) (3-0) Cr 3 F

Prereq Junior classification Survey of the history and theoretical concept of Chinese built environment with emphasis on the morphology of built form and its relation to art landscape design and urban structure Nonmajor graduate credit

Arch 431 Analytical Drawing (1-6) Cr 3 FS *Prereq 232 302* Exploration of 2 and 3 dimensional representations Emphasis on on site freehand sketching perspective and orthographic drawing rendering of shadows and textures and use of diverse media

Arch 434 Computer-aided Architectural and Environmental Design (1-4) Cr 3 S *Prereq 334 Com S 107 or 205* Emphasis on application of the computer as a design tool topical applications and computer graphic methods development of computer software for architectural and environmental problem solving Nonmajor graduate credit

Arch 436 Advanced Design Media (0 9) Cr 3 each time taken to a maximum of 6 credits FSS *Prereq 230 232* Special topics in design media applications

Arch 437 Architectural Photography (3 0) Cr 3 F *Prereq 202* Emphasis on use of the camera and lighting in photographing drawings and interior and exterior building environments Nonmajor graduate credit

Arch 448 Materials and Assemblies II (3 0) Cr 3 S *Prereq 346* Investigation of the materials and integrated systems found in complex construction assemblies Emphasis on determination and utilization of appropriate forms of material assemblies and structural systems for large scale construction

Arch 458 Environmental Control Systems (3 0) Cr 3 S *Prereq 357* Overview of architectural environmental control systems in response to occupant comfort patterns of use health and safety regulations Emphasis on the analytical rules of thumb and calculation methods necessary to provide integrated design synthesis of technical systems within architecture A process is developed to aid in understanding the use and design of mechanical electrical plumbing fire safety transportation and conveying systems and subsystems

Arch 467 Preservation, Restoration, and Rehabilitation (*Same as* Dsn S 467) (3 0) Cr 3 S *Prereq Senior classification* Construction standards and procedures for preserving restoring reconstructing and rehabilitating existing buildings following the guidelines of the National Park Service and the National Trust for Historic Preservation Nonmajor graduate credit

Arch 471 Design for All People (Same as Dsn S 471 Geron 471) (3 0) Cr 3 S *Prereq Senior classification or graduate standing* Principles and procedures of *universal design in response to the varying ability level* of users Assessment and analysis of existing buildings and sites with respect to standards and details of accessibility for all people including visually impaired mentally impaired and mobility restricted users Design is neither a prerequisite nor a required part of the course Enrollment open to students majoring in related disciplines Nonmajor graduate credit

Arch 482 Professional Practice (Dual listed with 582) (3-0) Cr 3 FS *Prereq 202* Emphasis on the circumstances and opportunities of the professional practice of architecture practice as profession process organization business and evolving models of practice

Arch 485 Contemporary Architectural Issues (2-0) Cr 2 F *Prereq Credit or enrollment in Arch 403* Topical lectures readings and seminar presentations regarding contemporary architectural issues in support of Arch 403

Arch 490 Independent Study FS SS Cr 1 to 9 *Prereq Written approval of instructor and department chair on required form* Independent investigation
A Design Communications
B Design
C Technical Systems
D Architectural History
E Behavioral Studies
F Practice
H Honors

Courses Primarily for Graduate Students, open to qualified undergraduate students

Arch 501 Architectural Design and Communication I (1 15) Cr 6 F *Prereq Admission to the M Arch program* Emphasis on architectural design and digital technologies Parallel development of fundamental architectural design and computer aided design capabilities

Arch 502 Architectural Design and Communication II (1 15) Cr 6 S *Prereq 501* Emphasis on architectural design fundamentals and communications Design process and materials for communication consideration of site use expression and construction

Arch 503 Architectural Design and Communication III (1 15) Cr 6 SS *Prereq 502* Architectural design and communication conventions Emphasis on architectural systems and design presentation graphics

Arch 520 History of American Architecture (Dual listed with 420) (3 0) Cr 3 S *Prereq Graduate classification* A survey of the historical development of American architecture

Arch 522 Topics in Medieval Architecture (Dual listed with 422) (3-0) Cr 3 F *Prereq 221 222 and senior classification or graduate standing* The history theory and principles of medieval architecture and urban design considering relationships to the culture visual arts site and surroundings

Arch 523 Topics in Renaissance to Mid eighteenth Century Architecture (Dual listed with 423) (3 0) Cr 3 S *Prereq 221 222 and senior classification or graduate standing* The history theory and principles of renaissance to mid-eighteenth century architecture and urban design considering relationships to the culture visual arts site and surroundings

Arch 524 Topics in Nineteenth Century Architecture (Dual listed with 424) (3 0) Cr 3 F *Prereq 221 222 and senior classification or graduate standing permission of instructor* The history theory and principles of nineteenth century architecture and urban design considering relationships to the culture visual arts site and surroundings

Arch 525 Topics in Twentieth Century Architecture (Dual listed with 425) (3-0) Cr 3 FS *Prereq 221 222 and senior classification or graduate standing* The history theory and principles of twentieth century architecture and urban design considering relationships to the culture visual arts site and surroundings

Arch 527 History, Theory and Criticism of Chinese Architecture (Dual listed with 427) (3 0) Cr 3 F *Prereq Senior classification or graduate standing* The history and theoretical concept of Chinese built environment with emphasis on the morphology of built form and its relationship to art landscape design and urban structure

Arch 528 Topical Studies in History Theory and Criticism of Architecture (Same as Dsn S 528) (2 0 or 3 0) Cr 2 or 3 each time taken FS *Prereq 221 222 or senior classification or graduate standing*
A Pre-Modern
B Modern
C American
D World Architecture
E Architects
F Historic Preservation
G Technical Structural and Programmatic
I Urban Design
J Vernacular Architecture
K Practice

Arch 534 Advanced Computer aided Architectural Design (1-4) Cr 3 each time taken maximum of 6 credits F *Prereq 434 permission of instructor* Emphasis on concepts algorithms data structures and data base development evaluation and development of software for complex data management and applications in architectural design

Arch 535 Advanced Three-Dimensional Studio (0-6) Cr 2 each time taken up to a maximum of 8 credits for 335 and 535 combined FS *Prereq 335 or graduate standing* Advanced investigation of sculptural expression with emphasis on individual projects

Arch 545 Construction Methods (3 0) Cr 3 S *Prereq Senior classification or graduate standing* Advanced studies of construction methods and procedures

Arch 552 Architectural Luminous Environment (3-0) Cr 3 S *Prereq Senior classification or graduate standing* An integrated study of the concepts of lighting natural and artificial lighting visual stimuli comfort discomfort perception and active and passive systems of control Emphasis on daylighting design

Arch 554 Architectural Acoustic Environment (3-0) Cr 3 S *Prereq Senior classification or graduate standing* An integrated study of the concepts of acoustic stimuli noise control room acoustics and sound isolation

Arch 557 Advanced Studies in Building Systems (3 0) Cr 3 S *Prereq Graduate standing* Advanced studies of the integration and development of technical building systems

Arch 558 Appropriate Technologies for Architecture (Same as Dsn S 558) (3 0) Cr 3 F *Prereq Graduate standing* Appropriate uses of technology in building design

Arch 566 Housing for Specific Groups (Same as Geron 566 Dsn S 566) (3-0) Cr 3 S Prereq Senior classification or graduate standing *Principles of* gerontology as related to planning programming designing and evaluating housing environments for elderly residents The continuum of age segregated and age integrated housing options for older people including independent living congregate living shared living continuing care retirement communities and nursing care environments Design is neither a prerequisite nor a required part of the course Open to students in related disciplines with an interest in gerontology and/or housing

Arch 575 Contemporary Urban Design Theory (Same as Dsn S 575) (3-0) Cr 3 S *Prereq Senior classification or graduate standing* Current urban design theory and its application to urban problems

Arch 577 Social Impact of the Built Environment (Same as Dsn S 577) (3-0) Cr 3 S *Prereq Graduate standing* Interdisciplinary review and analysis of social scientific research applied to architectural design

Arch 582 Professional Practice (Dual listed with 482) (3-0) Cr 3 F *Prereq Graduate standing* Emphasis on the circumstances and opportunities of the professional practice of architecture practice as profession process organization business and evolving models of practice

Arch 584 Architectural History and Theory I (3 0) Cr 3 F *Prereq Graduate standing* Pre modern architectural history and theory Interpretations of language form meaning and techniques in relationship to the production of architecture

Arch 586 Architectural History and Theory II (3 0) Cr 3 S *Prereq Graduate standing* Modern and contemporary architectural history and theory Interpretations of language form meaning and techniques in relationship to the production of contemporary architecture

Arch 588 Pre Thesis Seminar (3-0) Cr 3 *Prereq Graduate standing* Procedures and methods for thesis production

Arch 590 Special Topics Cr 1 to 5 each time taken FS SS *Prereq Written approval of instructor and department chair on approved form* Investigation of architectural issues having a specialized nature

Courses for Graduate Students

Arch 601 Advanced Architectural Design I (1 15) Cr 6 F *Prereq Admission into the graduate program* Formal contectual and cultural implications of building in the landscape

Arch 602 Advanced Architectural Design II (1 15) Cr 6 S *Prereq 601* A rigorous examination of architecture s relationship with culture and technology Studio projects stress the interpretation and integration of contextual and historical considerations as well as structural environmental and communica tion systems in a comprehensive design proposal

Arch 603 Advanced Architectural Design III (1 15) Cr 6 each time taken up to a maximum of 12 credits S *Prereq Professional degree in architecture or advanced standing in the graduate program* The design of urban buildings in their cultural context

Arch 690 Independent Design Study (1 15) Cr 6 FS SS *Prereq Admission to MSAS or M ARCH 30 credit program* Independent architectural design projects commensurate with student interests requiring approval of Architecture Graduate Advisory Committee

Arch 699 Thesis (1 18) Cr 3 9 FS SS

Art and Design

Roger E Baer Interim Chair of Department

Professors Dake Fowles Singer Smith Stieglitz Tartakov

Distinguished Professors (Emeritus) Heggen Miller

Professors (Emeritus) Allen Bro Danielson Evans Held Petersen Pickett Sontag

Associate Professors Akkurt Baer Caldwell Croyle Cunnally Curran Fontaine Gibbs Herrnstadt Jones Lilligren Malven Mickelson Stout Warme

Associate Professors (Adjunct) DeMartino Pohlman

Associate Professors (Emeritus) Bruene Lehner McClain Polster Sage Sreenivasam

Assistant Professors Gould Hannigan Harris Iasevoli Kang Katz Martin Muench Paschke Raverty Richards Satterfield Tilden Walton

Assistant Professors (Adjunct) Boehmer Ure

Undergraduate Study

The department offers work for the degrees bachelor of fine arts and bachelor of arts Programs in general studio art and/or art history integrated studio arts (visual communications or studio research emphasis) graphic design and interior design are possible within four curricula art and design—B FA art and design—B A graphic design—B FA and interior design—B FA see *College of Design Curricula* Each of these curricula affords excellent preparation for a variety of career opportunities or a basis for graduate study in art and design disciplines

The curriculum in art and design leading to the B FA provides a studio concentration Students select an emphasis in one of the following areas (1) visual communications (photography papermaking computer aided art and design illustration mixed media) (2) studio research (wood design ceramics jewelry and metals fibers painting printmaking drawing two and three dimensional mixed media) The two concentrations emphasize aesthetics visual problem solving and skill development in a variety of media employing contemporary historical and cultural thinking with visual languages

The curriculum in graphic design leads to the B FA degree Emphasis is on creative problem solving the design process and the visual organization of communication media Graphic design graduates effectively integrate abstract thinking skills communication design theory history and methodology technology design process and communication design systems including typography symbology and image creation with an understanding of professional practice

For students entering the Graphic Design Interior Design or Art IS programs involving computer aided design or animation the department highly recommends purchase or lease of a laptop/notebook computer and appropriate software Contact the department or see the College of Design web site for hardware and software specifications

The curriculum in interior design leads to the B FA degree Emphasis is on the student s application of the design process to creatively solve problems of the interior environment based on a knowledge of techniques materials resources human factors and interrelated professional responsibility Graduates in interior design are competent in visual communication (sketching drafting and computer aided design) design problem solving space planning lighting for interiors finish and furniture selection and detailing interior construction The curriculum is accredited by the Foundation for Interior Design Education Research (FIDER) as providing professional level education

Students working toward the B A in art and design pursue studies in a related or supporting area by means of a second major minor and/or approved program of study that meets the individual needs of a student Art history art education integrated studio arts pre graphic design and pre-interior design courses may be taken to fulfill the art and design program of study

Students planning a career in art education preparing for certification to teach art in grades kindergarten through twelve should matriculate in the art and design curriculum leading to the B FA degree This sequencing will provide a strong studio background Many requirements for teacher certification are course options within general education requirements Students should work closely with a department adviser in planning their program of study to maximize their ability to meet entrance requirements to the teacher education program For general requirements for teacher certification see *College of Education*

Transfer students with studio credits from other colleges and universities must present for department review a portfolio of work done in those courses in order to have the credits apply toward specific studio requirements Students are advised to present this portfolio of work upon admission and prior to registration for classes

A fee will be assessed when field trips are indicated In many courses fees for materials are required

The department offers no minor but participates in the undergraduate minor in design studies

Graduate Study

The department offers work for the degrees master of arts in art and design and master of fine arts in graphic design integrated visual arts and interior design Degree specializations leading to the master of arts degree are available in art education and interior design Graduates have a broad understanding of visual communication problem solving and interdisciplinary studies

Graduate students who have not completed an undergraduate program of study substantially equivalent to that required of undergraduates in the department can expect that additional supporting coursework determined by the graduate faculty will be required

Graduate students in the art education specialization leading to the M A degree participate in a 30 credit program of study which is linked with the New Art Basics research project If they do not hold teacher certification students may work toward acquiring this as part of their graduate study A creative component is required for the master of arts degree and is fulfilled through individually focused discipline specific classroom research culminating in a written summary of research results Graduates with a specialization in art education are competent as reflective teachers experienced in applied qualitative research in the K-12 classroom Graduates gain a deep understanding of the New Art Basics approach to visual thinking skills and global multicultural visual arts education with a learner-centered focus

The master of arts program in interior design requires a minimum of 34 credits including an art and design seminar a studio concentration a history/criticism course elective courses outside the department and completion of a thesis or thesis exhibition Graduates in interior design selecting the M A degree focus on research

The master of fine arts programs in graphic design and interior design require a minimum of 60 credits while the program in integrated visual arts requires a minimum of 61 credits including an art and design seminar a studio concentration history and criticism courses a teaching practicum elective courses outside the department or area of study and the completion of a thesis-exhibition or thesis

The M FA thesis exhibition is composed of two parts a substantial exhibition and a written statement that describes the development of the work in the exhibition its objectives and its historical and cultural points of reference A thesis may be an appropriate alternative but some portion of the work should entail an element of design problem solving in the form of a visual product

Master of Fine Arts graduates in graphic design are skilled in communication design problem solving and are adept in the use of visual language and symbol ogy Graduates are proficient in the design of communications and the use of technologies that incorporate human interaction with environments objects electronic and traditional publications

Interior Design graduate students selecting the M FA are proficient in visual communication skills design theory and space planning The M FA degree is considered a terminal degree in the interior design field

Integrated Visual Arts MFA graduates have skills that link traditional studio disciplines with emerging technologies Graduates are prepared as visual artists to enter studio research business higher education or new interdisciplinary fields The MFA is recognized as the terminal degree

Credit earned at Iowa State University or other institution for the master of arts degree may be applied toward the master of fine arts degree at the discretion of the program of study committee

Applicants to the graduate program should have an undergraduate major in an art or design area and demonstrate the ability to do technically competent and original work through the presentation of a slide portfolio for faculty review Past academic perfor mance and the quality of studio work are critical in the admission process A minimum 3 0 GPA in the student s undergraduate major is the standard for full admission to the graduate program Admission is also determined by studio space available within the program area which changes yearly due to graduate students progress in their programs of study

Prospective students are advised to contact the graduate coordinator with specific questions about admission procedures and portfolio review Application and additional program information may be obtained from the Department of Art and Design College of Design Iowa State University Ames Iowa 50011 3092

Courses open for nonmajor graduate credit ArtGr 387 388 Art H 380 382 383 385 394 481 484 489 495 496 ArtID 355 356 464 465 467 ArtIS 408 420 422 424 430 438 447

Art (Art)

Courses Primarily for Undergraduate Students

Art 108 Visual Foundations I (0 6) Cr 3 FS SS Exploring visual order creative process and interaction of two and three dimensional design Introduction to color

Art 109 Visual Foundations II (0-6) Cr 3 FS SS *Prereq 108* Continued exploration of visual order creative process and interaction of two- and three-dimensional design and color

Art 110 Orientation to Art and Design (1 0) Cr R FS Overview of the department and university with special emphasis on curricula program planning and study skills Advising policy and procedures student services Offered on a satisfactory fail grading basis only

Art 130 Drawing I (1 6) Cr 3 FS SS The introductory course in drawing focusing on the fundamentals of drawing from observation Subject matter may include working from the still life architectural settings landscape and the human figure Line shape perspective and value studies are explored through a variety of drawing media

Art 230 Drawing II (0 6) Cr 3 FS *Prereq 130* A continuation of Art 130 (Drawing I) Further development of perceptual drawing skills from a variety of subject matter Continued practice with drawing materials and techniques with emphasis on tonal and color media

Art 292 Dimensions of Art and Design (Same as Dsn S 292) (3 0) Cr 3 FS The work of the artist and designer through an examination of the design process artistic style and selected art and design forms Cross cultural viewpoints and issues of diversity in relation to the visual arts and design fields Primarily for nonmajors Offered on a satisfactory fail grading basis only

Art 494 Art and Design in Europe Seminar (1-0) Cr 1 *Prereq Permission of instructor and planned enrollment in 495* Cultural and historical aspects of art and design in Western Europe in preparation for study abroad Area of study varies each time offered Offered on a satisfactory fail grading basis only
A Fine Arts
G Graphic Design
I Interior Design
N Art History

Art 495 Art and Design in Europe (Dual-listed with 595) Arr Cr 3 FS SS *Prereq 494 permission of instructor* International study abroad program in western Europe Visits to design studios art museums and educational facilities Related activities depending on specific area of study which may vary each time offered Tour expenses to be paid by the student
A Fine Arts
G Graphic Design
I Interior Design
N Art History

Art 496 Art and Design Field Study Arr Cr R *Prereq Enrollment in an art and design studio or art history course permission of instructor* Study and tours of museums galleries artist and/or designer studios and other areas of interest within art and design Offered on a satisfactory-fail basis May be repeated

Art 497 Studio Internship Arr Cr 1 to 6 each time taken maximum of 6 FS SS *Prereq Advanced classification in a department curriculum* Written approval of supervising instructor and department chair on required form in advance of semester of enrollment Supervised experience with a cooperating artist or studio Offered on a satisfactory fail grading basis only

Art 498 Museum/Gallery Internship Arr Cr 1 to 6 each time taken maximum of 6 FS SS *Prereq Advanced classification in a department curriculum* Written approval of supervising instructor on required form in advance of semester of enrollment Supervised experience with a cooperating museum or gallery or art center Offered on a satisfactory fail grading basis only

Art 499 BFA Seminar and Exhibition Arr Cr 2 S *Prereq Senior classification in the Art and Design BFA curriculum portfolio review and written approval of supervising instructor on required form in advance of semester of enrollment* Participation in a group exhibition Statement of artistic philosophy and career goals resume development assembly of final portfolio of work As the capstone course in the BFA degree program the work in this class will reflect an integration of the media processes historical and theoretical components of each student s individual degree program Students should enroll in this course the spring semester prior to completion of the BFA degree

Courses Primarily for Graduate Students, open to qualified undergraduate students

Art 501 Art and Design Seminar (3-0) Cr 3 FS *Prereq Permission of instructor* Presentation and discussion of basic issues in contemporary art and design

Art 511 Seminar in Teaching (3 0) Cr 3 Alt S offered 2005 *Prereq Graduate classification* Readings and discussion of university level design education issues studio/classroom observation development of a teaching philosophy lesson planning and presentation

Art 595 Art and Design in Europe (Dual-listed with 495) Arr Cr 3 *Prereq Graduate classification 494 or equivalent permission of instructor* International study abroad program in western Europe Visits to design studios art museums and educational facilities Related activities depending on specific area of study which may vary each time offered Tour expenses to be paid by the student
A Fine Arts
G Graphic Design
I Interior Design
N Art History

Art 598 Museum/Gallery Internship Arr Cr 1 to 6 each time taken maximum of 6 FS SS *Prereq Graduate classification and permission of instructor* Written approval in advance of semester of enroll ment Supervised experience with a cooperating museum or gallery or art center Offered on a satisfactory fail grading basis only

Courses for Graduate Students

Art 608 Advanced Computer Aided Art and Design (0 6) Cr 3 *Prereq Permission of the instructor* Computer application applied to specific MFA studio concentration

Art 697 Studio Internship Arr Cr var maximum of 9 FS SS *Prereq Graduate classification and approval of department chair* Supervised off-campus learning experience with a prominent artist designer or firm

Art 698 Current Issues in Art and Design Cr 1 to 3 each time taken maximum of 9 *Prereq Graduate classification* Selected issues in contemporary art and design Topics and readings vary each time offered
D Art and Design
G Graphic Design
I Interior Design
K Interdisciplinary Design

Art 699 Research Cr var
A Thesis
B Thesis exhibition

Art Education (ArtEd)

Courses Primarily for Undergraduate Students

ArtEd 211 Introduction to Art Education (0-6) Cr 3 FS Design art experiences for the K 12 classroom Hands on discipline specific and integrated art activities emphasis on thinking skills

ArtEd 313 Practicum Art Education Arr Cr 1 each time taken maximum of 3 FS *Prereq Credit or enrollment in 211 permission of instructor in advance of semester of enrollment* Field experience in K 12 or community art education program

ArtEd 490 Independent Study Cr 1 to 3 each time taken *Prereq Written approval of instructor and department chair on required form in advance of semester of enrollment* Student must have completed art and/or education coursework appropriate to planned independent study Offered on a graded basis or a satisfactory fail basis
H Honors

Courses Primarily for Graduate Students, open to qualified undergraduate students

ArtEd 513 Introduction to New Art Basics Cr 3 or may be taken for CEU credit SS *Prereq Permission of instructor* Taught in 2 week workshop format and extended instruction and exploration over the World Wide Web Overview of higher order thinking skills instruction for visualization visual thinking metaphoric thinking visual logic and human cultural and historic contexts Design of discipline specific thinking skills strategies Some sections will be taught entirely on the World Wide Web

ArtEd 514 Multicultural Perspectives (3 0) Cr 3 S *Prereq Graduate classification permission of instructor* Understanding the nature roles and functions of the visual arts Designing methodology for effective classroom instruction in human cultural and historical contexts Observation and teaching experience at classroom based research site

ArtEd 515 VisualThinking Skills Education (3 0) Cr 3 F *Prereq Admission to the graduate program in art education* Using theory to inform and direct the design of teaching methodology Effective classroom techniques for promoting visual ideation Experience in applied teaching research at classroom based research site

ArtEd 516 Classroom Research Seminar (3 0) Cr 3 F *Prereq 514 515* Classroom based research theory and practice Review of literature for individual research in visual education Focused graduate research pilot project in K 12 classroom

ArtEd 517 Teaching Practicum Arr Cr 3 to 6 maximum of 6 S *Prereq 516 all courses in the art education program advanced registration required* Supervised experience and individually designed applied research in teaching art in elementary school

ArtEd 518 Teaching Practicum Arr Cr 3 to 6 maximum of 6 S *Prereq 516 all courses in the art education program advanced registration required* Supervised experience and individually designed applied research in teaching art in secondary school

ArtEd 590 Special Topics Cr arr *Prereq Bachelor s degree in art and/or design or evidence of satisfactory equivalency in specialized area* Written approval of instructor and department chair on required form in advance of semester of enrollment

ArtEd 593 Workshop Cr 1 to 3 each time taken SS *Prereq Graduate classification evidence of satisfactory experience in area of specialization* Intensive exploration of art education related topic Topics vary each time offered

ArtEd 599 Creative Component Cr var *Prereq Concurrent enrollment or credit in 517 and/or 518* Individually focused discipline specific applied classroom research Written summary of research exhibition of research results

Graphic Design (ArtGr)

Courses Primarily for Undergraduate Students

ArtGr 177 Introduction to Graphic Design (2 0) Cr 2 S *Prereq Art 108 credit or enrollment in Art 109 130 Dsn S 121* Historical cultural and social issues related to the practice of visual communication

ArtGr 270 Graphic Design Studio I (0-6) Cr 3 F *Prereq Art 109 130 ArtGr 177 Dsn S 121 enrollment in 275 admission to the graphic design program through department review* Basic design concepts and color principles used for visual communication Conceptual and analytical thinking skills through projects and discussions Decision making for effective visual communication

ArtGr 271 Graphic Design Studio II (0-6) Cr 3 S *Prereq Art 230 ArtGr 270 275 enrollment in 276* Principles of typographic composition structure and hierarchy Formal and conceptual principles of symbology

ArtGr 275 GraphicTechnology I (0-4) Cr 2 F *Prereq enrollment in 270* Basic computer skills for graphic design

ArtGr 276 GraphicTechnology II (0 4) Cr 2 S *Prereq 275 enrollment in 271* Basic computer skills for graphic design

ArtGr 277 Graphic Design Internship Seminar (1 0) Cr 1 F *Prereq Credit or enrollment in 270 275* Procedural and ethical concerns related to the graphic design internship Personal goals preparation of résumé and plans for internship Offered on a satisfactory fail grading basis only

ArtGr 370 Graphic Design Studio III (0-6) Cr 3 F *Prereq 271 276 enrollment in a 2 credit option credit or enrollment in 387* Creation and design of images and symbols for communication Application and integration of typography with images and symbols

ArtGr 371 Graphic Design Studio IV (0 6) Cr 3 S *Prereq 370 387 enrollment in a 2-credit option credit or enrollment in 388* Development and preparation of design concepts for application to the printing and electronic publishing process Creative problem solving skills Introduction to systems design

ArtGr 372 Graphic Design Materials and Processes (2 0) Cr 2 S *Prereq Credit or enrollment in 371* Lecture about the processes and materials involved in graphic design arts reproduction Course covers pre press paper selection and specification ink systems type systems and fonts output technology printing presses and bindary operations

ArtGr 378 Critical Issues in Graphic Design (2 0) Cr 2 F *Prereq Credit or enrollment in 370* Lecture discussion and writing about the critical issues facing the communications field today and in the future

ArtGr 387 Graphic Design History/Theory/ Criticism I (Dual listed with 587) (3 0) Cr 3 F *Prereq Art H 280 281 Dsn S 121* Late nineteenth century to the 1960s to provide understanding of the development and character of graphic design Influential forces artists and designers Nonmajor graduate credit

ArtGr 388 Graphic Design History/Theory/ Criticism II (Dual listed with 588) (3 0) Cr 3 S *Prereq 387* Theory and history of contemporary graphic design including designers from the 1960s present Analysis of the way new materials and technology are leading to present design forms Nonmajor graduate credit

ArtGr 470 Graphic Design Studio V (0 6) Cr 3 F *Prereq 371 enrollment in a 2-credit option* Advanced design systems as applied to corporate identity and environmental graphic design Symbology as an integrated component of communication systems

ArtGr 471 Graphic Design Studio VI (0-6) Cr 3 S *Prereq 470 enrollment in a 2 credit option* Exploration of theoretical and conceptual concerns of visual communication

ArtGr 472 Photographic Art Direction (Dual-listed with 572) (0 4) Cr 2 *Prereq 271 276 enrollment in 370 or 371 or 470 or 471* Photography as a graphic design component Compositional and conceptual elements in photographic images Must have a camera with adjustable shutter speeds and lens openings

ArtGr 473 Time Based Multi Media (Dual listed with 573) (0 4) Cr 2 F *Prereq 370* The design of visual aural and written communication for electronic media

ArtGr 474 Exhibition Design (Dual listed with 574) (0-4) Cr 2 *Prereq 271 276* enrollment in 370 or 371 *or 470 or 471* Visual communication applied to exhibition design focusing on educational or interactive museum exhibitions trade show booth design and modular unit design for traveling exhibitions Translation of graphic information to a three-dimensional space

ArtGr 475 AdvancedTypography (Dual listed with 575) (0 4) Cr 2 *Prereq 271 276 enrollment in 370 or 371 or 470 or 471* Typographic theory exploring traditional and nontraditional forms both historical and contemporary typographic achievements

ArtGr 476 Graphic Design Methodology (0-4) Cr 2 *Prereq 271 276 enrollment in 370 or 371 or 470 or 471* Analysis and application of scientific systematic and nontraditional problem solving and problem seeking techniques

ArtGr 477 Graphic Design Practicum (0 6) Cr 2 each time taken maximum of 4 *Prereq 370 portfolio review and permission of instructor* Graphic design outreach and problem solving Individual and group projects for non profit clients selected by the instructor

ArtGr 478 Web Design for E Commerce/Graphic Applications (Dual listed with 578) (0 4) Cr 2 S *Prereq Credit or enrollment in 371* The development of advanced and experimental web design for the applications of e commerce education and the communication of visual information

ArtGr 479 Environmental Graphics (Dual listed with 579) (0-4) Cr 2 *Prereq 271 276 enrollment in 370 or 371 or 470 or 471* Functional and aesthetic implica tions of environmental communication Way finding systems such as transportation graphics architectural signage Environmental graphics for community or corporate identity systems

ArtGr 480 Graphic Design Internship Arr Cr 3 SS *Prereq 277 12 credits in graphic design permission of instructor registration in advance of enrollment* Graphic design experience in an off campus professional environment

ArtGr 481 Graphic Design Professional Practices (3 0) Cr 3 F *Prereq Credit or enrollment in 470* Professional design management ethics setting up a new business client/designer relationships contractual options billing practices and effective operating procedures

ArtGr 482 Professional Presentation (0-4) Cr 2 S *Prereq Credit or enrollment in 471* Required for all students enrolled in 471 Exploration and development of the graphic design portfolio and resume in electronic print and photographic form

ArtGr 484 Selected Studies in Graphic Design Cr 1 to 3 each time taken maximum of 9 *Prereq Permission of instructor* Special issues related to graphic design Topics vary each time offered

ArtGr 490 Independent Study Cr 1 to 6 each time taken *Prereq Written approval of instructor and department chair on required form in advance of semester of enrollment* Student must have completed related graphic design coursework appropriate to planned independent study Offered on a graded basis or a satisfactory fail basis
A Theory Criticism and Methodology
B Two Dimensional Design
C Three Dimensional Design
H Honors
I Internship/Cooperative (in-depth experience other than ArtGr 480 satisfactory fail only)

ArtGr 491 Publication Design Magazines (0-4) Cr 2 F *Prereq Credit or enrollment in 370* The philosophy concepts and structures of magazine design

ArtGr 492 Publication Design Books (0-4) Cr 2 S *Prereq Credit or enrollment in 371* The philosophy concepts and structures of book design

ArtGr 493 Workshop Cr 1 to 3 each time taken *Prereq Evidence of satisfactory experience in area of specialization* Intensive 2 to 4 week studio explora tion Topics vary each time offered

Courses Primarily for Graduate Students, open to qualified undergraduate students

ArtGr 570 Advanced Studies in Visual Communica tion (0 6) Cr 3 F *Prereq Graduate classification* Theory and investigation of systems structures principles of visual organization and typography for communication Studio problems will be influenced by social cultural environmental or technological factors

ArtGr 571 Signs Symbols Images (0-6) Cr 3 S *Prereq 570* Investigation and application of signs symbols and semiotic theory for communication Studio problems will be influenced by social cultural environmental or technological factors

ArtGr 572 Photographic Art Direction (Dual listed with 472) (0 4) Cr 2 *Prereq Graduate enrollment* Photography as a graphic design component Compositional and conceptual elements in photo graphic images Must have a camera with adjustable shutter speeds and lens openings

ArtGr 573 Time Based Multi Media (Dual listed with 473) (0-4) Cr 2 F *Prereq Graduate enrollment* The design of visual aural and written communication for electronic media

ArtGr 574 Exhibition Design (Dual listed with 474) (0-4) Cr 2 *Prereq Graduate enrollment* Visual communication applied to exhibition design focusing on educational or interactive museum exhibitions trade show booth design and modular unit design for traveling exhibitions Translation of graphic information to a three dimensional space

ArtGr 575 AdvancedTypography (Dual listed with 475) (0-4) Cr 2 *Prereq Graduate enrollment* Typographic theory exploring traditional and nontraditional forms both historical and contemporary typographic achievements

ArtGr 578 Design for E-Commerce/Graphic Applications (Dual listed with 478) (0-4) Cr 2 S *Prereq Graduate enrollment* The development of advanced and experimental web design for the applications of e commerce education and the communication of visual information

ArtGr 579 Environmental Graphics (Dual listed with 479) (0-4) Cr 2 *Prereq Graduate enrollment* Functional and aesthetic implications of environmental communications Way finding systems such as transportation graphics architectural signage Environmental graphics for community or corporate identity systems

ArtGr 584 Selected Studies in Graphic Design Cr var *Prereq Graduate classification permission of instructor* Special issues related to graphic design Topics vary each time offered may be repeated

ArtGr 587 Graphic Design History/Theory/ Criticism I (Dual listed with 387) (3 0) Cr 3 F *Prereq Graduate classification permission of instructor* Late nineteenth century to the 1960s to provide understanding of the development and character of graphic design Influential forces artists and designers

ArtGr 588 Graphic Design History/Theory/ Criticism II (Dual listed with 388) (3 0) Cr 3 S *Prereq Graduate classification permission of instructor* Theory and history of contemporary graphic design including designers of the 1960s - present Analysis of the way new materials and technology are leading to present design forms

ArtGr 590 SpecialTopics Cr arr *Prereq Bachelor s degree in graphic design or evidence of satisfactory equivalency in specialized area* Written approval of instructor and department chair on required form in advance of semester of enrollment
A Theory Criticism and Methodology
B Two Dimensional Design
C Three Dimensional Design

ArtGr 591 Publication Design Magazines (Dual listed with 491) (0 4) Cr 2 F *Prereq Graduate enrollment* The philosophy concepts and structures of magazine design

ArtGr 592 Publication Design Books (Dual-listed with 492) (0-4) Cr 2 S *Prereq Graduate enrollment* The philosophy concepts and structures of book design

ArtGr 593 Workshop Cr 1 to 3 each time taken *Prereq Graduate classification evidence of satisfactory experience in area of specialization* Intensive 2 to 4 week studio exploration Topics vary each time offered

Courses for Graduate Students

ArtGr 672 Graphic Design and Human Interaction (0-6) Cr 3 each time taken maximum of 10 FS *Prereq 570 571* Exploration and design of the interface/interaction with products systems and technologies of contemporary society and culture Studio problems may involve such areas as exhibition design electronic interface design wayfinding packaging design and publication design

ArtGr 690 Advanced Topics Cr arr *Prereq MFA classification permission of instructor*

ArtGr 699 Research Cr var
A Thesis
B Thesis Exhibition

Art History (Art H)

Courses Primarily for Undergraduate Students

Art H 181 History of Design (Same as Dsn S 181) (3 0) Cr 3 FS Study of issues and artifacts their relation to the traditional and changing role of the creators and to western european and american culture

Art H 280 History of Art I (Same as Dsn S 280) (3 0) Cr 3 F Development of the visual arts of western civilization including painting sculpture architecture and crafts From prehistoric through Gothic

Art H 281 History of Art II (Same as Dsn S 281) (3 0) Cr 3 S Development of the visual arts of western civilization including painting sculpture architecture and crafts From the Renaissance to the twentieth century

Art H 380 North American Indian Art (Dual listed with 580 same as Am In 380 Dsn S 380) (3 0) Cr 3 Visual art forms of North American Indian people from prehistoric through contemporary Survey of major cultural areas and individual artist emphasis on the cultural context of their artistic production Nonmajor graduate credit

Art H 382 Art and Architecture of Asia (Dual-listed with 582 same as Dsn S 382) (3 0) Cr 3 Alt S offered 2004 A selective history of visual imagery from a variety of major Asian traditions chiefly India China Japan Sri Lanka Cambodia and Indonesia Nonmajor graduate credit

Art H 383 Greek and Roman Art (Dual-listed with 583 same as Dsn S 383) (3 0) Cr 3 Alt S offered 2005 Greek art from Neolithic and Hellenistic periods Roman art from the traditional founding to the end of the empire in the West Nonmajor graduate credit

Art H 385 Renaissance Art (Dual listed with 585 same as Dsn S 385) (3 0) Cr 3 Alt S offered 2004 European art including painting sculpture architec ture and crafts thirteenth through sixteenth centuries Nonmajor graduate credit

Art H 394 Women in Art (Dual listed with 594 same as Dsn S 394 W S 394) (3 0) Cr 3 Alt S offered 2005 Lives careers and achievements of women artists and the related cultural environment from the Middle Ages to contemporary times in Europe and America Feminist movement beginning in the 1970s and specifically feminist issues in art that are becoming widespread in the artistic culture Nonmajor graduate credit

Art H 481 Art and Architecture of India (Dual listed with 581 same as Dsn S 481) (3 0) Cr 3 Alt F offered 2003 South Asian art and architecture from earliest times to the present day Development of style social uses and symbolism that give imagery its meaning Nonmajor graduate credit

Art H 484 Traditional Indian Culture (Dual listed with Art H 584) (3-0) Cr 3 SS *Prereq Permission of instructor* Historical survey of traditional cultures of India Study abroad course taught in Kamataka India with travel to various sites Tour expenses to be paid by student

Art H 487 Nineteenth Century Art (Dual listed with 587 same as Dsn S 487) (3 0) Cr 3 Alt S offered 2004 European and American art and architecture from 1780 to 1900 focusing on the major monuments of western Europe Neo Classicism Romanticism Realism Impressionism and Post Impressionism Nonmajor graduate credit

Art H 488 Modernism and Modern Art 1880 1945 (Dual listed with 588 same as Dsn S 488) (3 0) Cr 3 F Painting sculpture crafts architecture photography and cinema from Post Impressionism to Surrealism Nonmajor graduate credit

Art H 490 Independent Study Cr 1 to 6 each time taken *Prereq Written approval of instructor and department chair on required form in advance of semester of enrollment* Student must have completed art history coursework appropriate to planned independent study Offered on a graded basis or a satisfactory-fail basis
H Honors

Art H 495 Art and Theory Since 1945 (Dual listed with 595 same as Dsn S 495) (3 0) Cr 3 Visual arts and critical theory from 1945 to the present Nonmajor graduate credit

Art H 496 History of Photography (Dual listed with 596 same as Dsn S 496) (3 0) Cr 3 F Survey of the evolution of photography and photojournalism from the 1830s to the present seen from an art historical perspective emphasizing causative factors cultural influences and major masters and schools Nonmajor graduate credit

Art H 498 Selected Topics in Art History (Dual listed with 598 same as Dsn S 498) (3 0) Cr 3 each time taken maximum of 9 Specialized study in the history or criticism of art and/or design

Courses Primarily for Graduate Students, open to qualified undergraduate students

Art H 580 North American Indian Art (Dual listed with 380 same as Dsn S 580) (3 0) Cr 3 *Prereq Graduate classification permission of instructor* Visual art forms of North American Indian people from prehistoric through contemporary Survey of major cultural areas and individual artists emphasis on the cultural context of their artistic production

Art H 581 Art and Architecture of India (Dual listed with 481 same as Dsn S 581) (3 0) Cr 3 Alt F offered 2003 *Prereq Graduate classification permission of instructor* South Asian art and architecture from earliest times to the present day Development of style social uses and symbolism that give imagery its meaning

Art H 582 Art and Architecture of Asia (Dual listed with 382 same as Dsn S 582) (3-0) Cr 3 Alt S offered 2004 *Prereq Graduate classification permission of instructor* Selective history of visual imagery from a variety of major Asian traditions chiefly India China Japan Sri Lanka Cambodia and Indonesia

Art H 583 Greek and Roman Art (Dual listed with 383 same as Dsn S 583) (3 0) Cr 3 Alt S offered 2005 *Prereq Graduate classification permission of instructor* Greek art from Neolithic and Hellenistic periods Roman art from the traditional founding to the end of the empire in the West

Art H 584 Traditional Indian Culture (Dual listed with Art H 484) (3 0) Cr 3 SS *Prereq Graduate classification permission of instructor* Historical survey of traditional cultures of India Study abroad course taught in Kamataka India with travel to various sites Tour expenses to be paid by student

Art H 585 Renaissance Art (Dual listed with 385 *same as Dsn S 585) (3 0) Cr 3 Alt S offered 2004 Prereq Graduate classification permission of instructor* European art including painting sculpture architecture and crafts thirteenth through sixteenth centuries

Art H 587 Nineteenth Century Art (Dual listed with 487 same as Dsn S 587) (3 0) Cr 3 Alt S offered 2004 *Prereq Graduate classification permission of instructor* European and American art and architecture from 1780 to 1900 focusing on the major monuments of western Europe Neo Classicism Romanticism Realism Impressionism and Post-Impressionism

Art H 588 Modernism and Modern Art 1880-1945 (Dual-listed with 488 same as Dsn S 588) (3-0) Cr 3 F *Prereq Graduate classification permission of instructor* Painting sculpture crafts architecture photography and cinema from Post Impressionism to Surrealism

Art H 590 Special Topics Cr arr *Prereq Bachelor s degree in art and/or design or evidence of satisfactory equivalency in specialized area* Written approval of instructor and department chair on required form in advance of semester of enrollment

Art H 594 Women in Art (Dual listed with 394 same as Dsn S 594 W S 594) (3 0) Cr 3 Alt S offered 2005 *Prereq Graduate classification permission of instructor* Lives careers and achievements of women artists and the related cultural environment from the Middle Ages to contemporary times in Europe and America Feminist movement beginning in the 1970s and specifically feminist issues in art that are becoming widespread in the artistic culture

Art H 595 Art and Theory Since 1945 (Dual listed with 495 same as Dsn S 595) (3 0) Cr 3 *Prereq Graduate classification permission of instructor* Visual arts and critical theory from 1945 to the present

Art H 596 History of Photography (Dual listed with 496 same as Dsn S 596) (3 0) Cr 3 F *Prereq Graduate classification permission of instructor* Survey of the evolution of photography and photojournalism from the 1830s to the present seen from an art historical perspective emphasizing causative factors cultural influences and major masters and schools

Art H 598 Selected Topics in Art History (Dual listed with 498 same as Dsn S 598) (3 0) Cr 3 each time taken maximum of 9 *Prereq Graduate classification permission of instructor* Specialized study in the history or criticism of art and/or design

Integrated Studio Arts (ArtIS)

Courses Primarily for Undergraduate Students

ArtIS 208 Color (0-6) Cr 3 FS *Prereq Art 108 or 130 or equivalent design/drawing coursework* The impact of changing visual relationships emphasizing color concepts Pigment mixing and interaction exercises using various color systems

ArtIS 220 Wood Design I (0 6) Cr 3 FS *Prereq Art 109 230* Use of wood as a design medium Creating sculptural forms in wood through the use of hand tools and techniques

ArtIS 222 Ceramics I (0-6) Cr 3 FS *Prereq Art 109 130* Visual problem solving through ceramic processes and concepts Techniques introduced handbuilding wheel throwing glazing and firing

ArtIS 224 Jewelry/Metalsmithing I (0-6) Cr 3 FS *Prereq Art109 and 130 or equivalent or permission of professor* Design of jewelry and metal objects using basic fabrication techniques and hand processes including silver soldering cold joinery

ArtIS 229 Photography I (0-6) Cr 3 FS Photogra phy as a medium of design expression and communication Camera techniques and black and white lab processing taught Digital and alternative processes explored 35 mm camera with manual exposure controls is required

ArtIS 233 Watercolor Painting (0-6) Cr 3 FS *Prereq Art 230* Painting using waterbased media

ArtIS 238 Painting I (0-6) Cr 3 FS *Prereq Art 230* Painting using acrylic and/or oil media

ArtIS 301 Foundations of Visual Literacy (arranged) Cr 3 FS *Prereq Art 109 130* Exploration through the World Wide Web of the nature of visual perception in

relation to issues of visual communication and problem solving envisioning information scientific visualization and visual thinking Studio assignments to be digitized and sent to instructor electronically for evaluation and critique

ArtIS 305 Mixed Media (Dual listed with 505) (0-6) Cr 3 each time taken maximum of 6 FS *Prereq 12 credits in design and/or drawing including Art 109 130* Exploration and application of various materials techniques and ideas

ArtIS 308 Modeling Rendering and Virtual Photography (0 6) Cr 3 FS *Prereq Art 230* Introduction to 3D modeling using computer and available software Modeling texturing lighting and rendering with respect to still scene creation and virtual photography will be emphasized

ArtIS 310 Sources of Visual Design (0-6) Cr 3 FS *Prereq Art 109 230* Studio exercises to develop awareness of external and internal sources for design

ArtIS 320 Wood Design II (0 6) Cr 3 each time taken maximum of 6 FS *Prereq 220* Design and fabrication of basic furniture forms with the use of visual problem solving Introduction to power tools Advanced hand and machine joinery

ArtIS 322 Ceramics II (0-6) Cr 3 FS *Prereq 222* Further investigation of concepts and techniques in ceramics Introduction to glaze research and kiln firing

ArtIS 324 Jewelry/Metalsmithing II (0 6) Cr 3 FS *Prereq 224* Design of jewelry and hollow forms using traditional and contemporary techniques Introduction to lost wax casting

ArtIS 325 Craft Design Seminar (2 0) Cr 2 Alt F offered 2005 *Prereq 3 credits in craft design* Contemporary issues in craft design through lectures presentations and field trips

ArtIS 326 Introduction to Illustration (Same as BPM I 326) (0 6) Cr 3 F *Prereq 238* Application of painting drawing and image making techniques to communication Development of technical facilities in a variety of illustration media The past and current state of illustration and the role of typography and its integration with illustration Digital and print production techniques

ArtIS 327 Illustration as Communication and Interpretive Expression (Same as BPM I 327) (0 6) Cr 3 S *Prereq 326* Studio problems in illustration covering editorial advertising and narrative expression Problem solving methodologies

ArtIS 329 Photography II (0-6) Cr 3 each time taken maximum of 6 FS *Prereq 229* Continuation and expansion of concepts and processes Thematic conceptual and historic aspects emphasized

ArtIS 330 Drawing III Life Drawing (0 6) Cr 3 each time taken maximum of 9 FS *Prereq Art 230* Drawing from the human figure

ArtIS 335 Three Dimensional Studio (Same as Arch 335) (0-6) Cr 2 each time taken maximum of 8 FS Sculptural media modeling in clay wood carving stone carving casting in plaster and metal welding and other constructing techniques

ArtIS 336 Biological Illustration Principles and Techniques (Same as BPM I 336) (0-6) Cr 3 each time taken maximum of 6 F *Prereq 6 credits in art and design and 3 credits in the biological sciences* Studio basics and fundamentals of traditional biological rendering techniques Emphasis on tools and materials

ArtIS 337 Application of Biological Illustration Techniques (Same as BPM I 337) (0-3) Cr 3 each time taken maximum of 6 S *Prereq 336* Rendering techniques applied to different types of biological subject matter including computer and airbrush applications Term project required

ArtIS 338 Painting II (0-6) Cr 3 FS *Prereq 238* Painting using acrylic and/or oil media composition and expression

ArtIS 343 Fiber Forms (0-6) Cr 3 FS *Prereq Art 109 and 130 or equivalent or permission of professor* Three-dimensional contemporary fiber construction Visual problem solving and conceptual idea development using processes and techniques such as knotting wrapping plaiting netting feltmaking sculptural fabric manipulation and basketry

ArtIS 344 Weaving (0 6) Cr 3 *Prereq Art 109 and 130 or equivalent or permission of professor* Color and pattern development through interlocking yarns Floor loom and frame loom fabric construction

ArtIS 345 Fiber and Fabric Design (0-6) Cr 3 F *Prereq Art 109 and 130 or equivalent or permission of professor* Shaped patterned manipulated and embellished textiles using contemporary and traditional yarn thread and cloth techniques

ArtIS 346 Resist and Dyed Fabric Design (0 6) Cr 3 F *Prereq Art 109 and 130 or equivalent or permission of professor* Two- and three dimensional problems in visual imagery using dye and resist processes

ArtIS 347 Printed Fabric Design (0 6) Cr 3 FS *Prereq Art 109 and 130 or equivalent or permission of professor* Repeat pattern and overlapping transparent colors for fabric design using screenprinting and direct application of pigments

ArtIS 356 Relief Printmaking (Dual listed with 556) (0 6) Cr 3 each time taken maximum of 9 F *Prereq Art 230* Woodcut and linoleum cut printmaking processes in black and white multiblock color and reduction color printing Collographs and forms of relief printmaking used separately and in combination with woodcuts

ArtIS 357 Monotype (Dual listed with 557) (0 6) Cr 3 each time taken maximum of 9 F *Prereq 238* Monoprint and monotype processes black and white and color techniques Basic knowledge production procedures and drawing skills experimentation

ArtIS 358 Lithography (Dual listed with 558) (0-6) Cr 3 each time taken maximum of 9 F *Prereq Art 230* Planographic printmaking process theory and practice Studio procedures drawing and printing skills applied to metal plate lithography

ArtIS 359 Intaglio (Dual listed with 559) (0 6) Cr 3 each time taken maximum of 9 S *Prereq Art 230* Intaglio printmaking processes Basic knowledge and production procedures drawing and printing skills

ArtIS 408 Principles of Computer Aided Animation (0 6) Cr 3 each time taken maximum of 9 FS *Prereq ArtIS 308 or permission of instructor* Animation techniques using the computer and available software Principles of animation Student s prior knowledge of modeling lighting texturing and rendering with computer and available software is assumed Nonmajor graduate credit

ArtIS 420 Wood Design III (Dual listed with 520) (0-6) Cr 3 each time taken maximum of 12 FS *Prereq 320* Independent design and creation of furniture forms Research and development of furniture forms utilizing innovative processes Nonmajor graduate credit

ArtIS 422 Ceramics III (Dual listed with 522) (0 6) Cr 3 each time taken maximum of 12 FS *Prereq 322* Forms and surfaces historical research Personal directions in advanced ceramic processes and concepts Nonmajor graduate credit

ArtIS 424 Jewelry/Metalsmithing III (Dual listed with 524) (0 6) Cr 3 each time taken maximum of 12 FS *Prereq 324* Design of jewelry and hollow forms using traditional and contemporary methods tools and materials Introduction to forming/raising Nonmajor graduate credit

ArtIS 430 Drawing IV (Dual-listed with 530) (0 6) Cr 3 each time taken maximum of 9 FS *Prereq Art 330* Figurative and/or non figurative drawing with advanced work in media composition and theory Nonmajor graduate credit

ArtIS 438 Painting III (Dual listed with 538) (0-6) Cr 3 each time taken maximum of 9 FS *Prereq 338* Figurative and/or non figurative painting with advanced work in media composition and theory Nonmajor graduate credit

ArtIS 447 Fiber/Fabric Studio Problems (Dual-listed with 547) (0 6) Cr 3 each time taken maximum of 9 S *Prereq 6 credits from among 343 344 345 346 347* Exploration of imagery using woven and surface design processes Personal development and exploration of ideas Nonmajor graduate credit

ArtIS 490 Independent Study Cr 1 to 6 each time taken *Prereq Written approval of instructor and department chair on required form in advance of semester of enrollment* Student must have completed craft design coursework appropriate to planned independent study Offered on a graded basis or a satisfactory fail basis

A Calligraphy
B Ceramics
C Computer Art and Design
D Drawing
E Fibers
F Illustration
G Metals
H Honors
I Painting
J Photography
K Printmaking
L Wood
M Mixed Media

ArtIS 493 Workshop Cr 1 to 3 each time taken SS *Prereq Permission of instructor* Intensive 2 to 4 week studio exploration Topics vary each time offered and may have prerequisites

A Calligraphy
B Ceramics
C Computer Art and Design
D Drawing
E Fibers
F Illustration
G Metals
H Honors
I Painting
J Photography
K Printmaking
L Wood
M Mixed Media

Courses Primarily for Graduate Students, open to qualified undergraduate students

ArtIS 505 Mixed Media (Dual listed with 305) (0 6) Cr 3 each time taken maximum of 6 FS *Prereq Graduate classification permission of instructor* Exploration and application of various materials techniques and ideas

ArtIS 508 Computer Aided Animation and Visualization (0 6) Cr 3 each time taken maximum of 6 S *Prereq ArtIS 408 or graduate status and permission of instructor* Further investigations begun in ArtIS 408 Attention given to the workflow and management of creating animation and visualizations

ArtIS 520 Wood Design Studio (Dual listed with 420) (0 6) Cr 3 each time taken maximum of 12 FS *Prereq Graduate classification permission of instructor* Independent design and creation of furniture forms Research and development of furniture forms utilizing advanced and/or innovative processes

ArtIS 522 Ceramics Studio (Dual-listed with 422) (0 6) Cr 3 each time taken maximum of 12 FS *Prereq Graduate classification permission of instructor* Forms and surfaces historical research Personal directions in ceramic processes and concepts

ArtIS 524 Jewelry and Decorative Metalsmithing Studio (Dual listed with 424) (0 6) Cr 3 each time taken maximum of 12 FS *Prereq Graduate classification permission of instructor* Design of jewelry and hollow forms using advanced construction techniques

ArtIS 530 Drawing (Dual listed with 430) (0-6) Cr 3 each time taken maximum of 9 FS *Prereq Graduate classification permission of instructor* Figurative and/

or non figurative drawing with advanced work in media composition and theory

ArtIS 538 Painting (Dual listed with 438) (0-6) Cr 3 each time taken maximum of 9 FS *Prereq Graduate classification permission of instructor* Figurative and/ or non figurative painting with advanced work in media composition and theory

ArtIS 547 Fiber/Fabric Studio Problems (Dual listed with 447) (0 6) Cr 3 each time taken maximum of 9 S *Prereq Graduate classification permission of instructor* Exploration of imagery using woven and surface design processes Personal development and exploration of ideas

ArtIS 556 Relief Printmaking (Dual listed with 356) (0 6) Cr 3 each time taken maximum of 9 F *Prereq Graduate classification permission of instructor* Woodcut and linoleum cut printmaking process in black and white multiblock color and reduction color printing Collographs and forms of relief printmaking used separately and in combination with woodcuts

ArtIS 557 Monotype (Dual listed with 357) (0-6) Cr 3 each time taken maximum of 9 F *Prereq Graduate classification permission of instructor* Monoprint and monotype processes black and white and color techniques Basic knowledge production procedures and drawing skills experimentation

ArtIS 558 Lithography (Dual listed with 358) (0-6) Cr 3 each time taken maximum of 9 F *Prereq Graduate classification permission of instructor* Planographic printmaking process theory and practice Studio procedures drawing and printing skills applied to metal plate lithography

ArtIS 559 Intaglio (Dual listed with 359) (0 6) Cr 3 each time taken maximum of 9 S *Prereq Graduate classification permission of instructor* Intaglio printmaking processes Basic knowledge and production procedures drawing and printing skills

ArtIS 590 Special Topics Cr arr *Prereq Bachelor s degree in art and/or design or evidence of satisfactory equivalency in specialized area* Written approval of instructor and department chair on required form in advance of semester of enrollment
A Calligraphy
B Ceramics
C Computer Art and Design
D Drawing
E Fibers
F Illustration
G Metals
I Painting
J Photography
K Printmaking
L Wood
M Mixed Media

ArtIS 593 Workshop Cr 1 to 3 each time taken SS *Prereq Graduate classification permission of instructor* Intensive 2 to 4 week studio exploration Topics vary each time offered and may have prerequisites
A Calligraphy
B Ceramics
C Computer Art and Design
D Drawing
E Fibers
F Illustration
G Metals
I Painting
J Photography
K Printmaking
L Wood
M Mixed Media

Courses for Graduate Students

ArtIS 605 Research Methods (3 0) Cr 3 *Prereq Permission of instructor* Research strategies related to fine art and technology Application of selected methods to specific issues

ArtIS 607 Intermedia (0 6) Cr 3 Exploration and application of media with various materials methods and ideas

Interior Design (ArtID)
Courses Primarily for Undergraduate Students

ArtID 160 Interior Design Foundations (3 0) Cr 3 S *Prereq Art 108 or equivalent* The profession issues and the role of interior design

ArtID 160S Interior Design Foundations Studio (0 6) Cr 3 S *Prereq Art 108 130 credit or enrollment in Art 109 ArtID 160 Art H 181* Creative problem solving methods rapid visualization techniques and computer based methods of managing design text information Small scale projects

ArtID 259 Sophomore Field Study Cr R *Prereq Enrollment in second year studio course* Study and tours of areas of interest within the interior design profession such as manufacturers designers showrooms and museums Offered on a satisfactory fail grading basis only

ArtID 261 Graphic Communication for Interior Design I (0 4) Cr 2 F *Prereq Admission to the interior design program through program review and enrollment in 265* Proficiency in the development of technical conventions and design drawing with drafting instruments Emphasis on drawing layout line quality and lettering Site and structure measure ments dimensioning single and multi view drawings sections and axonometrics

ArtID 262 Graphic Communication for Interior Design II (0-4) Cr 2 F *Prereq Admission to the interior design program through program review and enrollment in 265* Perspective drawing design sketching presentation drawings shades shadows and reflections Use of various rendering media and techniques

ArtID 263 Graphic Communication for Interior Design III (1-4) Cr 3 S *Prereq 261 enrollment in 267* Computer visualization techniques and applications projects employing computer graphic methods

ArtID 265 Interior Design Studio I (1 9) Cr 4 F *Prereq Art 109 Art H 181 ArtID 160 160S credit or enrollment in 261 262 350 or Arch 240 admission to the interior design program through department review* Enhanced creative interior design problem solving compositional and color theories and graphic communication as applied to the interior design of small scale environments Manual visualization techniques

ArtID 267 Interior Design Studio II (1 9) Cr 4 S *Prereq 261 262 265 350 or Arch 240 Art H 181 enrollment in 351 355 263 and T C 204* Human factors issues including ergonomics human behavior and the requirements of special groups Residential interior design and medium scale projects Detail drawings and expansion of visualization techniques

ArtID 350 Interior Systems I (4 0) Cr 4 *Prereq Admission to the interior design program through department review* Structural principles mechanical systems and standard construction methods as related to interior design

ArtID 351 Interior Systems II (2 2) Cr 3 S *Prereq 265 350 or Arch 240* Manufactured furniture interior finishes and related issues Selection criteria and written specifications

ArtID 352 Interior Systems III (2-2) Cr 3 F *Prereq 351 and enrollment in 365* Light and color as related to interior spaces Lighting principles and techniques to implement lighting design objectives Teamwork

ArtID 355 Interior Design History/Theory/Criticism I (3 0) Cr 3 F *Prereq Art H 181* Stylistic evaluation of interior finishes furnishings and decorative arts from a critical historic and multicultural perspective Nonmajor graduate credit

ArtID 356 Interior Design History/Theory/Criticism II (3 0) Cr 3 S *Prereq Art H 181* Theoretical approaches to the design of interior space from a critical historic and multicultural perspective including nineteenth and twentieth century Nonmajor graduate credit

ArtID 359 Junior Field Study Cr R F *Prereq Enrollment in third year studio course* Study and tours of areas of interest within the interior design profession such as manufacturers designers showrooms museums Offered on a satisfactory fail grading basis only

ArtID 365 Interior Design Studio III (1-9) Cr 4 F *Prereq 263 267 351 T C 204 enrollment in 352 and 356* Formal methods of design programming and problem identification Also includes conceptualization and problem solving related to work environments and special populations Large scale projects Alternative manual and computer based visualization methods Teamwork

ArtID 367 Interior Design Studio IV (1 9) Cr 4 S *Prereq 352 365 credit or enrollment in 356 and 369* Emphasis on three-dimensional spatial development in large multiple scale institutional projects Expansion of alternative manual and computer based visualization methods Teamwork

ArtID 368 International Study Orientation Seminar (1 0) Cr 1 *Prereq 365 permission of instructor and planned enrollment in Rome study option* Historic and contemporary architecture and interior design customs and traditions of Rome and related travel itinerary locations Required of students participating in the interior design international study option Offered on a satisfactory fail grading basis only

ArtID 369 Interior Design Internship Seminar (1 0) Cr 0 5 to be repeated for 1 credit FS *Prereq Enrollment in third year studio course* Procedural and ethical concerns relating to interior design internship Preparation of placement credentials and formulation of personal goals Internship plans and agreements Offered on a satisfactory fail basis only

ArtID 453 Interior Systems IV (2 2) Cr 2 S *Prereq 352 and enrollment in 467* Specialized interior assemblies and interface with related building systems Detailing and documentation

ArtID 459 Senior Field Study Cr R *Prereq Enrollment in fourth year studio course* Study and tours of areas of interest within the interior design profession such as manufacturers designers showrooms and museums Offered on a satisfactory fail grading basis only

ArtID 460 Interior Design Internship Arr Cr 3 SS *Prereq Satisfactory completion of all 300-level interior design coursework T C 204 and Arch 240* Profes sional interior design off-campus experience

ArtID 461 Interior Design Professional Practices (2 0) Cr 2 S *Prereq 460* Organization and general management of the interior design office agree ments business procedures professional ethics

ArtID 463 Housing for the Aging (Same as HD FS 463) *See Human Development and Family Studies*

ArtID 464 Selected Studies in Interior Design (Dual listed with 564) Cr 2 or 3 each time taken maximum of 9 *Prereq 12 credits in design related courses and permission of instructor* Special issues with emphasis on their translation into design application Topics vary each time offered Nonmajor graduate credit

ArtID 465 Interior Design Studio V (Dual listed with 565) (1 9) Cr 4 F *Prereq 460* Design research and refined problem solving methods including functional analysis programming and detailing Multi-cultural study abroad option Nonmajor graduate credit

ArtID 467 Interior Design Studio VI (1 9) Cr 4 S *Prereq 465 credit or enrollment in 464 and all required interior systems and history/theory/criticism courses* Refinement of technical analytical and theoretical problem solving methods and comprehen- sive design documentation In-depth development of individual projects Current issues in interior design Nonmajor graduate credit

ArtID 490 Independent Study Cr 1 to 6 each time taken *Prereq Written approval of instructor and department chair on required form in advance of semester of enrollment* Student must have

completed related interior design coursework appropriate to planned independent study Offered on a graded basis or a satisfactory fail basis
H Honors

ArtID 493 Workshop Cr 1 to 3 each time taken FS SS *Prereq Evidence of satisfactory experience in area of specialization* Intensive 2 to 4 week studio exploration Topics vary each time offered

Courses Primarily for Graduate Students, open to qualified undergraduate students

ArtID 564 Selected Studies in Interior Design (Dual listed with 464) Cr 2 or 3 each time taken maximum of 9 *Prereq Graduate classification permission of instructor* Special issues with emphasis on their translation into design application Topics vary each time offered

ArtID 565 Interior Design Studio (Dual listed with 465) (1 9) Cr 4 F *Prereq Graduate classification* Design research and refined problem solving methods including functional analysis programming and detailing Multi cultural hospitality and retail Study abroad option

ArtID 567 Interior Design Studio (2 9) Cr 5 FS *Prereq Graduate classification* Design research and interior design problem solving

ArtID 590 Special Topics Cr arr *Prereq Bachelor s degree in interior design or evidence of satisfactory equivalency in specialized area* Written approval of instructor and department chair on required form in advance of semester of enrollment

ArtID 593 Workshop Cr 1 to 3 each time taken FS SS *Prereq Graduate classification evidence of satisfactory experience in area of specialization* Intensive 2 to 4 week studio exploration Topics vary each time offered

Courses for Graduate Students

ArtID 660 Research Methods (3 0) Cr 3 S *Prereq Permission of instructor* Research strategies related to interior design Application of selected methods to specific issues

ArtID 665 Advanced Interior Design Studio (0 9) Cr 3 each time taken maximum of 15 *Prereq Graduate classification* Interior design problem-solving with emphasis on special issues Project types will include but not be restricted to hospitality health care institutional industrial residential historic preservation and commercial environments

ArtID 690 Advanced Topics Cr arr *Prereq M FA classification permission of instructor*

ArtID 699 Research Cr var
A Thesis
B Thesis Exhibition

Astronomy and Astrophysics

See *Physics*

Bacteriology

See *Microbiology*

Biochemistry, Biophysics, and Molecular Biology

Alan M Myers Chair of Department

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University Professors Hammond

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University Professors (Emeritus) Horowitz White

Professors (Emeritus) Applequist Tipton

Associate Professors Bazylinski Buss Dispirito Huiatt Shin

Associate Professors (Adjunct) James

Associate Professors (Collaborator) Rao

Assistant Professors Andreotti Culver Hargrove Norris Peters

Undergraduate Study

The department offers majors in biochemistry or biophysics in the College of Liberal Arts and Sciences and a major in agricultural biochemistry in the College of Agriculture

Biochemists and biophysicists seek to understand life processes in terms of chemical and physical principles They conduct research in the frontiers of biology such as metabolic networking structure and function of enzymes membranes and hormones computational approaches genomic and proteomic technology protein engineering plant biotechnology muscle structure and function and the design and evaluation of drugs for the treatment of disease Biochemistry biophysics and molecular biology provide the basis for much of modern biotechnology Graduates have opportunities in industry especially the biotechnology sector in universities veterinary medical and medical schools and government laboratories Students who meet the necessary high scholastic standards have the opportunity to continue their studies in graduate school medical school or veterinary medical school

Graduates of biochemistry agricultural biochemistry and biophysics understand the chemical principles of biological systems including molecular biology They have developed laboratory expertise in modern biochemical techniques including the ability to analyze data and prepare scientific reports Most have participated in undergraduate research and have developed the skills necessary for both written and oral presentations at a level that will serve the student both within the university and in postgraduate professional life Graduates have the experience of interacting with persons of different disciplines and cultures Students have the training in mathematics and physics to solve problems of broad scope in biological biomedical and environmental sciences and to provide leadership in diverse scientific and technological arenas

Agricultural Biochemistry Major in the College of Agriculture

For the undergraduate curriculum leading to the degree bachelor of science see *College of Agriculture Curricula* Agricultural biochemistry is recommended to students interested in the areas of agriculture requiring strong preparation in biochemistry chemistry physics and mathematics or in preparation for the study of veterinary medicine Employment opportunities exist in agrochemical industries and animal and plant biotechnology

Biochemistry or Biophysics Majors in the College of Liberal Arts and Sciences

For the undergraduate curriculum leading to the degree of bachelor of science see *Liberal Arts and Sciences Curriculum* Biochemistry and biophysics are recommended to students whose career interests involve advanced study or employment in biochemis try or biophysics or in related areas of the biological or medical sciences

Undergraduate majors in the College of Liberal Arts and Sciences in biochemistry usually have the following basic courses or their equivalents in their programs BBMB 101 102 404 405 (or 501 502) 411 461 or 551 Chem 177M 177N 178 210 (or 211) 211L 321 322 322L 331 332 333L 334L Math 165 166 265 (or 266) Phys 221 222 Biol 201 201L (or 202L or 301L or 302L) 202 301 302 and a minimum of 4 additional credits of biological science courses from biology botany genetics microbiology and zoology Undergraduate research BBMB 499 is strongly recommended

Undergraduate majors in biophysics usually include the following basic courses in their programs BBMB 101 461 or 551 Chem 177 177L 178 210 (or 211) 321 321L (or 322L or Phys 311) 322 331 332 Math 165 166 265 266 Phys 221 222 324 (or 321) and 232 or Com S 205 Biol 201 201L (or 202L) Biol 202 and 9 additional credits in 300 or higher level courses in biochemistry biophysics biological sciences chemistry or physics BBMB 404 405 and Biol 301 are recommended in meeting this requirement for students preparing for careers in molecular biophysics Students wishing a strong preparation for graduate studies are advised to take undergraduate research and further mathematics courses such as 385 and 465

These lists of courses should not be regarded as statements of fixed requirements or as complete outlines of the work necessary for the major They are given solely for the convenience of students or advisers who wish to estimate the amount of basic study that may be needed

Biochemistry and biophysics majors are advised to meet the College of Liberal Arts and Sciences foreign language requirement with courses in French German or Russian

See also the B S /M S program under Graduate Study

The department offers minors in biochemistry in both the College of Agriculture and the College of Liberal Arts and Sciences which may be earned by credit in BBMB 404 405 311 (or 411) and 451 (or Chem 321) plus additional supporting 300 level courses in chemistry or biochemistry for a total of 15 credits

English proficiency requirement Majors in agricultural biochemistry must complete Engl 104 and 105 and one course in speech fundamentals with a grade of C or better in each of these courses and complete a communications intensive requirement equivalent to 3 credits from courses within the major Majors in the College of Liberal Arts and Sciences must complete Engl 104 and 105 and one of the following with a grade of C or better (a) Engl 305 309 or 314 (b) a written report in BBMB 411 or 499

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with majors in biochemistry and biophysics and with interdepartmen tal majors in genetics immunobiology MCDB (molecular cellular and developmental biology) plant physiology and toxicology Minor work is offered to students taking major work in other departments

Prerequisite to graduate work is a sound undergradu ate background in biology chemistry mathematics and physics

All graduate students are required by the department to teach as part of their training for an advanced degree

The department offers a B S /M S program in biochemistry that allows students to obtain both the B S and M S degrees in five years The program is open to students in the College of Liberal Arts and Sciences and in the College of Agriculture Students interested in this program should contact the department office for details Application for admission to the Graduate College should be made near the end of the junior undergraduate (third) year Students would begin research for the M S thesis during the summer semester after their junior year and are eligible for research assistantships

Courses open for nonmajor graduate credit 404 405 411 420 451 461

Visit our departmental website at //molebio iastate edu/bbhtml/homepage htm

Courses Primarily for Undergraduate Students

BBMB 101 Introduction to Biochemical Activities (1 0) Cr 1 F Research activities career opportunities in biochemistry and biophysics and an introduction to the structure of biologically important compounds For students majoring in biochemistry agricultural biochemistry or biophysics or considering one of these majors

completed related interior design coursework appropriate to planned independent study Offered on a graded basis or a satisfactory fail basis
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BBMB 102 Introduction to Biochemistry (0-2) Cr 1 S *Prereq Credit or enrollment in Chem 177 and 177L* Topics in the scientific background of biochemistry such as macromolecules metabolism and catalysis May include laboratory experiments as well as literature readings and discussion A significant component is practice in scientific communication For students majoring in biochemistry agricultural biochemistry or biophysics or considering one of these majors

BBMB 221 Structure and Reactions in Biochemical Processes (3 0) Cr 3 FS *Prereq Chem 163 167 or 177* Fundamentals necessary for an understanding of biochemical processes Primarily for students in agriculture Not acceptable for credit toward a major in biochemistry or biophysics Credit for both 221 and Chem 231 may not be applied toward graduation

BBMB 301 Survey of Biochemistry (3-0) Cr 3 FS SS *Prereq Chem 231 or 331* A survey of biochemistry structure and function of amino acids proteins carbohydrates lipids and nucleic acids enzymology metabolism biosynthesis and selected topics Not acceptable for credit toward a major in biochemistry or biophysics

BBMB 311 Biochemistry Laboratory (1 3) Cr 2 FS *Prereq Credit or enrollment in 301 or Biol 302* Emphasis on isolation characterization and quantification of biological substances Not acceptable for credit toward a major in biochemistry or biophysics Only one of BBMB 311 or Biol 302L can be counted toward graduation

BBMB 398 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator junior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

BBMB 404 Biochemistry (3 0) Cr 3 F *Prereq Chem 332* A general overview for graduate and advanced undergraduate students in agricultural biological chemical and nutritional sciences Chemistry of amino acids proteins carbohydrates and lipids vitamins protein structure enzymology carbohydrate metabolism Credit for both 420 and the 404 405 sequence may not be applied toward graduation Nonmajor graduate credit

BBMB 405 Biochemistry (3 0) Cr 3 S *Prereq 404* A general overview for graduate and advanced undergraduate students in agricultural biological chemical and nutritional sciences Metabolism of carbohydrates amino acids nucleotides and lipids formation turnover and molecular relationships among DNA RNA and proteins genetic code regulation of gene expression selected topics in the molecular physiology of plants and animals Credit for both 420 and the 404 405 sequence may not be applied toward graduation Nonmajor graduate credit

BBMB 411 General Biochemical Research Techniques (1 8) Cr 3 F *Prereq Credit or enrollment in 404 or 501 Chem 210 or 211* Introduction to laboratory techniques for studying biochemistry including chromatographic methods electrophoresis spectrophotometry enzyme purification enzyme kinetics and characterization of carbohydrates proteins lipids and nucleic acids Nonmajor graduate credit

BBMB 420 Physiological Chemistry (3 0) Cr 3 F *Prereq Chem 332 BBMB 301 or Biol 302* Structure and function of proteins enzymology biological oxidation chemistry and metabolism of carbohydrates lipids amino acids and nucleic acids protein synthesis and the genetic code relationship of biochemistry to selected animal diseases Biochemistry of higher animals emphasized Not acceptable for credit toward a major in agricultural biochemistry biochemistry or biophysics Credit for both 420 and the 404 405 sequence may not be applied toward graduation Nonmajor graduate credit

BBMB 451 Physical Biochemistry (2 0) Cr 2 F *Prereq Chem 331 Phys 112 or 222 a previous course in calculus is helpful but not required* Selected topics in physical chemistry in the context of applications to problems in biology biochemistry and food sciences Not acceptable for credit toward a major in biochemistry or biophysics Nonmajor graduate credit

BBMB 461 Topics in Biophysics (2-0) Cr 2 S *Prereq 451 or Chem 321 or Phys 304* Biological phenomena viewed as problems in physics with a focus on structure determinations and macromolecular characterization Nonmajor graduate credit

BBMB 490 Independent Study Cr arr FS SS *Prereq College of Agriculture junior or senior classification and permission of instructor a maximum of 9 credits of 490 may be applied toward graduation College of Liberal Arts and Sciences permission of instructor*
H Honors

BBMB 498 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator senior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

BBMB 499 Undergraduate Research Cr 1 to 5 FS SS *Prereq Permission of staff member with whom student proposes to work* Research under senior staff guidance

Courses Primarily for Graduate Students, open to qualified undergraduate students

BBMB 501 Comprehensive Biochemistry (4 0) Cr 4 F *Prereq Chem 210 or 211 322 and 332 a previous course in biochemistry is strongly recommended* Chemical composition of living matter and the chemistry of life processes Chemical characterization of amino acids proteins carbohydrates and lipids enzymology and co-enzymes metabolism of carbohydrates biological oxidations

BBMB 502 Comprehensive Biochemistry (4 0) Cr 4 S *Prereq 501* Chemical composition of living matter and the chemistry of life processes Metabolism of lipids amino acids and nucleotides membrane biochemistry biosynthesis of DNA RNA and proteins gene regulation selected topics

BBMB 503 Bioinorganic Chemistry (Same as Chem 503) See *Chemistry*

BBMB 511 Topics in Experimental Biochemistry (1-6) Cr 1 each time taken FS *Prereq Credit or enrollment in 404 or 501 Chem 210L or 211L* Taught as individual one-credit modules Modules include
A Protein Chemistry
B Radioisotopes in biochemistry
C Flow cytometry
D Monoclonal antibodies
E Special techniques

BBMB 520 Genetic Engineering (Same as Gen 520) See *Zoology and Genetics*

BBMB 531 Structure and Reactivity of Biomolecules (3 0) Cr 1 F Five weeks *Prereq Chem 332* Special properties of reactive groups prevalent in biomolecules and reactions commonly encountered in biochemical studies A study of reaction types and mechanisms in biochemistry

BBMB 540 Signal Transduction (Same as Zool 540) See *Zoology and Genetics*

BBMB 541 Computational Biochemistry (1 0) Cr 1 F *Prereq A previous course in biochemistry is recommended* Computer applications in biochemical research

BBMB 542 Introduction to Molecular Biology Techniques (Same as Zool 542) See *Zoology and Genetics*

BBMB 551 Molecular Biophysics (3 0) Cr 3 F *Prereq Chem 322* An examination of physical methods for the study of molecular structure and organization of biological materials with emphasis on applications Spectroscopy hydrodynamic methods nuclear magnetic resonance and X ray diffraction

BBMB 581 Seminar (1 0) Cr 1 F *Prereq Permission of instructor* Short presentations by students and discussion on assigned topics For entering graduate students

BBMB 590 Special Topics FS SS Cr arr

BBMB 593 Workshop in Biochemistry and Biophysics Cr 1 each time taken *Prereq Permission of instructor* Graduate workshops in selected topics in biochemistry and biophysics Credit in this course does not meet the requirement for advanced graduate electives in Biochemistry

Courses for Graduate Students

BBMB 607 Plant Biochemistry (2 0) Cr 2 Alt F offered 2004 Thornburg Nikolau *Prereq 405 or 502* Description of unique aspects of plant biochemistry including lipid metabolism cell wall structure secondary metabolism phytoalexin biosynthesis and plant defenses

BBMB 615 Molecular Immunology (Same as Gen 615 Micro 615 V MPM 615) (3 0) Cr 3 Alt F offered 2004 *Prereq 405 or 502* Buss Current topics in molecular aspects of immunology T and B cell receptors major histocompatibility complex antibody structure immunosuppressive drugs and viruses and intracellular signalling pathways leading to expression of genes that control and activate immune function

BBMB 622 Carbohydrate Chemistry (2-0) Cr 2 Alt S offered 2004 Robyt *Prereq 404 or 501* Structure occurrence properties function and chemical and enzymatic modifications of monosaccharides oligosaccharides polysaccharides and glycoproteins

BBMB 632 Kinetics of Enzyme Action (2 0) Cr 1 or 2 8 or 16 weeks Alt S offered 2005 Fromm *Prereq 501* The one-credit version stresses the fundamentals of enzyme kinetics Topics include integrated rate equations methods for deriving initial-rate equations inhibition product effects and methods for verifying kinetic mechanisms The two credit version covers the same material plus additional topics such as allostery hysteresis isotope effects and complex kinetic mechanisms

BBMB 642 Mechanisms of Enzymatic Catalysis (2 0) Cr 1 First 8 weeks Alt F offered 2003 Robyt *Prereq 404 420 or 501* The chemical basis of enzymatic catalysis with emphasis on mechanisms of substrate recognition general acid base catalysis and stereoelectronic factors

BBMB 645 Molecular Endocrinology Hormones and Growth Factors (3-0) Cr 2 Alt S offered 2005 Nilsen Hamilton and Norris *Prereq 405 420 or 502* The endocrine system and mechanism of hormone and growth factor action with emphasis on receptors and signal transduction

BBMB 652 Protein Chemistry—Chemical Methods (2 0) Cr 1 8 weeks Alt S offered 2004 Graves *Prereq 404 or 501* Chemical reactions as a means of determining protein structure and biological function

BBMB 653 Protein Chemistry—Physical Methods (2 0) Cr 1 8 weeks Alt S offered 2004 Staff *Prereq 404 or 501* Protein structure determination as a means of understanding biological function

BBMB 660 Membrane Biochemistry (2-0) Cr 2 Alt F offered 2004 Chitnis *Prereq 405 or 502* Protein and lipid constituents of biological membranes Structure and topography of membrane proteins Selected topics concerning the membrane proteins involved in diverse biochemical processes such as energy transduction transport across membranes neurotransmission and signal transduction

BBMB 670 Molecular Biology of Muscle (Same as An S 670) (3 0) Cr 3 Alt F offered 2004 Huiatt Robson Stromer *Prereq 405 420 or 502* Ultrastructure of muscle chemistry structure function and molecular biology of muscle proteins Molecular aspects of muscle contraction development and turnover Cytoskeletal proteins and dynamics

BBMB 675 Nucleic Acid Structure end Function (Same as Gen 675) (2-0) Cr 2 Alt F offered 2003 *Prereq 405 or 502* In-depth discussion of nucleic acid properties structures and structure/function

relationships Interactions between nucleic acids and proteins will be emphasized

BBMB 676 Biochemistry of Gene Expression in Eucaryotes (Same as MCDB 676) (2 0) Cr 2 Alt S offered 2004 *Prereq 404 or 501 405 or 502 or Gen 511* Staff Analysis of the biochemical processes involved in expression of eucaryotic genes and the regulation thereof including RNA polymerase transcriptional regulatory proteins enhancers and silencers chromosome structure termination RNA processing RNA transport RNA turnover translational regulation protein turnover

BBMB 681 Advanced Seminar Cr 1 each time taken FS *Prereq Permission of instructor* Student presentations

BBMB 682 Departmental Seminar Cr R FS *Prereq Permission of instructor* Staff and visitor presentations

BBMB 696 Seminar in Plant Physiology and Molecular Biology (Same as Bot 696) See *Botany*

BBMB 698 Seminar in Molecular Cellular and Developmental Biology (Same as MCDB 698) See *Molecular Cellular and Developmental Biology*

BBMB 699 Research *Prereq Permission of instructor*

Bioinformatics and Computational Biology

www bcb iastate edu

bcb@iastate edu

(Interdepartmental Graduate Major)

Supervisory Committee D Voytas Chair V Honavar Assoc Chair S Aluru J Dekkers J Dickerson X Gu K M Ho R Jernigan (ex-officio) Z Wu

Participating Faculty R Ackerman D Adams S Aluru A Andreotti D Ashlock D Berleant M Bhattacharyya A Bogdanove V Brendel S Carpenter A Carriquiry P Chitnis H H Chou D Cook G Culver M Daniels J Davidson J Dekker J Dekkers J Dickerson P Dixon D Dobbs K Dorman O Eulenstein R Fernando S Gadia X Gu M Hargrove K M Ho V Honavar M Hong R Honzatko X Huang F Janzen R Jernigan S Kothari S Lamont H Levine C Link R Maddux J Mayfield L Miller W A Miller C Minion J Morris A Myers G Naylor D Nettleton N Nilsen-Hamilton T Peterson E Pollak A Qamhiyah J Reecy P Reilly S Rodermel M Rothschild P Schnable R Shoemaker J Smith H Stern C Tuggle D Voytas J Wendel S Willson R Wise Z Wu E Wurtele

Undergraduate Study

Courses in bioinformatics and computational biology are offered for undergraduates but a baccalaureate degree is not offered at this time

Undergraduates wishing to prepare for graduate study in Bioinformatics and Computational Biology should obtain solid undergraduate training in at least one of the foundation disciplines molecular biology computer science mathematics statistics and physics Undergraduates should elect courses in basic biology basic transmission and molecular genetics chemistry physics mathematics at least through calculus statistics and computer programming

Graduate Study

Work is offered for the master of science and doctor of philosophy degrees with a major in Bioinformatics and Computational Biology (BCB) Faculty are drawn from several departments Agronomy Animal Science Biochemistry Biophysics and Molecular Biology Botany Chemical Engineering Chemistry Computer Science Electrical and Computer Engineering Mathematics Physics and Astronomy Plant Pathology Statistics Veterinary Microbiology and Preventive Medicine and Zoology and Genetics

The BCB program emphasizes interdisciplinary training in six related areas of focus Bioinformatics Functional and Structural Genomics Genome Evolution Macromolecular Structure and Function Mathematical Biology and Biological Statistics and Metabolic and Developmental Networks Additional information about research areas and individual faculty members is available at www bcb iastate edu

BCB students are trained to develop an independent and creative approach to science through an integrative curriculum and thesis research projects that include both computational and biological components First year students are appointed as research assistants and participate in BCB 697 (Graduate Research Rotation) working with three or more different research groups to gain experience in both wet (biological) and dry (computer) laboratory environments In the second year students initiate a thesis research project under the joint mentorship of two BCB faculty mentors one from the biological sciences and one from the quantitative/ computational sciences The M S and Ph D degrees are usually completed in two and five years respectively

During the first year all BCB students complete background coursework in calculus molecular genetics computer science statistics and discrete structures with specific courses determined by prior training The total course requirements for Ph D students include at least one core course in Computational Molecular Biology (BCB 594 and/or BCB 548) one core course in Molecular Genetics (e g Gen 411 Gen 511 BBMB 501) and at least 12 credits of advanced coursework in the areas of Molecular Biology (6 credits) and either Computer Science or Mathematics/ Statistics (6 credits in one area) Students make research presentations (BCB 690) attend faculty research seminars (BCB 691) and participate in workshops/symposia (BCB 593) M S students take the above background and core courses take at least 12 credits of advanced coursework and may elect to participate in fewer seminars and workshops Additional coursework may be selected to satisfy individual interests or recommendations of the Program of Study Committee All graduate students are encouraged to teach as part of their training for an advanced degree (For curriculum details and sample programs of study see www bcb iastate edu)

Courses open for nonmajor graduate credit 484 495

Courses Primarily for Undergraduate Students

BCB 484 Computational Mathematics for Biologists (Same as Math 484) (3 0) Cr 3 F A survey of graph theory linear algebra discrete math and algorithms used in computational biology with examples taken from genomics phylogenetics and structure problems This course provides mathematics background for BCB/Gen/ Com S/Math 594 Nonmajor graduate credit

BCB 495 Molecular Biology for Computational Scientists (Same as Gen 495) (3 0) Cr 3 F Survey of molecular cell biology and molecular genetics for nonbiologists especially those interested in bioinformatics/computational biology Basic cell structure and function principles of molecular genetics biosynthesis structure and function of DNA RNA and proteins regulation of gene expression selected topics Provides biological background for BCB 594 Nonmajor graduate credit

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

BCB 542 Introduction to Molecular Biology Techniques (Same as Zool 542) See *Zoology and Genetics*

BCB 548 Fundamental Algorithms in Computational Biology (Same as Com S 548 Gen 548) (3 0) Cr 3 S *Prereq Com S 311 and some knowledge of programming* Introduction design and analysis of fundamental algorithms and methods for molecular biology Topics include pairwise sequence alignment alignment heuristics biological database and retrieval systems multiple sequence alignment phylogenetic trees physical mapping genome rearrangements DNA-chips fragment assembly protein folding and genetic networks

BCB 549 Advanced Algorithms in Computational Biology (Same as Cpr E 549 Com S 549) See *Computer Engineering or Computer Science*

BCB 550 Evolutionary Problems for Computational Biologist (Same as Com S 548 Gen 548) (3 0) Cr 3 F *Prereq Com S 311 and some knowledge of programming* Discussion and analysis of basic evolutionary principles and the necessary knowledge in computational biology to solve real world problems Topics include character and distance-based methods phylogenetic tree distances and consensus methods and approaches to extract the necessary information from sequence-databases to build phylogenetic trees

BCB 551 Computational Techniques for Genome Assembly and Analysis (Same as Com S 551) (3 0) Cr 3 F *Prereq Com S 311 and some knowledge of programming* Huang Introduction to practical sequence assembly and comparison techniques Topics include global alignment local alignment overlapping alignment banded alignment linear space alignment word hashing DNA protein alignment DNA-cDNA alignment comparison of two sets of sequences construction of contigs and generation of consensus sequences Focus on development of sequence assembly and comparison programs

BCB 556 Computational Genomics and Evolution (Same as Gen 556) (3-0) Cr 3 Alt S offered 2005 *Prereq Biol 301* Gu Introduction to evolutionary sequence analysis at the genome level Topics include sequence alignment phylogenetic inference molecular clock analysis ancestral state inference sequence/structure relation functional divergence and prediction evolutionary development genome duplication and comparative genomics Focus will be on data analysis and biological interpretation

BCB 557 Statistical Methods for Computational Biology (Same as Gen 557) (2-0) Cr 2 Alt S offered 2004 *Prereq BCB 594* Gu Advanced discussion about statistical modeling of DNA and amino acid sequences microarray expression profiles and other genome wide data

BCB 565 Professional Practice in the Life Sciences (Same as PI P 565) See *Plant Pathology*

BCB 590 Special Topics Cr var *Prereq Permission of instructor*

BCB 593 Workshop in Bioinformatics and Computational Biology (1 0) Cr 1 each time taken FS Current topics in bioinformatics and computational biology research Lectures by off-campus experts Students read background literature attend preparatory seminars attend all lectures meet with lecturers

BCB 594 Computational Molecular Biology (Same as Com S 594 Gen 594 Math 594) (3 0) Cr 3 S *Prereq BCB 484 BCB 495 Stat 432 or equivalent courses and programming experience (C C++ or Perl)* State of the art introduction to bioinformatics with emphasis on concepts and principles combined with hands on (keyboard) applications Topics typically include molecular databases score based sequence analysis amino acid substitution scoring matrices query search problems dynamic programming and other methods for pairwise sequence alignment motif identification multiple sequence alignment construction of phylogenetic trees from sequence data gene structure prediction protein structure prediction

BCB 596 Genomic Data Processing (Same as Gen 596 Com S 596) Cr 3 F *Prereq Some knowledge of programming* Chou Practical aspects of genomic data processing Emphasis on projects that carry out major steps in data processing using important bioinformatic tools Topics include base calling raw sequence cleaning and contaminant removal shotgun assembly procedures and EST clustering methods genome closure strategies and practices sequence

homology search and function prediction annotation and submission of GenBank reports and data collection and dissipation through the Internet

BCB 597 Introduction Computational Structural Biology (Same as Math 597) (3 0) Cr 3 S *Prereq Math 265 and some knowledge of programming* Mathematical and computational approaches to protein structure prediction and determination Topics include molecular distance geometry potential energy minimization and molecular dynamics simulation

BCB 599 Creative Component Cr var

Course for Graduate Students

BCB 690 Student Seminar in Bioinformatics and Computational Biology Cr 1 each time taken S Student research presentations

BCB 691 Faculty Seminar in Bioinformatics and Computational Biology (1 0) Cr 1 each time taken F Faculty research series

BCB 697 Graduate Research Rotation Cr var each time taken FS SS Graduate research projects performed under the supervision of selected faculty members in the Bioinformatics and Computational Biology major

BCB 699 Research

Biological/ Premedical Illustration

www bpmi iastate edu

(Interdepartmental Undergraduate Program)

Program Committee Warren D Dolphin Chair Dean Biechler C Arthur Croyle John Dorn Steven M Herrnstadt Harry Horner Don Sakaguchi

Undergraduate Study

The interdepartmental undergraduate BPM I major is designed for students who want to combine their interests and aptitudes in science and art Based on the theme of communicating science through art the major prepares students for careers in biological illustration or for graduate education in medical illustration elsewhere Graduates enter fields such as biocommunications environmental display design free lance illustration museum display design and various careers in the publishing industry

Entrance into the BPM I program is by application to the BPM I Advisory Committee Eligibility is based on an academic standard of at least 2 00 CGPA on 30 credits of university level work and a consideration of artistic ability as demonstrated through submission of a portfolio of representative drawings or other art work Freshman and transfer students usually declare pre BPM I as their major while satisfying the conditions for entrance into the major although other majors can be declared

To earn the B A degree offered by the College of Liberal Arts and Sciences students must complete the general education requirements in that college and take at least 42 credits in design and 32 credits in the biological sciences Design courses include Art 130 and 230 ArtIS 233 238 and 330 BPM I 326 327 336 337 494 and 497 plus 12 credits chosen from a list of approved upper level courses in art and design Biological science courses include Biol 102 201 201L 202 202L Bot 306 or 404 or 505 Zool 155 320 and at least 12 credits chosen from a list of approved biological science courses Students must earn a grade of C– or better in all art and science courses included in the major and must earn an overall GPA of 2 00 in both categories A brochure is available in 201 Bessey Hall that gives a detailed listing of the requirements

English Proficiency Requirement Students must earn a minimum of C in both English 104 and 105 or equivalent composition courses and in one advanced writing course numbered Engl 302 through 316

Students in BPM I must complete a senior project or an internship experience in which they design and produce artwork that is suitable for publication or public display

A minor in biological illustration is offered A minimum of 17 credits must be taken including 8 credits in biological science courses and 9 credits in art and design courses The biological sciences must include Biol 201 201L 202 202L The art and design courses must include ArtVS 336 and 337 and an advanced drawing or painting course For more information contact the chair of the BPM I Advisory Committee in 201 Bessey Hall or view the website listed above

Courses Primarily for Undergraduate Students

BPM I 326 Introduction to Illustration (Same as ArtIS 326) See *Art and Design*

BPM I 327 Illustration as Communication and Interpretive Expression (Same as ArtIS 327) See *Art and Design*

BPM I 336 Biological Illustration Principles and Techniques (Same as ArtIS 336) (0 6) Cr 3 each time taken maximum of 6 F *Prereq 6 credits in art and design and 3 credits in biological sciences* Studio basics and fundamentals of traditional biological rendering techniques Emphasis on tools and materials

BPM I 337 Application of Biological Illustration Techniques (Same as ArtIS 337) (0 6) Cr 3 each time taken maximum of 6 S *Prereq 336* Rendering techniques applied to different types of biological subject matter including computer applications Term project required

BPM I 395 Field Illustration Cr 1 to 3 each time taken maximum of 6 S SS *Prereq Permission of instructor* A combination seminar and field trip course emphasizing nature interpretation field sketching techniques and preparation of a final illustration based on field experience

BPM I 398 Cooperative Education Cr R FS SS *Prereq Permission of the program cooperative education coordinator junior classification* Required of all cooperative education students Students must register for these courses prior to commencing each work period

BPM I 435I Illustrating Nature I Sketching (Same as Ia LL 435I) See *Iowa Lakeside Laboratory*

BPM I 436I Illustrating Nature II Photography (Same as Ia LL 436I) See *Iowa Lakeside Laboratory*

BPM I 490 Independent Study Cr 1 to 3 each time taken maximum of 3 *Prereq Written approval of instructor and advisory committee chair on required form in advance of semester of enrollment*

BPM I 494 Special Topics in Illustration Cr 1 to 3 each time taken Intensive exploration of illustration techniques in a studio or field setting

BPM I 497 Illustration Internship Cr 1 to 6 each time taken maximum of 6 *Prereq Junior or senior classification in BPMI written approval of supervising instructor and advisory committee chair on required form in advance of semester of enrollment* Offered on a satisfactory fail grading basis only

Biology

www biology iastate edu

Warren D Dolphin Program Coordinator

The biological sciences at Iowa State University are organized into 20 departments and programs These can be grouped into the basic sciences agricultural sciences and veterinary sciences Well over 200 faculty consider themselves life scientists and most teach courses at the undergraduate and graduate levels Such a large faculty group provides many opportunities for students to learn from some of the national leaders in biological research and teaching and to participate in exciting meaningful research projects that explore frontiers in the life sciences Few other universities have such a wealth of faculty expertise available to undergraduate students

Biology is an interdepartmental undergraduate major Students majoring in Biology are able to integrate knowledge from several life science disciplines into a coherent broadly based undergraduate program of study Students who wish to study specific areas of the basic biological sciences should declare majors in animal ecology biochemistry botany entomology genetics microbiology or zoology Course requirements for these majors are listed elsewhere in this bulletin under the department s name Although requirements for biology and related majors differ significantly the courses taken during the first two years are similar In particular all require freshman biology and chemistry most require calculus and organic chemistry and all require credits in general education courses As a result and with proper planning a student is able to transfer from one basic biological science major to another without serious consequences any time during the first two years For detailed requirements see the catalog entries under the particular majors

The biology major is well suited for those who plan to teach biology who wish to enter government or industrial employment in health or environmental professions or who prefer educational breadth as an end in itself A bachelor s degree in biology provides excellent preparation for graduate study in many biological disciplines and for entrance into various professional schools such as human medicine physical therapy or veterinary medicine Students with particular interests can combine biology with a minor or a second major in another area such as chemistry environmental studies a foreign language journalism mathematics or other majors offered by the university

Undergraduate Study

Of the courses taught by the biology program Biol 109 is a general presentation of selected biological topics designed primarily for students not majoring in the basic biological sciences Biol 123 also designed for the non major is intended to be an introduction to topics in environmental biology

A unified biology core serves the various majors in the life sciences This core consists of six integrated courses with labs that explore the basic principles of the biological sciences The first year (Biol 201 202) provides a broad introduction to the nature of life The second year (Biol 301 302) provides an integrated foundation in the principles of genetics cell biology and elementary biochemistry The third year (Biol 312 303) provides an ecological and evolutionary perspective

A detailed description of the courses required in the biology major is available in 201 Bessey Hall or is available on the WWW at the site listed above Biology majors take a minimum of 40 credits in the biological sciences *including the following courses* Biol 102 201 201L 202 202L 301 301L 302 302L 303 and 312 plus 18 additional credits in approved life science courses numbered 300 or above A partial listing of approved courses by department follows

Animal Ecology

A Ecl 310	Vertebrate Biology
A Ecl 321	Fish Biology
A Ecl 350	Ecological Methods & Analyses
A Ecl 363	Natural History of Birds
A Ecl 410	Aquatic Ecology
A Ecl 442	Aquaculture

Biochemistry Biophysics and Molecular Biology

BBMB 301	Survey of Biochemistry
BBMB 311	Biochem Lab or 411
BBMB 404	Biochemistry I
BBMB 405	Biochemistry II
BBMB 420	Physiological Chemistry
BBMB 451	Physical Biochemistry
BBMB 461	Biophysics

Biomedical Sciences

BMS 329	Physiology and Anatomy of Domestic Animals
BMS 415	Anatomy of Laboratory Animals
BMS 416	Avian Anatomy

Botany
Bot 304 Plants & People
Bot 306 Plant Taxonomy
Bot 320 Plant Physiology
Bot 321 Plant Physiology Lab
Bot 330 Environmental Systems
Bot 364 Biology of Aquatic Plants and Algae
Bot 404 Plant Anatomy
Bot 406 Principles of Mycology
Bot 484 Plant Ecology [S]

Entomology
Ent 370 Insect Biology
Ent 374 Insects and Our Health
Ent 375 Plant Protection Using Natural Enemies
Ent 376 Fundamentals of Entomology & Pest Management

Genetics
Gen 308 Biotechnology in Agriculture Food & Human Health
Gen 340 Human Genetics
Gen 410 Transmission Genetics
Gen 411 Molecular Genetics
Gen 462 Evolutionary Genetics Microbiology
Micro 302 Biology of Microorganisms
Micro 201L Intro Microbiology Lab (201)
Micro 310 Fundamentals of Microbial Infection & Immunity
Micro 402 Microbial Genetics
Micro 404 Microbial Physiology
Micro 408 Virology
Micro 420 Food Microbiology
Micro 475 Immunology
Micro 477 Bacterial Plant Interactions

Zoology
Zool 304 Animal Behavior
Zool 311 Intro Parasitology
Zool 310 Brain & Behavior
Zool 320 Comparative Chordate Anatomy
Zool 322 Vertebrate Histology
Zool 355 Principles of Physiology
Zool 405 Invertebrate Biology
Zool 428 Cell Biology
Zool 433 Developmental Biology
Zool 454 General and Comp Endocrinology
Zool 456 Neurobiology
Zool 459 Environmental Physiology

Iowa Lakeside Lab
Ia LL 301I Iowa Natural History
Ia LL 302I Plant animal Interactions
Ia LL 312I Ecology
Ia LL 326I Ornithology
Ia LL 364I Biology of Aquatic Plants
Ia LL 367I Plant Taxonomy
Ia LL 371I Intro to Insect Ecology
Ia LL 403I Evolution
Ia LL 415I Developmental Biology of Freshwater Invertebrates
Ia LL 419I Vertebrate Ecology and Evolution
Ia LL 422I Prairie Ecology
Ia LL 490I Undergraduate Independent Study

Many courses from the departments of Agronomy Animal Science Horticulture and Plant Pathology may also be applied to the Biology major The complete list of approved courses may be obtained in 201 Bessey Hall or viewed on the WWW at www biology iastate edu

Courses beyond the core must be chosen from at least two departments so that the student s program of study reflects breadth of preparation Students are encouraged to participate in research projects by taking Biol 490 (Independent Study) in order to gain research experience prior to graduation A grade of C– or better is required in all biological science courses applied to the major and the cumulative average in the major must be at least a C

Supporting course requirements include 16 credits in chemistry to include two semesters of general chemistry with labs and at least one semester of organic chemistry with lab after demonstrating competence in algebra and trigonometry two semesters of calculus or two semesters of statistics chosen from a list of approved courses available in 201 Bessey Hall and a two semester sequence in general physics

Because biology is a major in the College of Liberal Arts and Sciences students must fulfill the foreign language and general education requirements listed in this bulletin for that college

English Proficiency Requirement Students must earn a minimum of C in both English 104 and 105 or equivalent composition courses and in one advanced writing course numbered Engl 302 through 316

In addition to courses offered on campus courses in field and aquatic biology are offered at the Iowa Lakeside Laboratory Courses in marine biology are available at the Gulf Coast Research Laboratory in Mississippi Students may also attend summer biological field stations elsewhere and transfer credits back

Biology majors seeking certification to teach biology in secondary schools must meet requirements of the College of Education as well as those of the biology program In addition they must apply formally for admission to the teacher education program See *Index Teacher Education Program Teacher Licensure*

The program offers a minor in biology which may be earned by credit in Biol 201 201L 202 202L 301 and 6 credits in courses numbered 300 or above from the list included here A minor or a double major in biology with a major in Animal Ecology Agricultural Biochemistry Biochemistry Biochemistry Botany Entomology Genetics Microbiology or Zoology is not permitted Likewise a minor in another basic biological science with a major in biology is not permitted

Graduate Study

Biology is only an undergraduate major Persons interested in graduate study in the biological sciences should apply directly to one of the life science departments Interdepartmental graduate offerings in ecology and evolutionary biology (EEB) genetics molecular cellular and developmental biology (MCDB) neurobiology plant physiology toxicology immunobiology biomedical engineering and water resources are also available (See *Index*)

A non thesis master s degree in interdisciplinary graduate studies (biological sciences) has been established particularly for teachers who wish to broaden and update their formal training in biology

Courses open for nonmajor graduate credit 374 403I

Courses Primarily for Undergraduate Students

Biol 102 Opportunities in Biology (1 0) Cr 5 F Orientation to the scope of the biological sciences and discussion of professional opportunities Required of first year biology majors Offered on a satisfactory fail grading basis only

Biol 109 Introductory Biology (3-0) Cr 3 FS SS Life considered at cellular organism and population levels Function and diversity of the living world Presentation of basic biological principles as well as topics and issues of current human interest Non majors only Students may receive graduation credit for no more than one of the following 109 123 or 201

Biol 123 Environmental Biology (Same as Env S 123) (3 0) Cr 3 FS An introduction to the structure and function of natural systems at scales from the individual to the biosphere and the complex interactions between humans and their environment Discussions of human population growth biodiversity sustainability resource use and pollution Non majors only Students may receive graduation credit for no more than one of the following 109 123 or 201

Biol 201 Principles of Biology I (3-0) Cr 3 FS *Prereq High school biology and chemistry or credit or enrollment in Chem 163 or 177* Introduction to the nature of life including the cellular basis of life the nature of heredity evolution diversity of microbial plant and animal life and principles of ecology Intended for life science majors Students may receive graduation credit for no more than one of the following 109 123 201

Biol 201L Principles of Biology Laboratory (0 3) Cr 1 FS *Prereq Credit or enrollment in 201 Laboratory to accompany 201*

Biol 202 Principles of Biology II (3 0) Cr 3 FS *Prereq 201* Introduction to the nature of life including the cellular basis of life energy relationships the nature of heredity evolution form and function of microbial plant and animal life

Biol 202L Principles of Biology Laboratory (0-3) Cr 1 FS *Prereq credit or enrollment in 202* Laboratory to accompany 202

Biol 301 Principles of Genetics (Same as Gen 301) (3-0) Cr 3 FS *Prereq 201L and 202 L credit or enrollment in organic chemistry* Introduction to the principles of transmission and molecular genetics of plants animals and bacteria Recombination structure and replication of DNA gene expression cloning quantitative and population genetics Students may receive graduation credit for no more than one of the following 301 and 301L Gen 260 Gen 301 Gen 320 and Agron 320

Biol 301L Genetics Laboratory (Same as Gen 301L) (0 3) Cr 1 FS *Prereq Credit or enrollment in 301* Laboratory to accompany 301 Students may receive graduation credit for no more than one of the following 301 and 301L Gen 260 Gen 301 Gen 320 and Agron 320

Biol 302 Principles of Molecular Cell Biology and Biochemistry (3 0) Cr 3 FS *Prereq 301* Integration of elementary principles of metabolism bioenergetics cell structure and function to develop a molecular view of how the cell works

Biol 302L Molecular Cell Biology and Biochemistry Laboratory (0 3) Cr 1 FS *Prereq Credit or enrollment in 302* Laboratory to accompany 302 BBMB 311 and Biol 302L cannot both be taken for credit

Biol 303 Biological Evolution (Same as Bot 303 Zool 303) (3 0) Cr 3 FS *Prereq 301* The mechanisms of evolution Topics in microevolution population genetics natural selection genetic variation and adaptation Macroevolution speciation extinction phylogeny and major evolutionary patterns

Biol 312 Ecology (Same as A Ecl 312 Bot 312 EnSci 312) (2-3) Cr 3 FSS *Prereq 201L and 202L* Fundamental concepts and principles of ecology dealing with organisms populations communities and ecosystems Laboratory and field exercises examine ecological principles and methods as well as illustrate habitats

Biol 312I Ecology (Same as Ia LL 312I) See *Iowa Lakeside Laboratory*

Biol 374 Insects and Our Health (Same as Ent 374) See *Entomology* Nonmajor graduate credit

Biol 393 North American Field Trips in Biology Cr 1 to 4 each time taken *Prereq Two courses in the biological sciences and by approval of application* Extended field trips usually during break periods to North American locations of interest to biologists Inquire in 201 Bessey Hall for trip schedule
A Pre trip Seminar Cr 1 Discussion of relevant biological and cultural topics during semester preceding trip
B Field trip Cr 1 to 3 Trip to North American location under supervision of faculty member Report required

Biol 394 International Field Trips in Biology Cr 1 to 4 each time taken *Prereq Two courses in the biological sciences and by approval of application* Extended field trips usually during break periods to international locations of interest to biologists Inquire in 201 Bessey Hall for trip schedule
A Pre trip Seminar Cr 1 Discussion of relevant biological and cultural topics during semester preceding trip
B Field trip Cr 1 to 3 Trip to international location under supervision of faculty member Report required

Biol 398 Cooperative Education Cr R FS SS *Prereq Junior classification and permission of the department cooperative education coordinator*

Required of all cooperative education students Students must register for this course prior to commencing each work period

Biol 403I Evolution (Same as Ia LL 403I) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

Biol 433 Developmental Biology (Same as Zool 433) See *Zoology and Genetics*

Biol 433L Developmental Biology Laboratory (Same as Zool 433L) See *Zoology and Genetics*

Biol 490 Independent Study Cr 1 to 6 each time taken *Prereq 8 credits in biology and permission of instructor* See also 490 offerings in biological science departments No more than 9 credits in Biol 490 may be counted toward graduation and of those only 6 credits may be applied to the major
I Iowa Lakeside Laboratory (Same as Ia LL 490I) Cr 1 to 4 each time taken See *Iowa Lakeside Laboratory*
R Biological research Cr 1 to 6 each time taken For students registering to work on an independent research project under the direction of a faculty member
U Laboratory teaching experience Cr 1 to 2 For students registering to be undergraduate laboratory assistants Offered on a satisfactory fail grading basis only

Biol 494 Biology Internship Cr 1 to 3 each time taken *Prereq 8 credits in biology and permission of instructor* Intended to provide credit for significant professional experiences in biological sciences A written proposal is required prior to registration Intended for Biology majors

Biol 495 Undergraduate Seminar Cr 1 F *Prereq 15 credits in biological science* Content varies from year to year and may include detailed discussion of special topics in biology current issues in biology or careers in biology

Courses Offered at the Gulf Coast Research Laboratory (GCRL), Ocean Springs, Mississippi

The Gulf Coast Research Laboratory is affiliated with the University of Southern Mississippi Iowa State students register for the following University of Southern Mississippi courses and transfer them to their ISU degree programs Written permission of the ISU coordinator for the GCRL 201 Bessey is required for this arrangement Inquire at 201 Bessey for further information or check the www site at www coms usm edu

MAR 301 Marine Biology Cr 5 SS *Prereq 8 semester hours of biological sciences* A general introduction to marine biology with emphasis on local fauna and flora

MAR 402 Applications of Biotechnology in Marine Biology Cr 6 *Prereq 12 semester hours in biology with biochemistry highly recommended* Designed to introduce students to the basic biochemical and molecular techniques used to conduct research in various fields of marine sciences

MAR 457 Coastal Ecology Cr 4 SS *Prereq Permission of instructor* Designed to acquaint teachers with marine and coastal environments

Other courses offered at Gulf Coast are listed under Animal Ecology Botany Geological and Atmospheric Sciences and Zoology and Genetics

Courses Offered by the Organization for Tropical Studies

Iowa State University is a member of the Organization for Tropical Studies (OTS) which offers undergraduate courses in tropical biology in Costa Rica Iowa State students may register for OTS courses and transfer the credit toward their ISU degree programs For further information about OTS courses see www ots duke edu or inquire at 201 Bessey

OTS 410 Tropical Biology Cr 1 to 4 each time taken maximum of 8 *Prereq One year of college biology knowledge of Spanish desirable but not required* Students registering for courses taught by the Organization for Tropical Studies will receive credit for this ISU course when requesting a transfer of credits

(For information regarding graduate courses offered by OTS see *Index Ecology and Evolutionary Biology*)

Biomedical Engineering

(Interdepartmental Graduate Program)

Supervisory Committee E B Bartlett T R Derrick W D Franke S Jeftinija S Mallapragada T D McGee S P McLean P E Patterson R C Seagrave H Tyler R J Weber H Xin

The biomedical engineering program (B M E) is interdisciplinary in scope The participating faculty are from the Colleges of Engineering Veterinary Medicine Education and Agriculture Biomedical engineers are concerned with the application of engineering concepts and analytical techniques to biological and medical problems They are interested in developing new concepts instrumentation and materials for use with living systems In addition they seek to understand those phenomena of living systems which have functional capabilities desirable in the design of physical systems Graduates of the program are able to understand scientific literature formulate hypotheses complete independent research or design projects and report their results They engage in research or design careers in the various fields of biomedical engineering

Undergraduate Study

A curriculum leading to a bachelor s degree in biomedical engineering is not offered Undergraduate students planning graduate study are encouraged to develop knowledge in subjects prerequisite to biomedical engineering courses For example undergraduate students majoring in engineering physics or mathematics are encouraged to elect courses in organic chemistry biochemistry and biology Undergraduate students majoring in life science areas should prepare for graduate study by electing courses in mathematics engineering and physics

Graduate Study

Work is offered for the degrees master of science and doctor of philosophy with a major in biomedical engineering students taking major work in other areas can minor or comajor in biomedical engineering Prerequisite to major and minor work in biomedical engineering is an undergraduate degree in one of the fields of engineering life sciences physical sciences or a professional degree in one of the fields of medicine

The program of formal courses taken by students is oriented toward developing proficiency in research or design in the interdisciplinary field or in utilizing biomedical principles in clinical situations Selected background and advanced courses from related disciplines are taken in conjunction with appropriate biomedical engineering courses The program of formal courses varies depending upon the back ground and interests of the student and is deter mined in consultation with the student s advisory committee

Courses Primarily for Graduate Students, open to qualified undergraduate students

B M E 590 Special Topics Cr 1 to 5 as arranged Investigation of problems of special interest in biomedical engineering
B Simulation
E Information Processing
G Biomechanics
H Virtual Reality
I Computational Intelligence

Courses for Graduate Students

B M E 690 Advanced Topics Cr 1 to 5 as arranged
B Simulation
E Information Processing
G Biomechanics
H Virtual Reality
I Computational Intelligence

B M E 699 Research

Biomedical Sciences

Richard J Martin Chair of Department

University Professors Draper

Professors Bloedel Evans Ghoshal Hsu R Martin Randic Riedesel Scanes Sharp Uemura Ware

Professors (Collaborators) Horst

Distinguished Professors (Emeritus) Christensen Dellmann

University Professors (Emeritus) Adams Reece

Professors (Emeritus) Ahrens Bal Carithers Engen Hembrough Pineda Swenson VanMeter

Associate Professors Apley Bracha Greer Jeftinija A G Kanthasamy P Martin J Ourednik W Ourednik Sakaguchi

Associate Professors (Collaborators) Goff

Associate Professors (Emeritus) Crump

Assistant Professors Day Greenlee Kim

Assistant Professors (Adjunct) Anantharam Barnhill A Kanthasamy Robertson Rowe

Assistant Professors (Collaborators) Kesl Kwon Rasmussen

Instructors (Adjunct) Bolser

Professional Program of Study

For professional curriculum in veterinary medicine leading to the degree doctor of veterinary medicine see *Veterinary Medicine Curriculum*

A good foundation in anatomy physiology and pharmacology of animals is necessary to understand the mechanisms of animal disease processes and their treatment Study of mammalian anatomy and physiology prepares students with a background in the structural and functional activities of cells tissues organs and body systems of importance to veterinary medicine

An understanding of drug action is essential for rational drug therapy The general pharmacology courses provide students with a background in basic pharmacology to include pharmacodynamics toxicology and the clinical application of drugs Special emphasis is placed on chemical agents and therapeutic practices specific to veterinary medicine

Graduate Programs

The department offers work for the degrees master of science and doctor of philosophy with majors in veterinary anatomy physiology or in physiology with pharmacology as a specialization In veterinary anatomy both thesis and nonthesis options are available for the master of science degree Up to 10 credits of dual listed veterinary anatomy courses may be applied for major graduate credit Departmental research facilities provide for training in experimental anatomy pharmacology and physiology Graduate studies are supervised by faculty members recognized in their areas of expertise Current areas of research include diabetes mellitus glia neuron signaling neurophysiology of pain neurotoxicology physiology and pharmacology of nematode ion channels Parkinson s disease pharmacology of schistosomiasis physiology and pharmacology of thalamic neurons physiology of the retina and study of neural stem cells The objective of the department is to prepare graduate students for successful careers in biomedical research and professional service The department is part of interdepartmental programs in neuroscience toxicology and molecular cellular and developmental biology The combined Ph D /DVM program is an option

Foreign language requirements may be established by the student s program of study committee

Courses open for nonmajor graduate credit 354 421

Courses Primarily for Undergraduate Students

B M S 329 Anatomy and Physiology of Domestic Animals (3 0) Cr 3 S *Prereq Biol 202 202L* Survey of body systems of the domestic animals Provides a medical science orientation particularly useful to students in a preveterinary medicine curriculum

Courses Primarily for Professional Curriculum Students

B M S 330 Principles of Morphology I (Dual listed with 530) (3-6) Cr 5 F *Prereq First year classification in veterinary medicine* Comparative anatomy of domestic animals

B M S 331 Principles of Morphology II (Dual listed with 531) (2-6) Cr 4 S *Prereq First year classification in veterinary medicine* Comparative and topographic anatomy of domestic animals

B M S 333 Biomedical Sciences I (5 3) Cr 6 F *Prereq First year classification in veterinary medicine* Microscopic anatomy and physiology of cells tissues cardiovascular system respiratory system and urinary system

B M S 334 Biomedical Sciences II (5 3) Cr 6 S *Prereq First-year classification in veterinary medicine* Microscopic anatomy of the immune system and integument Microscopic anatomy and physiology of the digestive system endocrine system and reproductive system

B M S 337 Neurobiology (Dual listed with 537) (2 2) Cr 3 S *Prereq First year classification in veterinary medicine* Neurobiology of domestic animals

B M S 345 Case Study I (0-4) Cr 2 F *Prereq First year classification in veterinary medicine* Clinical applications of basic sciences taught concurrently in the fall semester of the first year curriculum in veterinary medicine

B M S 346 Case Study II (0 2) Cr 1 S *Prereq First year classification in veterinary medicine* Clinical applications of basic sciences taught concurrently in the spring semester of the first year curriculum in veterinary medicine

B M S 354 General Pharmacology (Dual listed with 554) (3-0) Cr 3 S *Prereq 333 334* General principles drug disposition drugs acting on the nervous cardiovascular renal gastrointestinal and endocrine systems Nonmajor graduate credit

B M S 355 Integrative Physiology (0 2) Cr 1 F *Prereq Second year classification in veterinary medicine* To integrate all organ systems into a total physiological response to stress etc Small group discussions and computer simulations will be utilized

B M S 403 Behavior of Domestic Animals (1 0) Cr 1 Alt S offered 2004 *Prereq Classification in veterinary medicine* Normal and abnormal behavior of domestic animals

B M S 415 Anatomy of Laboratory Animals (Dual listed with 515) (1 2) Cr 2 Alt S offered 2005 *Prereq One year of college biology* Gross and microscopic anatomy of laboratory animals

B M S 416 Avian Anatomy (Dual listed with 516) (1 2) Cr 2 Alt S offered 2004 *Prereq One year college biology* Gross and microscopic anatomy of domestic and exotic birds

B M S 421 Special and Applied Anatomy of the Horse (1-3) Cr 2 F *Prereq 330 classification in veterinary medicine or An S 316 or 415* Applied anatomy of the horse Nonmajor graduate credit

B M S 443 Pharmacology and Therapeutics (Dual listed with 543) (3 0) Cr 3 F *Prereq 354* Pharmacology and therapeutic uses of fluids antimicrobial drugs and antiparasitic drugs and adverse drug reactions

B M S 490 Independent Study Cr 1 to 5 each time taken *Prereq Permission of instructor*
H Honors

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

B M S 501 Selected Research Methods in Pharmacology (0 8) Cr 3 FS SS *Prereq Graduate classification permission of pharmacology staff* Experience in pharmacologic techniques in selected pharmacology laboratories cytochemical methods extracellular and intracellular unit recording microiontophoresis spectrophoto fluorometric analysis of biogenic amines atomic absorption spectrometry radioimmunoassay gas chromatography enzyme analysis use of isotopes in drug studies intestinal perfusion techniques renal clearance methods and isolated tissue bioassay

B M S 511 Functional Neuroanatomy and Morphology of Neurotransmitter Pathways (2 4) Cr 4 Alt S offered 2004 *Prereq 10 credits in biological science and permission of instructor* Basic organizational schemes of the mammalian brain including cytoarchitecture chemoarchitecture and connectivity of different regions of the nervous system

B M S 515 Anatomy of Laboratory Animals (Dual listed with 415) (1 2) Cr 2 Alt S offered 2005 *Prereq One year of college biology* Gross and microscopic anatomy of laboratory animals

B M S 516 Avian Anatomy (Dual listed with 416) (1 2) Cr 2 Alt S offered 2004 *Prereq One year college biology* Gross and microscopic anatomy of domestic and exotic birds

B M S 530 Principles of Morphology I (Dual listed with 330) (3 6) Cr 5 F *Prereq 10 credits in biological science and permission of the instructor* Comparative anatomy of domestic animals

B M S 531 Principles of Morphology II (Dual listed with 331) (2-6) Cr 4 S *Prereq B M S 530* Comparative and topographic anatomy of domestic animals

B M S 537 Neurobiology (Dual listed with 337) (2 2) Cr 3 S *Prereq 10 credits in biological science and permission of the instructor* Neurobiology of domestic animals

B M S 542 Introduction to Molecular Biology Techniques (Same as Zool 542) See *Zoology and Genetics*

B M S 543 Pharmacology and Therapeutics (Dual listed with 443) (3-0) Cr 3 F *Prereq 554* Pharmacology and therapeutic uses of fluids antimicrobial drugs and antiparasitic drugs clinical use of veterinary drugs and adverse drug reactions

B M S 549 Advanced Vertebrate Physiology I (Same as An S 549) (4 0) Cr 4 F *Prereq Zool 355 credit or enrollment in BBMB 420 or 404* Neurophysiology sensory systems muscle neuroendocrinology endocrinology

B M S 552 Advanced Vertebrate Physiology II (Same as An S 552) (4 0) Cr 4 S *Prereq Zool 355 credit or enrollment in BBMB 420 or 404* Cardiovascular renal respiratory and digestive physiology

B M S 552L Advanced Vertebrate Physiology Laboratory (Same as An S 552L) (0 3) Cr 1 S *Prereq Credit or enrollment in B M S 552* Laboratory for cardiovascular renal respiratory and digestive physiology

B M S 554 General Pharmacology (Dual listed with 354 Same as Tox 554) (3 0) Cr 3 S *Prereq 549 and 552 BBMB 404 405* General principles drug disposition drugs acting on the nervous cardiovascular renal gastrointestinal and endocrine systems

B M S 565 Physiology and Pharmacology of Autonomic Nervous System (2 0) Cr 2 Alt S offered 2005 *Prereq 549 552 or permission of instructor* Hsu Release of neurotransmitters and their regulation control and regulation of autonomic functions mechanisms of action of adrenergic and cholinergic receptors

B M S 590 Special Topics Cr 1 to 7 *Prereq Permission of instructor*
A Anatomy
B Physiology
C Pharmacology

B M S 599 Creative Component Cr 1 to 3 Creative component for non thesis master of science degree

Courses for Graduate Students

B M S 688 Research Review Cr 1 each time taken FS A forum for B M S students to gain experience in the critical exchange of ideas through oral presentation and discussion of scientific information

B M S 690 Advanced Topics Cr 1 to 5 *Prereq Permission of instructor*
A Anatomy
B Physiology
C Pharmacology

B M S 698 Seminar
A Cr R each time taken FS Attendance required
B Cr 1 each time taken FS SS Offered on a satisfactory fail grading basis only Attendance and presentation required

B M S 699 Research
A Anatomy
B Physiology
C Pharmacology

Biorenewable Resources and Technology

www biorenew iastate edu

(Interdepartmental Graduate Program)

Program Coordinating Committee B Shanks Chair R C Brown G Kraus T Richard B Nikolau L Johnson J Colletti

Graduate Study

The graduate program in Biorenewable Resources and Technology (BRT) offers students advanced study in the use of plant and crop based resources in the production of biobased products (fuels chemicals materials and energy) This multi disciplinary program offers work for the degrees of master of science and doctor of philosophy in Biorenewable Resources and Technology and a minor to students taking major work in other departments The curriculum is designed to encourage students to obtain co-major degrees in Biorenewable Resources and Technology and a more traditional science or engineering degree A thesis is required for the master of science degree

Prerequisite to major graduate work is a bachelor s degree or prior graduate training in engineering or a physical or biological discipline including agriculture sciences

The core required courses in the Biorenewable Resources and Technology graduate program include a foundation course BRT 501 Fundamentals of Biorenewable Resources two credits of approved laboratory and BRT 506 Biobased Products Seminar The elective core courses must come from an approved list of courses from a variety of traditional disciplines that encompass one or more of four areas considered as barriers in the development of biobased products plant science production processing and utilization Students must include courses from at least three of the four barrier topical areas selected in consultation with the student s Program of Study (POS) committee

Information on applications procedures and specific requirements of the major can be obtained from the following Internet address www biorenew iastate edu

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

BRT 501 Fundamentals of Biorenewable Resources (0 3) Cr 3 S *Prereq Undergraduate training in an engineering or physical or biological discipline or degrees in agriculture or economics* Introduction to the science and engineering of converting biorenewable resources into bioenergy and biobased products Survey of biorenewable resource base and properties description of biobased products methods of biorenewable resource production processing

technologies for fuels chemicals materials and energy environmental impacts economics of biobased products and bioenergy

BRT 506 Biobased Products Seminar (1 0) Cr R or 1 FS *Prereq Undergraduate training in an engineering or physical or biological discipline or degrees in agriculture or economics* Taken one semester for 1 credit and remaining semesters as R credit Seminars and discussion on current topics in biorenewable resources and technology Offered on a satisfactory fail grading basis only
A Cr 1 Paper required
B Cr R Attendance only

BRT 515L Bioinformatics Laboratory (Same as Ch E 515L) See *Chemical Engineering*

BRT 525L Metabolic Engineering Laboratory (Same as Ch E 525L) See *Chemical Engineering*

BRT 543L Tissue Engineering Laboratory (Same as Ch E 543L) See *Chemical Engineering*

BRT 562L Bioseparations Laboratory (Same as Ch E 562L) See *Chemical Engineering*

Botany

www public iastate edu/~botany/

David J Oliver Chair of Department

University Professors Horner

Professors Clark Farrar Oliver Rodermel Spalding van der Valk Wendel Wurtele

Distinguished Professors (Emeritus) Tiffany

Professors (Emeritus) Lamotte Lersten Smith Stewart Swenson

Associate Professors Colbert Crumpton Jurik Moloney Raich Wallace

Assistant Professors Bassham Mittler Nason Wilsey

Assistant Professors (Adjunct) Pritchard

Undergraduate Study

For undergraduate curriculum in liberal arts and sciences major in botany see *Liberal Arts and Sciences Curriculum*

The Botany department offers broad opportunity for the study of many basic and applied aspects of plant biology The botany and biology majors and other undergraduate programs in which the department participates prepare students for a wide range of science related occupations including biotechnology biology teaching medicine and pharmacology conservation and outdoor recreation activities and research and development The botany and biology majors offer excellent preparation for graduate study in biological sciences or in such applied disciplines as agronomy forestry horticulture and plant pathology Graduates of the botany major understand the basic principles of plant structure function ecology and evolution and are able to communicate effectively about plant biology

Botany is one of the basic biological sciences Undergraduates majoring in Botany must therefore obtain a general biological foundation by taking courses in the biology program (see *Biology Cross Disciplinary Program*) Botany faculty are involved in both the organization and teaching of Biology courses thus Biology and Botany are integrated for the benefit of the student

In addition to the basic Liberal Arts and Sciences requirements Botany majors must also complete

1 Biol 201 201L 202 202L 301 301L 302 302L 303 and 312 (22 credits)

2 18 credits at the 300 level or above in botany from an approved list including Plant Anatomy (Bot 404) and at least one course from each of the other three major disciplines within Botany

3 Phys 111 and 112 (8 credits)

4 Two courses in Mathematics (calculus and/or statistics) from an approved list (7 8 credits)

5 Two semesters of general chemistry with labs and at least one semester of organic chemistry with lab (13 credits)

6 A grade of C or better in Engl 104 and 105 and a C or better in an approved writing course (or satisfactory performance on a departmental writing exam) A list of approved courses is available in 353 Bessey Hall

Additional courses in other areas of the biological sciences are recommended depending upon the student s interests Qualified students are encouraged to enrich their program through an independent study or research project (Bot 490) under the guidance of a faculty member Courses at the Iowa Lakeside Laboratory the Gulf Coast Research Laboratory or other field laboratories are also recommended

In addition to the courses listed above students in consultation with their advisers choose electives that address their individual interests and needs

A second major or minor in Biology with a major in Botany is not permitted

Teacher Licensure Botany majors seeking licensure to teach biology in secondary schools must meet requirements of the College of Liberal Arts and Sciences and the College of Education as well as those of the Botany major In addition they must apply formally for admission to the Teacher Education Program See *Index Teacher Education Program and Teacher Licensure*

Botany Minor The department offers a minor in Botany which may be earned by completion of 15 or more credits in Botany courses with at least 6 credits in courses numbered 300 or above and earned at ISU with a grade of C or higher The minor must include 9 credits that are not used to meet any other department college or university requirement

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with a major in Botany and minor work for students majoring in other departments Within the Botany major one of the following areas of specialization may be designated aquatic and wetland ecology cytology ecology morphology mycology physiology and molecular biology or systematics and evolution

The department also participates in the interdepart mental majors in Ecology and Evolutionary Biology Genetics Molecular Cellular and Developmental Biology Plant Physiology Toxicology and Water Resources (See *Index*)

Prospective graduate students need a sound background in the physical biological and mathemati cal sciences and English The department requires submission of Graduate Record Examination aptitude test scores

Courses open for nonmajor graduate credit 320 321 330 403 403l 404 406 410 411 422l 461l 484 484l 487

Courses Primarily for Undergraduate Students

Bot 102 Biology of Plants (2-4) Cr 2 SS 8 weeks Function structure development and evolution of plants Primarily for students who do not have a professional interest in plant science

Bot 202 Field Botany (2 4) Cr 2 FSS 8 weeks Field and laboratory studies of plants in various local habitats Includes trees shrubs flowering plants and other green plants lichens and fungi Not recom mended for students with professional interest in plant science

Bot 301l Iowa Natural History (Same as Ia LL 301l) See *Iowa Lakeside Laboratory*

Bot 302l Plant animal Interactions (Same as Ia LL 302l) See *Iowa Lakeside Laboratory*

Bot 303 Biological Evolution (Same as Biol 303) See *Biology*

Bot 304 Plants and People (3-0) Cr 3 S *Prereq Credit in Biol 201* Wallace Uses of plants and fungi by humans and the importance of plants in the past present and future Discussion of fruits vegetables grains herbs spices beverages oils fibers wood medicines and drugs in the context of their agricultural cultural and economic roles in modern societies Emphasis on origins and worldwide diversity of culturally important plants their characteristics and uses

Bot 306 PlantTaxonomy (2-4) Cr 4 S *Prereq Biol 201* Wendel Principles of plant classification survey of flowering plant families identification and field study of local plants

Bot 308 Plants in the Classroom (2 3) Cr 3 F *Prereq Sophomore classification* Colbert Introduc tion to the structure function and ecology of plants Students will develop lesson plans focusing on plants and have opportunities to prepare presentations on selected aspects of plant biology Intended for Elementary Education Majors and Secondary Education Majors and Secondary Education Students

Bot 312 Ecology (Same as Biol 312) See *Biology*

Bot 312l Ecology (Same as Ia LL 312l) See *Iowa Lakeside Laboratory*

Bot 320 Plant Physiology (3 0) Cr 3 S *Prereq Biol 301 or Gen 320 Biol 302 or BBMB 301 Chem 231 or 332 Phys 106 or 111* Spalding Application of physical and biological principles to the understanding of plant processes involved in assimilation metabolism and regulation of growth and development Nonmajor graduate credit

Bot 321 Plant Physiology Laboratory A (0 3) Cr 1 S B (0 6) Cr 2 S *Prereq Biol 202L credit or enrollment in 320* Spalding Laboratory to accompany 320 321B will include independent group research projects Nonmajor graduate credit

Bot 330 Environmental Systems (Same as Env S 330 EnSci 330) (2-4) Cr 4 F *Prereq Biol 202 or Micro 201 Chem 164 167 or 178 Math 165 or 181* Crumpton Introduction to the dynamics of metabolic and biogeochemical processes in environmental systems emphasizing microbial processes Environmental factors controlling major autotrophic and heterotrophic processes of microbes and higher organisms Laboratory emphasizes mass balance analysis and environmental simulation modeling Nonmajor graduate credit

Bot 340 Biodiversity (Same as Env S 340) (4 0) Cr 2 S Second 8 weeks *Prereq One course in life sciences* Clark Survey of the major groups of organisms and biological systems Definition measurement and patterns of distribution of organisms Sources of information about biodiversity Not intended for major credit in the biological sciences

Bot 356 Dendrology (Same as For 356) (2 6) Cr 4 F *Prereq Biol 201* Farrar Taxonomy morphology and ecology of North American species of woody plants of importance in timber production and wildlife food and cover

Bot 367l PlantTaxonomy (Same as Ia LL 367l) See *Iowa Lakeside Laboratory*

Bot 403 Environmental Biogeochemistry (Same as EnSci 403 Geol 403) (3 2) Cr 4 S *Prereq EnSci 330* Raich Biological chemical and physical phenomena controlling material energy and elemental fluxes in the environment Human interactions with and effects on environmental systems Nonmajor graduate credit

Bot 403l Evolution (Same as Ia LL 403l) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

Bot 404 Plant Anatomy (3 3) Cr 4 F *Prereq Biol 202L 306 recommended* Characteristics of cell and tissue types in vascular plants Anatomy of developing and mature stems roots and leaves including secondary (woody) growth Introduction to the special anatomy of flowers and seeds Nonmajor graduate credit

Bot 406 Principles of Mycology (Same as Micro 406) (2 3) Cr 3 F *Prereq 10 credits in biological sciences* Tiffany Morphology taxonomy and ecology of fungi their relation to agriculture and industry Nonmajor graduate credit

Bot 410 Aquatic Ecology (Same as A Ecl 410 EnSci 410) (3-0) Cr 3 F *Prereq 312 EnSci 330 or For 301* Structure and function of aquatic ecosystems with application to fishery and pollution problems Emphasis on lacustrine riverine and wetland ecology Nonmajor graduate credit

Bot 410L Aquatic Ecology Laboratory (Same as A Ecl 410L EnSci 410L) (0 3) Cr 1 F *Prereq Concurrent enrollment in 410* Field trips and laboratory exercises to accompany 410 Hands-on experience with aquatic research adn monitoring techniques and concepts Nonmajor graduate credit

Bot 411 Identification of Aquatic Organisms (Same as A Ecl 411) (0 3) Cr 1 FS *Prereq Credit or enrollment in 410L* On line taxonomic and identifica tion exercises to accompany 410 Instruction and practice in the identification of algae aquatic macrophytes zooplankton and benthos Nonmajor graduate credit

Bot 422I Prairie Ecology (Same as Ia LL 422I) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

Bot 461I Introduction to GIS (Same as Ia LL 461I) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

Bot 484 Plant Ecology (3-0) Cr 3 S *Prereq Biol 312* Moloney Principles of plant population and commu nity ecology Nonmajor graduate credit

Bot 484I Plant Ecology (Same as Ia LL 484I) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

Bot 487 Aquatic and Wetland Microbial Ecology (Dual listed with 587 same as EnSci 487 Micro 487) (3 0) Cr 3 S *Prereq 6 credits in biology and 6 credits in chemistry* Crumpton Introduction to major functional groups of autotrophic and heterotrophic microorganisms and their roles in aquatic and wetland ecosystems Emphasis on energy flow and nutrient dynamics Nonmajor graduate credit

Bot 490 Independent Study Cr 1 to 3 each time taken *Prereq 7 credits in botany permission of instructor* No more than 9 credits of 490 may be counted toward a degree in botany
A Plant Physiology and Molecular Biology
B Morphology
D Mycology
E Systematics and Evolution
F Plant Ecology
H Honors
I Iowa Lakeside Laboratory (Same as Ia LL 490I) See *Iowa Lakeside Laboratory*
J Cytology
K Aquatic and Wetland Ecology

Courses Primarily for Graduate Students, open to qualified undergraduate students

Bot 501I Freshwater Algae (Same as Ia LL 501I) See *Iowa Lakeside Laboratory*

Bot 505 Plant Diversity and Evolution (2-6) Cr 4 Alt S offered 2005 *Prereq 10 credits in biological sciences* Farrar Current concepts of plant phylogeny from the origin of land plants through the origin of angiosperms with emphasis on morphology reproduction and evolutionary trends in bryophytes pteridophytes and gymnosperms

Bot 512 Plant Growth and Development (Same as Gen 512 MCDB 512 P Phy 512) (2 0) Cr 2 S *Prereq 320 or a course in developmental biology 545 or BBMB 404 405 or Gen 520* Wurtele and Becraft Plant growth and development and its molecular genetic regulation Hormone biosynthesis metabolism and action Signal transduction in plants

Bot 513 Plant Metabolism (Same as P Phy 513) (2 0) Cr 2 F *Prereq 320 Phys 111 Chem 331 one semester of biochemistry recommended* Spalding Photosynthesis respiration and other aspects of plant metabolism

Bot 529 Plant Cell Biology (Same as MCDB 529) (2 0) Cr 2 F *Prereq 320 Biol 301 302 or BBMB 405* Bassham Organization function and development of plant cells and subcellular structures

Bot 531I Conservation Biology (Same as Ia LL 531I) See *Iowa Lakeside Laboratory*

Bot 535I Restoration Ecology (Same as Ia LL 535I) See *Iowa Lakeside Laboratory*

Bot 537 Environmental Stress Physiology (Same as Hort 537) See *Horticulture*

Bot 542 Introduction to Molecular Biology Techniques (Same as Zool 542) See *Zoology*

Bot 545 Plant Molecular Biology (Same as MCDB 545 P Phy 545) (3 0) Cr 3 F *Prereq 320 Biol 302* Mittler Organization and function of plant nuclear and organelle DNA regulation of gene expression Methods of generating novel genetic variation Impact of plant biotechnology on agriculture

Bot 552 Pteridology (1-3) Cr 2 Alt SS offered 2004 *Prereq 10 credits in biological sciences* Farrar Morphology taxonomy and ecology of the lower vascular plants with emphasis on ferns

Bot 562 Evolutionary Genetics (Same as Gen 562) See *Genetics*

Bot 563 Molecular Phylogenetics (Same as Zool 563) See *Zoology*

Bot 564 Wetland Ecology (Same as EnSci 564) (3 0) Cr 3 S *Prereq 15 credits in biological sciences* van der Valk Ecology classification creation and restoration and management of wetlands Emphasis on North American temperate wetlands

Bot 564I Wetland Ecology (Same as Ia LL 564I) See *Iowa Lakeside Laboratory*

Bot 566 Molecular Evolution (Same as Gen 566 Zool 566) (3 0) Cr 3 F *Prereq Permission of instructor* Wendel Seminar/discussion course covering the fundamentals of molecular evolution Emphasis is placed on original scientific literature and current topics including rates and patterns of genetic divergence nucleotide and allelic diversity molecular clocks gene duplication genome structure organellar genomes polyploidy transposable elements and modes and mechanisms of gene and genome evolution

Bot 568 Advanced Systematics (Same as Ent 568 Zool 568) (2 3) Cr 3 Alt S offered 2005 *Prereq Permission of instructor* Principles and practice of systematic biology taxonomy nomenclature and classification of plants and animals sources and interpretation of systematic data speciation fundamentals of phylogenetic systematics

Bot 569 Biogeography (Same as Zool 569) (3 0) Cr 3 Alt F offered 2003 *Prereq Biol 303 or equivalent permission of instructor* Wallace Principles underlying the geographic distribution of organisms throughout the world influences of geology and tectonic movements climate migration dispersal habitat and phylogeny on present distribution patterns biogeographic methods

Bot 570 Landscape Ecology (Same as A Ecl 570) (2 3) Cr 3 Alt F offered 2004 *Prereq Permission of instructor Bot 588 or A Ecl 588 a course in calculus* The study of ecological and evolutionary processes within a spatial context with emphasis on behavior population and community dynamics

Bot 575 Field Mycology (2 6) Cr 4 each time taken SS *Prereq 5 credits in botany* Tiffany Collection and identification of fungi and relation of their occurrence to environmental factors Field trips

Bot 575I Field Mycology (Same as Ia LL 575I) See *Iowa Lakeside Laboratory*

Bot 580I Ecology and Systematics of Diatoms (Same as Ia LL 580I) See *Iowa Lakeside Laboratory*

Bot 582 Functional Ecology (3-0) Cr 3 Alt S offered 2005 *Prereq Biol 312* Jurik The nature of adaptations to physical and biotic environments Biophysical biomechanical and physiological bases of the structure form growth distribution and abundance of organisms

Bot 584 Ecosystem Ecology (Same as EnSci 584) (3-0) Cr 3 Alt S offered 2004 *Prereq Combined 12 credits in biology and chemistry* Survey of the structure and functioning of major terrestrial ecosystems Nutrient cycles energy flows and biotic and abiotic controls over ecosystem structure and composition

Bot 585 Community Ecology (2 3) Cr 3 Alt F offered 2004 *Prereq 484* Factors controlling species diversity species abundance and the structure and function of communities in space and time Weekend field trips to various vegetation types

Bot 587 Aquatic and Wetland Microbial Ecology (Dual listed with 487 same as Micro 587) (3 0) Cr 3 S *Prereq 6 credits in biology and 6 credits in chemistry* Crumpton Introduction to major functional groups of autotrophic and heterotrophic microorgan isms and their roles in aquatic and wetland ecosystems Emphasis on energy flow and nutrient dynamics

Bot 588 Population Ecology (Same as A Ecl 588) (2 2) Cr 3 F *Prereq Biol 312 Stat 401 a course in calculus* Concepts and theories of population dynamics with emphasis on models of growth predation competition and regulation

Bot 590 Special Topics Cr 1 to 3 each time taken *Prereq 10 credits in botany permission of instructor*
A Plant Physiology and Molecular Biology
B Morphology
D Mycology
E Systematics and Evolution
F Plant Ecology
I Iowa Lakeside Laboratory (Same as Ia LL 590I) See *Iowa Lakeside Laboratory*
J Cytology
K Aquatic and Wetland Ecology

Bot 595 Agrostology (2 3) Cr 3 Alt F offered 2004 *Prereq 306* Clark Structure identification classifica tion phylogeny and economic aspects of grasses and related families

Bot 599 Creative Component Cr arr Research toward nonthesis master s degree

Courses for Graduate Students

Bot 612 Seminar in Plant Development Cr 1 each time taken S *Prereq Bot/Gen 512 (can be taken concurrently)* Becraft Wurtele In depth discussion and critique of journal articles on current topics of interest to participants

Bot 641 General Mycology (Same as Micro 641) (2-6) Cr 4 F *Prereq PlP 407* Tiffany First semester of a full year course Taxonomy morphology ecology and phylogeny of slime molds and fungi (ooymcetes chytridiomycetes zygomycetes ascomycetes basidiomycetes and fungi imperfecti)

Bot 642 General Mycology (Same as Micro 642) (2 6) Cr 4 S *Prereq 641* Tiffany Continuation of 641 Taxonomy morphology ecology and phylogeny of slime molds and fungi (oomycetes chytridiomycetes zygomycetes ascomycetes basidiomycetes and fungi imperfecti)

Bot 651 Reproductive Biology of Flowering Plants (Same as Hort 651) See *Horticulture*

Bot 679 Light Microscopy (Same as Micro 679) (2 9) Cr 5 Fall semester even years *Prereq Permission of instructor* Horner Current theories encompassing light optics and their applications for specimen preservation paraffin and resin sectioning general staining histochemistry cytophotometry immunocytochemistry autoradiography image digitization processing and presentation and photomacro and photomicrography Limit of 10 students

Bot 680 Scanning Electron Microscopy (Same as Micro 680) (2 9) Cr 5 Fall semester odd years *Prereq Permission of instructor* Horner Current theories encompassing scanning electron optics and

their applications for high and low vacuum micros copy specimen chemical and cryo-preservation methods x ray microanalysis backscattered and topographic imaging image digitization processing and presentation and photomicrography Limit of 10 students

Bot 681 Transmission Electron Microscopy (Same as Micro 681) (2-9) Cr 5 Spring semester odd years *Prereq Bot 679 and permission of instructor* Horner Current theories encompassing electron optics and their applications for chemical and physical specimen preservation ultramicrotomy general staining and cytochemistry immunocytochemistry autoradiogra phy negative staining and shadowing x-ray microanalysis image digitization processing and presentation and photomicrography Limit of 10 students

Bot 696 Seminar in Plant Physiology and Molecular Biology (Same as Agron 696 BBMB 696 For 696 Gen 696 Hort 696 MCDB 696 P Phy 696) Cr 1 each time taken FS Presentations and discussions of recent literature and problems under investigation

Bot 698 Seminar Cr 1 each time taken Meetings of botany faculty and students to discuss recent literature and problems under investigation
A Vascular Plants
B Non vascular Plants
C Systematics and Evolution
E Molecular Cellular and Developmental Biology (Same as MCDB 698) See *Molecular Cellular and Developmental Biology*
F Ecology
G Aquatic and Wetland Ecology

Bot 699 Research Cr var
A Plant Physiology and Molecular Biology
B Morphology
D Mycology
E Systematics and Evolution
F Plant Ecology
I Iowa Lakeside Laboratory (Same as Ia LL 699I) See *Iowa Lakeside Laboratory*
J Cytology
K Aquatic and Wetland Ecology

Courses Offered at the Gulf Coast Research Laboratory (GCRL), Ocean Springs, Mississippi

The Gulf Coast Research Laboratory is affiliated with the University of Southern Mississippi Iowa State students may register for the following University of Southern Mississippi/GCRL courses and transfer them to their ISU degree programs Written permission of the ISU coordinator for the GCRL 201 Bessey is required for this arrangement Inquire at 201 Bessey for further information

MAR 305 Marine Botany Cr 3 SS A general study of coastal vegetation with emphasis on local examples such as swamps savannas woodlands strands and island vegetation

MAR 490 Independent Study

MAR 491 Special Topics

Business Administration

Labh S Hira Dean

Undergraduate Study

James C McElroy Professor in charge Undergradu ate Programs in Business

For undergraduate curriculum leading to the degree bachelor of science majors in accounting finance management management information systems marketing production/operations management transportation and logistics and a secondary major in international business see *College of Business Curricula*

The department of Business Administration supports the undergraduate programs in the departments of Accounting Finance Logistics Operations and Management Information Systems Management and Marketing by providing specialized coursework in orientation to business and cooperative education opportunities

Graduate Study

James C McElroy Professor in Charge Graduate Programs in Business

The College of Business offers two graduate programs in business administration the master of business administration (MBA) and the master of science in business (M S) which are described below The college also has two specialized master degree programs the master of accounting which is described under the Department of Accounting and the Master of Science in Information Systems (M S I S) which is described under management informations systems Finally the College of Business is a participating member in two interdiscipli nary programs the master of science in industrial relations and the master of science in information assurance

Master of Business Administration (M B.A)

The College of Business offers a 48 credit program leading to a nonthesis master of business administration degree with a specialization in accounting agribusiness finance human resource management information systems marketing or sports manage ment The coursework is designed to provide the knowledge skills and abilities for managerial success and leadership in organizations The M B A is the professional management education program for those pursuing careers in business

Students working toward the master of business administration are required to complete a series of core courses in the basic functional areas of business (accounting economics statistics finance marketing operations management organizational behavior *management information systems international* business ethics and social responsibility strategic management and business policy) and advanced elective coursework

Courses for the M B A are provided by the depart ments of Accounting Economics Finance Logistics Operations and Management Information Systems Management Marketing and Statistics Courses from other departments may also be chosen to meet specific student interests Students interested in the agribusiness specialization may need to take courses in the College of Agriculture Double degree programs are offered with architecture (M Arch /M B A) community and regional planning (M B A / M C R P) and statistics (M B A /M S Statistics)

Students may enroll in either the full time program the part time Saturday program or part time evening program in Des Moines The part time M B A programs are intended for those individuals who desire an M B A while continuing their full time employment

The M B A program is open to all individuals with a baccalaureate degree Undergraduates from liberal arts science and technical programs are especially encouraged to apply Academic potential and promise for a productive career in business and for managerial success and leadership in organizations are important criteria for admission Applicants must submit Graduate Management Admission Test (GMAT) scores official transcripts of previous academic work personal essays resume and three letters of reference International students whose native language is not English and who did not graduate from a U S college or university are required to submit the Test of English as a Foreign Language (TOEFL) scores

Admissions offers to the MBA program are made only for fall semester entry Although applicants will be considered after this date applicants are encouraged to submit their application materials by May 1 (March 1 for international students)

Master of Science (M S) in Business

The College of Business offers graduate work leading to the master of science degree with a major in business All the departments in the college (Accounting Finance Logistics Operations and Management Information Systems Management and Marketing) and the departments of Economics and Statistics cooperate in providing coursework toward this degree The program is designed to serve those students who desire specialized study of an area within business at the master s level It also serves to develop their research capabilities

The M S degree is best suited for students with degrees or academic backgrounds in business as they may complete the program within the 30 credit minimum Students without business backgrounds are required to fulfill pre requisites and common body of knowledge coursework in accounting finance management information systems marketing organizational behavior operations management global business and business ethics The program is composed of 7 credits of required courses in economics and statistics plus 3 to 6 credits of thesis and 17 to 20 credits of coursework in an area of emphasis The student with the help of a program of study committee designs an educational program in specialized functional or industry areas within business

Application deadline for the M S program is May 1 for fall admission and November 1 for spring admission Applicants must submit official transcripts of previous educational coursework and degrees the Graduate Management Admission Test (GMAT) scores personal essays resume and three letters of reference International students whose native language is not English and who did not graduate from a U S college or university are required to submit the Test of English as a Foreign Language (TOEFL) scores

Courses Primarily for Undergraduate Students

BusAd 101 Orientation (1-0) Cr 0 5 FS SS First 8 weeks A required orientation for all College of Business students Review of college and university requirements transfer credits academic planning university policies and deadlines and registration procedures Includes group advising for course selection and registration Offered on a satisfactory fail grading basis only

BusAd 101H Orientation (1 0) Cr 0 5 F 8 weeks *Prereq Membership in the Freshman Honors Program* Designed to supplement the Freshman Honors orientation (Hon 121) with college specific information to facilitate the development of Honors programs of study in business and to acquaint students with university policies and procedures Offered on a satisfactory fail grading basis only

BusAd 201 Introduction to Careers in Business (1-0) Cr 0 5 FS 8 weeks *Prereq Sophomore classification* Introduction to career fields open to business majors Presentations by business professionals in various areas of business Offered on a satisfactory fail grading basis only

BusAd 291 Experiential Learning Cr 1 to 3 each time taken *Prereq Written approval of supervising instructor and department chair on required form prior to the learning experience* Supervised travel and/or work experience in a business related discipline Offered on a satisfactory fail basis only
A Domestic Internship
B International Internship
C Domestic Travel and Study
D International Travel and Study

BusAd 301 Professional Employment Preparation (1 0) Cr 1 Designed to provide students with the skills to develop and implement full time or internship job search Topics include resume writing interviewing skills application letters job search skills business etiquette dress for success adapting to the workplace and organizing your job search Highlights include a business etiquette dinner with professional leader and and employer panel Offered on a satisfactory fail basis only

BusAd 392 Business Analysis Laboratory (1-6) Cr 3 FS SS *Prereq Permission of Instructor* Engineering and business related projects are completed by interdisciplinary student teams Projects are supplied by the industrial partners of the ISU

Business Analysis Lab Supplementary seminars are provided with the intent to help teams complete the projects The seminar topics include an overview of research methodology design principles team dynamics project management library research and presentation methods Offered on a satisfactory fail grading basis only

BusAd 398 Cooperative Education Cr R *Prereq Permission of department* Required of all cooperative students Students must register for this course prior to commencing each work period May be taken with up to three credit hours maximum No more than three credits may be taken in addition to BusAd 398 during any given semester

BusAd 490 Independent Study Cr 1 to 3 each time taken *Prereq 490A Mgmt 414 Mkt 448 Trlog 466 or Fin 380 senior classification permission of instructor for 490H Admission to the Business Honors Program*
A International Business
H Honors

BusAd 491 Professional Experiential Learning Cr 1 to 3 each time taken *Prereq Professional program 12 credits from College of Business written approval of supervising instructor and department chair on required form prior to the learning experience* Supervised travel and/or work experiences in a business related discipline Offered on a satisfactory fail grading basis only
A Domestic Internship
B International Internship
C Domestic Travel and Study
D International Travel and Study
E Other Experiential Learning Experience

Courses Primarily for Graduate Students, open to qualified undergraduate students

BusAd 533 Economic and Business Decision Tools (Same as Econ 533) (3-0) Cr 3 *Prereq Econ 501 or Econ 532 not for Ph D students in the economics program* Team taught by faculty in the Department of Economics and the College of Business this course focuses on applied economic and business tools decision making The topics covered include Monte Carlo analysis with applications to option pricing and insurance mechanism design portfolio analysis using existing standard spreadsheet software and add-ons dynamic programming tools for inventory manage ment and sequential decisions discrete choice modeling and statistical bootstrapping and financial performance evaluation using commercially available software

BusAd 591 Professional Experiential Learning Cr 1 to 3 each time taken *Prereq Graduate standing written approval of supervising instructor and department chair on required form prior to the learning experience* Academically supervised travel and/or work experiences in a business related discipline Offered on a satisfactory fail grading basis only

BusAd 598 Cooperative Education Cr R FS SS *Prereq Permission of instructor* Professional work experience Students must register for this course prior to commencing work Offered on a satisfactory-fail grading basis only

BusAd 599 Creative Component Cr 3 *Prereq Graduate classification permission of supervisory committee chair* Preparation and writing of creative component
A Accounting
C Finance
E Management
F Marketing
H Transportation and Logistics
I Agribusiness
J General Business
K Management Information Systems
L Production/Operations Management

BusAd 699 Research Cr 3 to 6 arranged FS SS *Prereq Graduate classification permission of major professor* Research

Chemical Engineering

www.iastate.edu/~ch_e/

Charles E Glatz Chair of Department

Distinguished Professors Reilly Seagrave

University Professors Hill

Professors Brown Fox Glatz Hebert Jolls Porter Schrader J Shanks Ulrichson

Distinguished Professors (Emeritus) Burnet Doraiswamy

University Professors (Emeritus) Wheelock

Professors (Emeritus) Abraham Boylan Youngquist

Associate Professors Mallapragada Rollins B Shanks Vigil

Associate Professors (Adjunct) Hanneman

Associate Professors (Emeritus) Collins

Assistant Professors Gonzalez Narasimhan

Undergraduate Study

For undergraduate curriculum in chemical engineering leading to the degree bachelor of science see *College of Engineering Curricula* This curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology

Chemical engineering is a profession which provides a link between scientific knowledge and manufactured products The chemical engineer relies on science experience creativity and ingenuity to produce these materials economically Almost everything of a material nature used by society today has at some point felt the influence of the chemical engineer From raw materials such as minerals coal petroleum and agricultural products chemical engineers create versatile intermediate and commodity chemicals high performance fuels new materials for construction pharmaceuticals high performance foodstuffs synthetic textiles plastics solid state electronic components and dozens of other engineered materials The chemical engineer s influence has been important in the development of catalysts fuel cells automatic controls biochemical processes artificial kidneys tissue engineering nuclear energy medical instruments and devices as well as in the develop ment of air and water pollution control systems Many new and equally exciting challenges await the practicing chemical engineer of the future

The profession of chemical engineering embraces a wide variety of activities including research process development product development design manufacturing supervision technical sales consulting and teaching The engineer can be behind a desk in a laboratory in a manufacturing plant or engaged in nationwide and worldwide travel

Successful chemical engineers find chemistry mathematics and physics to be interesting and exciting Many chemical engineers also have interest in the biological sciences The curriculum in chemical engineering includes continued study of chemistry mathematics and physics as well as intensive study in the engineering sciences such as chemical reaction engineering thermodynamics mass transfer fluid mechanics heat transfer system analysis and process synthesis and design

The curriculum in chemical engineering is designed to produce graduates that have the ability to apply knowledge of mathematics science and engineering the ability to design conduct and interpret experi ments and the ability to design a chemical engineer ing system component or process Graduates should also have the ability to function on multi disciplinary teams the ability to identify formulate and solve chemical engineering problems and the ability to use the techniques skills and modern engineering tools necessary for engineering practice

The curriculum should also assure that graduates have the ability to communicate effectively the broad education necessary to understand the impact of chemical engineering solutions in a global and societal context and recognition of the need for and an ability to engage in life-long learning as well as a knowledge of contemporary issues and an understanding of professional and ethical responsibility

The curriculum assures that graduates have a thorough grounding in chemistry along with a working knowledge of advanced chemistry such as organic inorganic physical analytical materials chemistry or biochemistry In addition a working knowledge including safety and environmental aspects of material and energy balances applied to chemical processes thermodynamics of physical and chemical equilibria heat mass and momentum transfer chemical reaction engineering continuous and stage wise separation operations process dynamics and control process design and appropriate modern experimental and computing techniques is assured

A significant number of chemical engineering graduates should have an ability to function as engineers in an international setting and an ability to pursue research and advanced studies in chemical engineering or in related fields such as medicine law and business

A cooperative education program is available to students in chemical engineering See *Cooperative Programs College of Engineering*

Graduate Study

The department offers work for the degrees master of science master of engineering and doctor of philosophy with major in chemical engineering and minor work to students taking major work in other departments

Prerequisite to major graduate work is a bachelor s degree in chemical engineering chemistry or other related field Students with undergraduate background other than chemical engineering should contact the department for further details

The master of engineering degree requires a creative component A thesis is required for the master of science degree

Courses open for nonmajor graduate credit All 300 and 400 level courses except 302 391 392 396 397 398 490 498 and 499

Courses Primarily for Undergraduate Students

Ch E 202 Seminar (1-0) Cr R S *Prereq Sophomore classification in chemical engineering* Offered on a satisfactory fail grading basis only

Ch E 210 Material and Energy Balances (3-0) Cr 3 FS *Prereq Chem 17B Math 166* Introduction to chemical processes Physical behavior of gases liquids and solids Application of material and energy balances to chemical engineering equipment and processes

Ch E 298 Cooperative Education Cr R FS SS *Prereq Permission of department chair* First professional work period in the cooperative education program Students must register for this course before commencing work

Ch E 302 Seminar (1-0) Cr R S *Prereq Junior classification in chemical engineering* Offered on a satisfactory fail grading basis only

Ch E 325 Chemical Engineering Laboratory I (0-4) Cr 2 FS *Prereq 357 credit or enrollment in 381* Experiments covering fundamental material and energy balances momentum and energy transport operations and thermodynamics Computer applications Nonmajor graduate credit

Ch E 356 Transport Phenomena I (3 0) Cr 3 FS *Prereq 210 Phys 221 credit or enrollment in Math 267* Momentum and mechanical energy balances Incompressible and compressible fluid flow Applications to fluid drag piping system design filtration packed beds and settling Nonmajor graduate credit

Ch E 357 Transport Phenomena II (3 0) Cr 3 FS *Prereq 356* Conduction and diffusion convective heat and mass transfer boiling and condensation radiation

and design of heat exchange equipment Introduction to diffusion Nonmajor graduate credit

Ch E 358 Separations (4 0) Cr 4 FS *Prereq 357* Diffusion and mass transfer in fluids Analysis and design of continuous contacting and multistage separation processes Binary and multicomponent distillation absorption extraction evaporation membrane processes and simultaneous heat and mass transfer Nonmajor graduate credit

Ch E 381 Chemical EngineeringThermodynamics (3 0) Cr 3 FS *Prereq Math 267 Phys 222 Chem 321* Application of thermodynamic principles to chemical engineering problems Thermodynamic properties of fluids phase equilibria and chemical reaction equilibria Nonmajor graduate credit

Ch E 382 Chemical Reaction Engineering (3 0) Cr 3 FS *Prereq 381 credit or enrollment in 357* Kinetics of chemical reactions design of homoge neous and heterogeneous chemical reactors Nonmajor graduate credit

Ch E 391 Foreign Study Orientation (1 0) Cr 1 S *Prereq 356 permission of instructor* Preparation for foreign study program Offered on a satisfactory fail basis only Credit for graduation allowable only upon completion of 392

Ch E 392 Foreign Study Program Cr 2 6 SS *Prereq 391* Study of chemical engineering including laboratories and lectures at University College London or other collaborating international universities Comparative study of U S and international manufacturing facilities Expenses required Offered on a satisfactory fail grading basis only

Ch E 396 Summer Internship Cr R SS *Prereq Permission of department* Summer professional work period Students must register for this course prior to commencing work

Ch E 397 Engineering Internship Cr R FS *Prereq Permission of department* One semester maximum per academic year professional work period Students must register for this course prior to commencing work

Ch E 398 Cooperative Education Cr R FS SS *Prereq 298 permission of department chair* Second professional work period in the cooperative education program Students must register for this course before commencing work

Ch E 406 Environmental Chemodynamics (3 0) Cr 3 Alt F offered 2003 *Prereq 381 credit or enrollment in 358* Examines the mechanisms and rates of chemical transport across air water and soil interfaces Applications of transport and thermody namic fundamentals to movement of chemicals in the environment Nonmajor graduate credit

Ch E 410 Industrial and Engineering Chemistry (2 3) Cr 3 Alt F offered 2004 *Prereq 382 and Chem 331 or senior or graduate classification in chemistry or material science and engineering* Integration and synthesis of chemical engineering and chemistry as practiced in modern industry Engineering of chemical reactions and processes Processing routes and product engineering for commodity chemicals petroleum based fuels petrochemicals intermediates specialty chemicals pharmaceuticals and engineered materials Environmental strategies for waste/by product minimization and pollution prevention Nonmajor graduate credit

Ch E 415 Biochemical Engineering (3 0) Cr 3 S *Prereq 357 382 recommended Chem 331 Enrollment in Ch E 515L optional* Application of basic chemical engineering principles in biochemical and biological process industries such as enzyme technology and fermentation Nonmajor graduate credit

Ch E 421 Process Control (3-0) Cr 3 FS *Prereq Credit or enrollment in 35B Math 267* Control of industrial chemical processes Device applications and limitations Dynamics of chemical process compo nents and process control systems Nonmajor graduate credit

Ch E 426 Chemical Engineering Laboratory II (0-4) Cr 2 FS *Prereq 325 358 382* Experiments in heat and mass transfer staged operations chemical reactor performance unit processes Computer applications Nonmajor graduate credit

Ch E 430 Process and Plant Design (2-6) Cr 4 FS *Prereq 358 382* Synthesis of chemical engineering processes equipment and plants Cost estimation and feasibility analysis Nonmajor graduate credit

Ch E 443 Polymers and Polymer Engineering (3-0) Cr 3 S *Prereq 382 and Chem 331 or Mat E 351* Chemistry of polymers addition and condensation polymerization Physical and mechanical properties polymer rheology production methods Applications of polymers in the chemical industry Nonmajor graduate credit

Ch E 490 Independent Study (0 3 to 0 18) Cr 1 to 6 Introduction to research methods investigation of an approved topic
H Honors

Ch E 498 Cooperative Education Cr R FS SS *Prereq 398 permission of department chair* Third and subsequent professional work periods in the cooperative education program Students must register for this course before commencing work

Ch E 499 Undergraduate Research (0 9) Cr 3 *Prereq Permission of department* Research in chosen area of chemical engineering with final written report Students are encouraged to elect this course for two consecutive semesters For students majoring in chemical engineering No more than 6 credits may be counted toward graduation

Courses Primarily for Graduate Students, open to qualified undergraduate students

Ch E 515L Bioinformatics Laboratory (Same as BRT 515L) (0-3) Cr 1 Alt S offered 2004 *Prereq Credit or enrollment in 415 or BBMB 301 or 404* Project based computational and experimental investigation of enzyme structure and function

Ch E 525 Metabolic Engineering (3 0) Cr 3 Alt S offered 2004 *Prereq 382 Chem 331 Enrollment in Ch E 525L optional* Principles of metabolic engineer ing Emphasis on emerging examples in biorenewables and plant metabolic engineering Overview of biochemical pathways determination of flux distributions by stoichiometric and labeling techniques kinetics and thermodynamics of metabolic networks metabolic control analysis genetic engineering for overexpression deregulation or inhibition of enzymes directed evolution application of bioinformatics genomics and proteomics

Ch E 525L Metabolic Engineering Laboratory (Same as BRT 525L) (0 3) Cr 1 Alt S offered 2004 *Prereq 382 BBMB 404 or background combining metabolism and laboratory experience* Project based development of metabolic flux analysis of fermenta tion for the production of chemicals Engineers and biologists will divide responsibilities in team assignments

Ch E 539 Fluidized Bed Processes (Same as M E 539) See *Mechanical Engineering*

Ch E 540 Biomedical Applications of Chemical Engineering (3-0) Cr 3 Alt S offered 2005 *Prereq 210 Math 266 Phys 222* Applications of material and energy balances transport phenomena chemical reaction engineering and thermodynamics to problems in biomedical and biochemical engineering applied physiology and environmental studies

Ch E 543 Polymeric Biomaterials (3 0) Cr 3 Alt F offered 2003 *Prereq Chem 331 or a polymers class Enrollment in Ch E 543L optional* Polymeric biomaterials overview of biomaterial requirements different classes of polymers used as biomaterials specific bioapplications of polymers

Ch E 543L Tissue Engineering Laboratory (Same as BRT 543L) (0 3) Cr 1 Alt F offered 2003 *Prereq Chem 331 or a polymers class* Problem based learning laboratory involving working in teams to design construct and test a bioreactor to cultivate bioartificial skin *in vitro* on three dimensional porous biodgradable polymer scaffolds

Ch E 545 Analytical and Numerical Methods (3 0) Cr 3 F *Prereq 358 Math 267* Analysis of equipment and processes by analytic and/or numerical solution of descriptive differential equations Operational and series techniques boundary value problems numerical interpolation and approximation integration techniques

Ch E 552 Transport Phenomena I (3 0) Cr 3 F *Prereq 357 381 Math 267 credit or enrollment in 545* Equations of change for mass energy and momentum Introduction to transport in multicompo nent systems Exact and approximate solutions to the equations of motion

Ch E 553 Transport Phenomena II (3 0) Cr 3 S *Prereq 552* Convective and radiative heat transfer boiling condensation multicomponent diffusion mass transfer models High transfer rate effects Simultaneous heat mass and momentum transfer

Ch E 562 Bioseparations (3 0) Cr 3 Alt F offered 2004 *Prereq 357 or advanced standing in a science major Enrollment in Ch E 562L optional* Principles and techniques for separation and recovery of biologically produced molecules especially proteins Relationship between the chemistry of biological molecules and efficient separation and preservation of biological activity Includes centrifugation and filtration membrane processing extraction precipitation and crystallization chromatography and electrophoresis

Ch E 562L Bioseparations Laboratory (Same as BRT 562L) (0 3) Cr 1 Alt F offered 2004 *Prereq 358 or background combining protein chemistry and lab experience* Project based development of protein recovery from plants process Engineers and biologists will divide responsibilities in team assignments

Ch E 565 Processing of Solid State Materials (3 0) Cr 3 Alt S offered 2005 *Prereq 382* Application of chemical engineering principles in the semiconductor and related industries Analysis of chemical and physical processes in materials fabrication

Ch E 572 Turbulence (Same as Aer E 572) See *Aerospace Engineering*

Ch E 583 AdvancedThermodynamics (3 0) Cr 3 S *Prereq 381* Application of thermodynamic principles to chemical engineering problems Thermodynamic properties of non ideal fluids and solutions phase and chemical reaction equilibria/stability

Ch E 587 Advanced Chemical Reactor Design (3 0) Cr 3 F *Prereq 382* Analysis of complex reactions and kinetics Fixed bed fluidized bed and other industrial reactors Analysis and design of non ideal flow mixing and residence times Heterogeneous reactors

Ch E 590 Special Topics Cr 2 to 6 each time taken Investigation of an approved topic on an individual basis

Ch E 595 Special Topics Cr 2 or 3 each time taken *Prereq Permission of instructor*
A Separations
B Advanced Control Theory
C Crystallization
D Thermodynamics
E Kinetics and Catalysis
F Transport Operations
G Bioengineering
H Chemical Engineering Instrumentation
I Materials

Ch E 599 Creative Component Cr var

Courses for Graduate Students

Ch E 601 Seminar (1 0) Cr R FS Offered on a satisfactory fail grading basis only

Ch E 632 Multiphase Flow (Same as M E 632) See *Mechanical Engineering*

Ch E 645 Advanced Calculation Methods for Chemical Engineers (3-0) Cr 3 Alt S offered 2005

Prereq 545 Advanced analysis and design of equipment and processes requiring specialized mathematical techniques

Ch E 652 Advanced Transport (3 0) Cr 3 Alt F offered 2004 *Prereq 552 and 553* Advanced topics in momentum transport fluid mechanics and mass transport including study of recent literature

Ch E 688 Catalysis and Catalytic Processes (3-0) Cr 3 Alt S offered 2004 *Prereq 382* Principles and applications of heterogeneous and homogeneous catalysis Adsorption Reaction kinetics and mass transfer effects Catalyst characterization Industrial catalytic processes

Ch E 690 AdvancedTopics Cr var

Ch E 697 Engineering Internship Cr R FS SS *Prereq Permission of major professor graduate classification* One semester and one summer maximum per academic year professional work period

Ch E 699 Research

Chemistry

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Gordon J Miller Chair of Department

Distinguished Professors Angelici Barton Corbett Espenson Gordon Small Thiel Yeung

University Professors Hoffman Larock Verkade

Professors Armstrong Geoffroy Greenbowe Houk Kostic Kozak Kraus Miller Petrich Porter Rabideau W Trahanovsky

Distinguished Professors (Emeritus) Fritz Johnson Ruedenberg Svec

Professors (Emeritus) Franzen Gerstein Hutton Jacobson Martin McCarley Powell Struve Voigt

Associate Professors Ashby Jenks Schmidt Rohr Shin Woo

Associate Professors (Adjunct) Russell K Trahanovsky

Assistant Professors Hong Lin Pohl Song Zhao

Undergraduate Study

For undergraduate curricula in liberal arts and sciences leading to the degrees bachelor of science and bachelor of arts see *Liberal Arts and Sciences Curriculum*

Graduates holding the B S degree in chemistry qualify in many fields as teachers of chemistry as supervisors in industry as technical sales personnel and as research chemists in federal state municipal academic or industrial laboratories Students with high scholastic standing often continue with graduate work where they can explore more thoroughly the specialized areas of chemistry in which they are interested

The B A degree is useful for students who intend to pursue studies in parallel areas such as secondary school teaching or to obtain joint majors or strong minors The B A degree does not prepare students as well for graduate study or professional employment in chemistry

Graduates have firm foundations in the fundamentals and application of current chemical theories They are able to design carry-out record and analyze the results of a chemical experiment They are able to use modern instrumentation and classical techniques to identify and solve chemical problems as well as explore new areas of research Graduates are able to communicate the results of their work to chemists as well as non-chemists They understand the ethical and environmental dimensions of problems and issues facing chemists They follow the proper procedures and regulations for safe storage labeling use of chemicals and disposal of chemicals Graduates are skilled in problem solving critical thinking and analytical reasoning These skills can be applied to careers in education and industry or professions such as law medicine environmental sciences and forensic sciences The curricula in chemistry are approved by the American Chemical Society(ACS) Students who complete the program obtain an ACS certified baccalaureate degree

Liberal arts majors who wish to transfer into chemistry at the end of their second year may still complete all degree requirements and graduate within five years

Undergraduate students seeking the B S degree in chemistry usually take courses essential to the degree program according to the following schedule

First year Chem 177M 177N 178M 211L Math 165 166 Engl 104 105 Lib 160

Second year Chem 331 332 333L 334L Math 265 Phys 221 222

Third year Chem 321 322 322L 316 316L 301 Engl 314 Foreign language requirement

Fourth year Chem 402 401L 2 advanced chemistry courses (minimum 4 credits) Chem 399 or 499 is strongly recommended however credits earned in 399/499 can only be used to meet one of the advanced course requirements

Chemistry majors seeking certification to teach chemistry in secondary schools must meet requirements of the College of Education as well as those of the chemistry program In addition they must apply formally for admission to the teacher education program

Undergraduate students seeking the B A degree in chemistry have the following courses in their degree programs as minimum requirements 177 (or 167) 177L (or 167L) 178 211 211L 301 316 316L 321 321L or 322L 322 331 331L 332 332L Math 165 166 and Phys 221 222 are required as supporting work

The Department offers a minor in chemistry which may be earned by credit in Chem 177 177L (or 167 and 167L) 178 211 211L 321 331 331L and one of the following Chem 301 316 and 316L or 322 and 321L or 332 and 332L The total minimum credits in chemistry thus will be 20 to 23 depending on which advanced courses are selected

English proficiency requirement The Department requires a grade of C– or better in each of English 104 105 and 314

Graduate Study

The Department offers work for the degrees master of science and doctor of philosophy with majors in analytical inorganic organic and physical chemistry as well as the degrees master of science and doctor of philosophy in chemistry Co majors may be taken between areas within chemistry or between one of the areas in chemistry and another department Courses in other areas of chemistry as well as courses in other departments may be used to satisfy the requirement for coursework outside the major field A Ph D student in chemistry may choose an additional speciality in one of the five areas Materials Chemistry Industrial Chemistry Biomolecular Sciences Chemical Instrumentation and Foresnci Chemistry A minimum of ten credits is required for each additional specialty A course which counts towards an additional specialty may also count toward the outside course requirement A minor in chemistry is available to students in other departments The Department participates in the interdepartmental major in toxicology

The Department of Chemistry requires all graduate students majoring in chemistry to teach as part of their training for an advanced degree

Prerequisite to major graduate work is the completion of undergraduate work in chemistry mathematics and physics substantially equivalent to that required of undergraduate chemistry majors at this institution

Courses open for nonmajor graduate credit 301 316 316L 321 321L 322 331 332 401L 402

The course numbers for general chemistry courses include 105 and 160 178

Index to field of work for 200 level courses and above is given by the second and third digits of course numbers

(a) Inorganic Chemistry 00-09

(b) Analytical Chemistry 10 19

(c) Physical Chemistry 20 29 and 60-69

(d) Organic Chemistry 30 39

(e) Chemical Education 50 59

(f) Interdisciplinary Chemistry 70 89

(g) Research 99

Courses Primarily for Undergraduate Students

Chem 105 Fundamentals of College Chemistry (3-0) Cr 3 F *Prereq 1 year high school algebra* An in depth active learning experience designed to impart the fundamental concepts and principles of chemistry with an emphasis on mathematics skills and logical thinking For students intending to enroll in general chemistry and who have not taken high school chemistry or who have not had a high school college preparatory chemistry course Credit for Chem 105 does not count toward graduation but it does count toward the GPA

Chem 155 Foundations of Chemistry for Engineers (3-0) Cr 3 F *Prereq Math 140 or the high school equivalent* The first semester of a two semester sequence covering principles of chemistry and properties of matter explained in terms of modern chemical theory with emphasis on topics of general interest to the engineer Chem 155 may not be counted for credit toward graduation in any engineering curriculum Credit may not be applied toward graduation for both 160 and another chemistry course Only one of 163 165 167 and 177 may count toward graduation Only one of 155 163 167 and 177 may count toward graduation

Chem 160 Chemistry in Modern Society (3 0) Cr 3 S Aspects of chemistry visible to a nonscientist in our society A survey of selected areas of chemistry with emphasis on the interface between chemistry and other fields of human activity Credit may not be applied toward graduation for both 160 and another chemistry course

Chem 163 General Chemistry (4 0) Cr 4 S SS *Prereq 1 year of high school algebra and geometry and either Chem 105 or 155 or 1 year of high school chemistry and credit or enrollment in 163L* The first semester of a two semester sequence A general survey of chemistry and properties with an emphasis on conceptual problems Stoichiometry atomic structure chemical bonding states of matter energy relations acid base theory and oxidation reduction reactions The 163 164 sequence does not meet the prerequisite for 331 Credit for examination (test-out exams) for 163 is available only to students who are not currently enrolled in the course Credit may not be applied toward graduation for both Chem 160 and another chemistry course Only one of 163 165 167 and 177 may count toward graduation Only one of 155 163 167 and 177 may count toward graduation

Chem 163L Laboratory in General Chemistry (0 3) Cr 1 FS SS *Prereq Credit or enrollment for credit in 163 Laboratory to accompany 163* Must be taken with 163 Only one of 163L 167L and 177L may count toward graduation

Chem 164 General Chemistry (3 0) Cr 3 FS *Prereq 163 and 163L* Continuation of 163 A general survey of chemistry and properties with an emphasis on conceptual problems Kinetics gas phase and acid base equilibria electrochemistry selected topics in the chemistry of metallic and nonmetallic elements and organic molecules The 163 164 sequence does not meet the prerequisite for 331 Credit by examination (test-out exams) for 164 is available only to students who are not currently enrolled in the course Only one of 164 and 178 may count toward graduation

Chem 164L Laboratory in General Chemistry (0-3) Cr 1 FS *Prereq 163L and credit or enrollment for credit in 164* Laboratory to accompany 164 164L is not a necessary corequisite with 164 Only one of 164L and 178L may count toward graduation

Chem 165 Foundations of Chemistry for Engineers (4 0) Cr 4 S *Prereq 155* Continuation of 155 Principles of chemistry and properties of matter explained in terms of modern chemical theory with emphasis on topics of general interest to the engineer Chem 165 or 167 satisfies the chemistry requirement in engineering curricula Credit may not be applied toward graduation for both Chem 160 and another chemistry course Only one of 163 165 167 and 177 may count toward graduation Only one of 155 163 167 and 177 may count toward graduation

Chem 167 General Chemistry for Engineering Students (4 0) Cr 4 FS *Prereq Math 140 or the high school equivalent and one year of traditional college prep chemistry or Chem 105* Principles of chemistry and properties of matter explained in terms of modern chemical theory with emphasis on topics of general interest to the engineer This is an accelerated course designed for students with an excellent preparation in math and science and is a terminal course intended for engineering students who do not plan to take additional courses in chemistry Credit may not be applied toward graduation for both 160 and another chemistry course Only one of 163 165 167 and 177 may count toward graduation Only one of 155 163 167 and 177 may count toward graduation Credit by examination (test out exams) for 167 is available only to students who are not currently enrolled in the course

Chem 167L Laboratory in General Chemistry for Engineering (0 3) Cr 1 FS *Prereq Credit or enrollment for credit in 167 or 165* Laboratory to accompany 167 Only one of 163L 167L and 177L may count toward graduation

Chem 177 General Chemistry (4 0) Cr 4 FS SS *Prereq Math 140 or high school equivalent and 105 155 or 1 year high school chemistry and credit or enrollment in 177L* 177M For chemistry and biochemistry majors The first semester of a two semester sequence which explores chemistry at a greater depth and with more emphasis on concepts problems and calculations than 163 164 Recommended for physical and biological science majors chemical engineering majors and all others intending to take 300 level chemistry courses Principles and quantitative relationships stoichiometry chemical equilibrium acid base chemistry thermochemistry rates and mechanism of reactions changes of state solution behavior atomic structure periodic relationships chemical bonding Credit may not be applied toward graduation for both 160 and another chemistry course Only one of 163 165 167 or 177 may count toward graduation Only one of 155 163 167 and 177 may count toward graduation Credit by examination (test-out exams) for 177 is available only to students who are not currently enrolled in the course

Chem 177L Laboratory in General Chemistry (0-3) Cr 1 FS SS *Prereq Credit or enrollment for credit in 177* Laboratory to accompany 177 177L must be taken with 177 177N For chemistry and biochemistry majors Only one of 163L 167L and 177L may count toward graduation

Chem 178 General Chemistry (3 0) Cr 3 FS *Prereq 177 177L* Continuation of 177 Recommended for physical or biological science majors chemical engineering majors and all others intending to take 300 level chemistry courses 178M For chemistry and biochemistry majors Electro chemistry acid base equilibria thermodynamics nuclear chemistry and descriptive topics (non metals transition metals coordination compounds organic compounds polymers biological molecules) Only one of 164 and 178 may count toward graduation Credit by examination (test-out exams) for 178 is available only to students who are not currently enrolled in the course

Chem 178L Laboratory in General Chemistry (0-3) Cr 1 FS *Prereq 177L and credit or enrollment for credit in 178* Laboratory to accompany 178 178L is not a necessary corequisite with 178 Only one of 164L and 178L may count toward graduation

Chem 211 Quantitative and Environmental Analysis (2-0) Cr 2 FS *Prereq 164 and 164L or credit or enrollment in 178 and concurrent enrollment in 211L* Theory and practice of elementary volumetric chromatographic electrochemical and spectrometric methods of analysis Chemical equilibrium sampling and data evaluation Emphasis on environmental analytical chemistry the same methods are widely used in biological and materials sciences as well

Chem 211L Quantitative and Environmental Analysis Laboratory (0-6) Cr 2 FS *Prereq Credit or enrollment in 164 and 164L or 178 and concurrent enrollment in Chem 210 or 211* Introductory laboratory experience in volumetric spectrometric electrochemical and chromatographic methods of chemical analysis

Chem 231 Elementary Organic Chemistry (3 0) Cr 3 FS SS *Prereq 163 163L credit or enrollment in 231L* A survey of modern organic chemistry including nomenclature structure and bonding and reactions of hydrocarbons and important classes of natural and synthetic organic compounds For students desiring only an elementary course in organic chemistry Students in physical or biological sciences and premedical or preveterinary curricula should take the full year sequence 331 and 332 (with the accompanying laboratories 331L and 332L) Only one of 231 and 331 or BBMB 221 may count toward graduation

Chem 231L Laboratory in Elementary Organic Chemistry (0 3) Cr 1 FS SS *Prereq Credit or enrollment for credit in 231* Laboratory to accompany 231 231L must be taken with 231

Chem 298 Cooperative Education Cr R FS SS *Prereq Permission of the Department cooperative education coordinator sophomore classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Chem 299 Undergraduate Research (for Freshmen and Sophomores) Cr var *Prereq Permission of staff member with whom student proposes to work*

Chem 301 Inorganic Chemistry (2 0) Cr 2 S *Prereq 321* Atomic and molecular structure and bonding principles molecular shapes and symmetry acids and bases solid state structures and properties inorganic chemistry of H B C Nonmajor graduate credit

Chem 316 Instrumental Methods of Chemical Analysis (2 0) Cr 2 F *Prereq 211 211L Math 166 and concurrent enrollment in 316L Phys 222 recommended* Quantitative and qualitative instrumental analysis Operational theory of instruments atomic and molecular absorption and emission spectroscopy electroanalysis mass spectrometry liquid and gas chromatography electrophoresis literature of chemical analysis Nonmajor graduate credit

Chem 316L Instrumental Analysis Laboratory (0 6) Cr 2 F *Prereq Credit or enrollment in Chem 316* Advanced laboratory experience in UV visible spectrophotometry atomic absorption and emission spectrometry electrochemistry gas and liquid chromatography electrophoresis mass spectrometry and other instrumental methods Nonmajor graduate credit

Chem 321 Physical Chemistry I (3-0) Cr 3 FS *Prereq 178 Math 166 Phys 222 recommended* Classical thermodynamics 1st 2nd and 3rd laws with applications to gases and interfacial systems multicomponent multiphase equilibrium of reacting systems surface chemistry and electrochemical cells Nonmajor graduate credit

Chem 321L Laboratory in Physical Chemistry for Engineers (1 3) Cr 2 S *Prereq Credit or enrollment for credit in 321* Error analysis use of computer thermodynamics of gases transport properties thermochemistry thermodynamics of phase equilibrium chemical kinetics polymers mass spectrometry Only one of 321L and 322L may count toward graduation Nonmajor graduate credit

Chem 322 Physical Chemistry II (3 0) Cr 3 S *Prereq Chem 321* Kinetic theory of gases transport properties chemical kinetics quantum mechanics atomic and molecular structure spectroscopy statistical thermodynamics solids Nonmajor graduate credit

Chem 322L Laboratory in Physical Chemistry (1 6) Cr 3 S *Prereq Credit or enrollment for credit in 322* Error analysis use of computer thermodynamics of gases transport properties thermochemistry thermodynamics of phase equilibrium chemical kinetics polymers molecular spectroscopy x-ray crystallography nuclear chemistry surface chemistry mass spectrometry Only one of 321L and 322L may count toward graduation

Chem 331 Organic Chemistry (3 0) Cr 3 FS *Prereq 178 enrollment in 331L highly recommended* The first half of a two semester sequence Modern organic chemistry including nomenclature synthesis structure and bonding reaction mechanisms For students majoring in physical and biological sciences premedical and preveterinary curricula chemistry and biochemistry Students desiring only one semester of organic chemistry should take 231 and 231L not 331 Only one of 231 and 331 may count toward graduation Nonmajor graduate credit

Chem 331L Laboratory in Organic Chemistry (0 3) Cr 1 FS *Prereq Credit or enrollment for credit in 331* Laboratory to accompany 331

Chem 332 Organic Chemistry (3-0) Cr 3 FS 332M S *Prereq 331 enrollment in 332L highly recommended* Continuation of 331 Modern organic chemistry including nomenclature synthesis structure and bonding reaction mechanisms natural products carbohydrates and proteins For students majoring in physical and biological sciences premedical and preveterinary curricula chemistry and biochemistry 332M For chemistry and biochemistry majors Nonmajor graduate credit

Chem 332L Laboratory in Organic Chemistry (0-3) Cr 1 FS *Prereq 331L credit or enrollment for credit in 332* Laboratory to accompany 332

Chem 333L Laboratory in Organic Chemistry (0-6) Cr 2 F *Prereq Credit or enrollment for credit in 331* Laboratory to accompany 331 for chemistry and biochemistry majors

Chem 334L Laboratory in Organic Chemistry (0-6) Cr 2 S *Prereq 333L credit or enrollment for credit in 332* Laboratory to accompany 332 for chemistry and biochemistry majors

Chem 398 Cooperative Education Cr R FS SS *Prereq Permission of the Department cooperative education coordinator junior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Chem 399 Undergraduate Research Cr var *Prereq Permission of instructor with whom student proposes to work and junior or senior classification* No more than six total credits of Chem 399 and Chem 499 may count toward graduation

Chem 401L Inorganic Chemistry Laboratory (0 3) Cr 1 F *Prereq 301* Preparation and characterization of inorganic and organometallic compounds by modern techniques For students majoring in chemistry or biochemistry Nonmajor graduate credit

Chem 402 Inorganic Chemistry (3-0) Cr 3 F *Prereq 301 331 recommended* Chemistry of the d and f metals Structure bonding electronic spectra and reaction mechanisms Aspects of organometallic solid state and bioorganic chemistry Nonmajor graduate credit

Chem 490 Independent Study Cr var *Prereq Completion of 6 credits in chemistry at the 300 level*

or higher and permission of instructor No more than 9 credits of Chem 490 may count toward graduation

Chem 498 Cooperative Education Cr R FS SS *Prereq Permission of the Department cooperative education coordinator senior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Chem 499 Senior Research (0-6 or 0 9) Cr 2 or 3 each time taken *Prereq Permission of instructor with whom student proposes to work B average in all chemistry physics and mathematics courses* Research in chosen area of chemistry with final written report as senior thesis This course should be elected for two consecutive semesters For students majoring in chemistry No more than six total credits for Chem 399 and 499 may count toward graduation

Courses Primarily for Graduate Students, open to qualified undergraduate students

Chem 500 Advanced Inorganic Chemistry (2 0) Cr 2 F *Prereq 301* Concepts of structure bonding and chemical reactivity applied to inorganic compounds of the metallic and nonmetallic elements For students not majoring in inorganic chemistry

Chem 501 Inorganic Preparations (0-3) Cr 1 F *Prereq 402* Preparation and characterization of inorganic and organometallic compounds by modern research techniques

Chem 503 Bioinorganic Chemistry (Same as BBMB 503) (2-0) Cr 2 Alt S offered 2005 *Prereq 402 or BBMB 405* Essential elements transport and storage of ions and of oxygen metalloenzymes and metallocoenzymes electron transfer processes in respiration and photosynthesis metabolism of nonmetals and redox processes involved in it medicinal aspects of inorganic chemistry

Chem 505 Physical Inorganic Chemistry (3 0) Cr 3 F *Prereq 402 and 322* Elementary group theory and molecular orbital theory applied to inorganic chemistry Spectroscopic methods of characterization of inorganic compounds and organometallic compounds

Chem 506 Systematic Inorganic Chemistry (3 0) Cr 3 S *Prereq 402 or 500 and 322* Principles of structure and reactivity in inorganic chemistry Descriptive chemistry of the chemical elements and their compounds

Chem 510 Advanced Survey of Analytical Chemistry (2-0) Cr 2 F *Prereq 316 and 316L* Selected topics in modern quantitative analysis including analytical separations titrimetry spectroscopy and other instrumental methods

Chem 511 Advanced Quantitative Analysis (3 0) Cr 3 S *Prereq 316 and 316L* General methods of quantitative inorganic and organic analysis Aqueous and nonaqueous titrimetry selective reagents sampling and sample dissolution modern instrumentation sensors atomic and molecular microscopy bioanalytical methods data evaluation chemometrics and analytical literature

Chem 512 Electrochemical Methods of Analysis (3 0) Cr 3 F *Prereq 316 and 316L 322 and 322L* Principles of convective diffusional mass transport in electroanalysis Applications of potentiometry voltammetry and coulometry Introduction to heterogeneous and homogeneous kinetics in electroanalysis Analog and digital circuitry Interfacing

Chem 513 Analytical Molecular and Atomic Spectroscopy (3-0) Cr 3 S *Prereq 316 and 316L 322 322L* Introduction to physical optics and design of photometric instruments Principles of absorption emission fluorescence and Raman spectroscopy Error and precision of optical methods Ultraviolet visible and infrared methods of qualitative and quantitative organic and inorganic analysis

Chem 516 Analytical Separations (3 0) Cr 3 F *Prereq 316 and 316L 322 322L* Principles and examples of inorganic and organic separation methods applied to analytical chemistry Solvent extraction volatilization ion exchange liquid and gas chromatography and electrophoresis

Chem 530 Advanced Organic Chemistry (2 0) Cr 2 S *Prereq 332* Selected topics in modern organic chemistry including structure reaction mechanisms organic synthesis and spectroscopy For students not majoring in organic chemistry

Chem 531 Organic Synthesis I (2-0) Cr 2 S *Prereq 332* Survey of organic functional group transformations

Chem 532 Organic Synthesis II (2 0) Cr 2 F *Prereq 531* Synthesis of complex organic compounds including natural products

Chem 537 Physical Organic Chemistry I (3-0) Cr 3 F *Prereq 332* Molecular structure stereochemistry introduction to reaction mechanisms thermodynamic and kinetic data linear free energy relationships isotope effects orbital symmetry

Chem 538 Physical Organic Chemistry II (3-0) Cr 3 S *Prereq 537* Survey of reactive intermediates including cations anions carbenes and radicals

Chem 550 Safety in the Chemical Laboratory (1 0) Cr 1 S *Prereq 332L* Introduction to laboratory safety and chemical hygiene Use of engineering controls and personal protective equipment Chemical storage and waste disposal practices Handling hazardous chemicals Radiation safety and laser safety Offered on a satisfactory fail grading basis only

Chem 555 Chemical Pedagogy (1 0) Cr 1 FS SS *Prereq 332* Policies methods of instruction and practice teaching in undergraduate chemistry recitation discussion and laboratory courses for chemistry graduate teaching assistants Offered on a satisfactory fail grading basis only

Chem 560 Advanced Physical Chemistry (2-0) Cr 2 S *Prereq 322* Principles of physical chemistry as they apply to analytical inorganic and organic chemistry including thermodynamics kinetics quantum mechanics and spectroscopy For students not majoring in physical chemistry

Chem 561 Fundamentals of Quantum Mechanics (4 0) Cr 4 F *Prereq 322* Schrodinger equation and exact solutions square wells and barriers harmonic oscillator the hydrogen atom atomic orbitals operators including angular momenta time independent and time dependent perturbation theory Schrodinger and Heisenberg representations unitary operators interaction picture density matrix

Chem 562 Fundamentals of Atomic and Molecular Quantum Mechanics (3-0) Cr 3 S *Prereq 561 credit or enrollment in 583* Variational method many electron atoms addition of angular momentum self consistent field method for open and closed shells linear combinations of atomic orbitals origin of chemical bonding many electron diatomic and polyatomic molecules treatments of electron correlation approximation methods

Chem 563 Statistical Mechanics (3 0) Cr 3 S *Prereq 322* Microscopic and macroscopic properties laws of thermodynamics ensembles and distribution functions applications to gases solids and chemical equilibrium

Chem 564 Molecular Spectroscopy and Structure (3-0) Cr 3 Alt S offered 2004 *Prereq 505 or 562* Maxwell s field equations interaction of light with matter including time-dependent perturbation theory microwave vibrational (infra red Raman) and electronic spectroscopies symmetry derived selection rules special lineshapes and introduction to nonlinear and coherent laser spectroscopies

Chem 571 Solid State Chemistry (3 0) Cr 3 Alt S offered 2005 *Prereq 301 322* A study of solid state materials including structures bonding defects disorder phase transitions ionic mobility metal insulator transitions band theory synthesis and intercalation

Chem 572 Spectrometric Identification of Organic Compounds (2 3) Cr 3 F *Prereq 332* Principles of infrared ultraviolet nuclear magnetic resonance and mass spectroscopy as applied to organic chemistry

Chem 574 Organometallic Chemistry of the Transition Metals (2-0) Cr 2 Alt S offered 2004 *Prereq 301 332* Transition metal complexes of ligands such as cyclopentadienyl olefins acetylenes benzenes and carbon monoxide Homogeneous catalysis

Chem 575 Diffraction and Crystal Structure (3 0) Cr 3 Alt F offered 2003 *Prereq 322* Crystal and molecular structure determination Data collection techniques space group symmetry application of Fourier methods methods of phasing structural amplitudes

Chem 576 Surface Chemistry (3 0) Cr 3 Alt F offered 2004 *Prereq 322* Gas surface interactions and techniques of characterization Idealized surface lattices surface tension Wulff plots work function adsorbate adsorbate interactions 2D phase diagrams diffusion thin film growth adsorption and desorption mechanisms/energetics/kinetics adsorption isotherms vacuum techniques electron and ion based spectroscopies for surface analysis (including AES FIM XPS UPS EXAFS EELS SIMS LEED and STM)

Chem 577 Mass Spectrometry (2 0) Cr 2 F 2003 S 2005 *Prereq Permission of instructor* Basic physics instrumentation and chemical applications of mass spectrometry

Chem 578 Chemical Kinetics and Mechanisms (2 0) Cr 2 Alt F offered 2004 *Prereq 322* Rates and mechanisms reversible consecutive and competing reactions chain mechanisms kinetic isotope effects very rapid reactions acid base catalysis theories of unimolecular reactions transition state and Marcus theories

Chem 579 Introduction to Research in Chemistry (1 0) Cr R FS Introduction to the various areas of research in chemistry at Iowa State University

Chem 580 Introduction to Computational Quantum Chemistry (3 0) Cr 3 Alt F offered 2003 *Prereq 322* Basic principles of quantum mechanics schrodinger equation Hartree Fock/molecular orbital theory introduction to group theory introduction to modern methods of computational chemistry applications include molecular structure potential energy surfaces and their relation to chemical reactions molecular spectroscopy and photochemistry

Chem 581 Principles of Lasers and Optics (3 0) Cr 3 Alt S offered 2005 *Prereq 322 Phys 222* Students with weak background should take Chem 580 For students working with lasers and optics stimulated adsorption and emission based on the classical electron oscillator model population inversion laser amplification laser pumping oscillation and cavity modes laser beam characterization linear propagation design of laser resonators ray and wave optics nonlinear optics

Chem 583 Chemical Group Theory (1 0) Cr 1 F *Prereq 322* Basic concepts and theorems representation theory point groups molecular orbitals molecular states molecular vibrations rotation group and angular momenta space groups and crystals permutation group antisymmetry and spin states

Chem 589 Current Topics in Chemistry (1 0) Cr R FS Presentation of recent literature and chemical problems under current investigation

Chem 599 Nonthesis Research Cr arr *Prereq Permission of instructor concerned*

Courses for Graduate Students

Chem 600 Seminar in Inorganic Chemistry (1 0) Cr 1 each time taken FS *Prereq Permission of instructor*

Chem 601 Selected Topics in Inorganic Chemistry (1 0 or 2-0) Cr 1 or 2 FS *Prereq Permission of*

instructor Topics such as molecular structure and bonding organometallic compounds physical techniques of structure determination nonaqueous solutions Zintl phases transition metal oxides free-radical reactions electron transfer reactions metal metal bonding and bioinorganic chemistry of nucleic acids

Chem 611 Seminar in Analytical Chemistry (1 0) Cr 1 each time taken FS *Prereq Permission of instructor*

Chem 619 Special Topics in Analytical Chemistry (2-0) Cr 2 each time taken FS *Prereq Permission of instructor* Raman spectroscopy sensors spectroelectrochemistry capillary electrophoresis analytical plasmas chemometrics and bioanalytical chemistry

Chem 631 Seminar in Organic Chemistry (1 0) Cr 1 each time taken FS *Prereq Permission of instructor*

Chem 632 Selected Topics in Organic Chemistry (1 0) Cr 1 each time taken FS *Prereq 537* Topics of current interest in organic chemistry such as spectroscopy physical organic chemistry photochem istry organometallic chemistry mechanisms of oxidations and reductions modern organic synthesis reactive intermediates bioorganic chemistry and polymers

Chem 660 Seminar in Physical Chemistry (1-0) Cr 1 each time taken S *Prereq Permission of instructor*

Chem 667 Special Topics in Physical Chemistry (1 0) or (2 0) Cr 1 or 2 FS *Prereq Permission of instructor* Advanced and recent developments in physical chemistry are selected for each offering

Chem 699 Research *Prereq Permission of instructor concerned*

Civil Engineering

(Administered by the Department of Civil Construc tion and Environmental Engineering)

Lowell F Greimann, Chair of Department

Distinguished Professors Klaiber

University Professors Austin

Professors Fanous Greimann Jeyapalan Kannel Maze Northup Porter Schaefer van Leeuwen Wipf

Professors (Collaborators) McCoy

Distinguished Professors (Emeritus) Baumann Cleasby Handy

University Professors (Emeritus) Lohnes

Professors (Emeritus) Bergeson Brewer Carstens Ekberg Hardy Jellinger Kao Lee Mashaw Mickle Morgan Oulman Sanders

Associate Professors Abendroth Baenziger Cable Ellis Gu Jahren Jaselskis Ong Pitt Sarkar Souleyrette Strong

Associate Professors (Emeritus) Chase Mercier Sheeler Ward

Assistant Professors Bolluyt Ceylan Coree Hallmark Sharma Sritharan Sung Walters Wang White

Assistant Professors (Adjunct) Andrle Fan Phares Plazak Schlorholtz Sirotiak Smadi Smith Walton

Assistant Professors (Collaborators) Golchin Stanley

Instructors (Adjunct) Amenson Cackler Gaunt Nelson

Lecturers Cormicle

Undergraduate Study

For undergraduate curriculum in civil engineering leading to the degree bachelor of science see *College of Engineering Curricula* This curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology

Civil engineering consists of the application of the laws forces and materials of nature to the planning design construction maintenance and operation of public and private facilities subject to economic social and environmental constraints Commonly included are transportation systems bridges and buildings water supply pollution control irrigation and drainage systems river and harbor improvements dams and reservoirs Civil engineering also includes the planning design and responsible execution of surveying operations and the location delimitation and delineation of physical and cultural features on the surface of the earth Research testing sales management and related functions are also a part of *civil engineering Work on the campus is supple* mented by inspection trips which furnish an opportunity for firsthand study of engineering systems in operation as well as projects under construction

Environmental engineering involves the design construction and operation of facilities to protect our environment the air we breathe the land on which we live and work the water that we drink or use for recreational purposes and our natural resources Environmental engineering as a specialty area in civil engineering is concerned with protecting the public and natural health providing safe palatable and ample water supply management of solid and hazardous waste proper treatment and disposal of domestic and industrial wastewaters and waste resource recovery providing adequate drainage of urban and rural areas for sanitation and the control of water quality soil contamination and air pollution At the undergraduate level the study of various environmental and water resource engineering topics is part of the course of study leading to the Bachelor s degree in civil engineering

Because of the widespread use of microcomputers throughout civil engineering practice the department has incorporated microcomputer applications into many of the civil engineering courses

Program Goal
Consultation with an industrial advisory board of employers of civil engineers with a broad base of civil engineering educators and with students and alumni has yielded a continuous process of program planning program assessment curriculum development and instructional development to produce an integrated learning based curriculum The curriculum listed in this bulletin has the academic program goal of developing an effective program that fulfills student educational needs and that equips and empowers qualified students for a successful career in civil and environmental engineering

Program Objectives
Program objectives and related outcomes intended to proceed toward achievement of the program goal above include the following

1 Design coordinate and execute an integrated undergraduate civil engineering program that produced graduates who

•have a fundamental understanding of mathematics statistics and physical sciences and where appropriate life sciences

•have a broad base of knowledge in civil engineering technical areas represented by the transportation and surveying structural environmental and water resources and geotechnical and materials disciplinary areas

•have a basic understanding of cost estimating planning and scheduling for civil engineering projects

•utilize critical thinking to identify define and develop alternative solutions and to implement a feasible design to solve an open ended or ill-defined problem while considering constructability sustainability and maintainability of the design

•are effective in oral written and graphical communi cation of ideas to engineers and non-engineers

•recognize and understand the importance of timely and effective communication during the design and construction process

•have an ability to effectively use computers as a tool for communication problem solving analysis and design

•have an ability to work effectively within a multi disciplinary team

•recognize and understand the importance of and necessity for high professional and ethical standards

•have a basic knowledge of business and manage ment principles and practices

•have an understanding of social political and cultural issues and

•have an ability to design and conduct experiments as well as analyze and interpret data

2 Provide opportunities for student interaction with practicing professionals

3 Provide opportunities for students to develop their leadership skills

4 Encourage and motivate students for life long learning continued intellectual and professional growth and professional licensure

5 Encourage cooperative education internships or progressive summer engineering employment

6 Develop and maintain an academic advising system and a mentoring system that retains qualified students

7 Develop and maintain a faculty that serves as a model of professional excellence for students

Continued curriculum development will expand and increase the implementation of courses and programs to support the goal and objectives listed here This goal and these objectives are consistent with and supportive of the College goals and objectives (See *College of Engineering section*)

Graduate Study

The Department of Civil Construction and Environ mental Engineering offers work for the master of science and doctor of philosophy degrees with a major in civil engineering with areas of specialization in structural engineering environmental engineering construction engineering and management geotechnical engineering civil engineering materials transportation engineering and geometronics The department also offers minor work to students taking major work in other engineering departments

Candidates for the degree master of science are required to satisfactorily complete 30 credits of acceptable graduate work including preparation of a thesis or the completion of a creative component in lieu of a thesis

The normal prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of engineering students at this university However because of the diversity of interests within the graduate programs in civil engineering a student may qualify for graduate study even though undergraduate or prior graduate training has been in a discipline other than engineering Supporting work will be required depending upon the student s background and area of interest A prospective graduate student is urged to specify the degree program in which he or she is interested on the application for admission

The department participates in the interdepartmental majors in transportation (M S only) and water resources (see *Index*)

Courses open for nonmajor graduate credit all 300 and 400 level courses except 303 304 314 350 383 396 397 398 403 420 421 428 451 485 486 490 and 498

Courses Primarily for Undergraduate Students

C E 101 Technical Lecture (1 0) Cr R FS Discussion of various phases of civil engineering For transfer

students only Evaluation of transfer credits and discussion of graduation requirements

C E 104 Civil Engineering Projects (1 0) Cr 1 FS Introduction to civil engineering projects and practices

C E 111 Fundamentals of Surveying I (2 3) Cr 3 FS *Prereq 103 160 credit or enrollment in Engr 170 or C E 170 Math 165 credit or enrollment in C E 104 for C E majors* Introduction to error theory Fundamentals of observing distances elevations and angles Traversing Irregular areas Circular and parabolic curves Earthwork including mass diagrams Construction staking Computer applications and introduction to photogrammetry geographic information systems and global positioning systems technology

C E 160 Engineering Problems with Computational Laboratory (2 2) Cr 3 FS *Prereq Math 141 142 or satisfactory scores on mathematics placement examinations credit or enrollment in Math 165* Solving engineering problems and presenting solutions through technical reports Graphing and curve fitting Use of SI units Significant figures Flowcharting Introduction to engineering economics and statistics Solution of engineering problems using spreadsheets

C E 170 Graphics for Civil Engineering (0-4) Cr 2 FS *Prereq Math 165 credit or enrollment in 104* Fundamental graphics Introduction to computer aided drafting and modeling Civil engineering applications

C E 203 Civil Engineering Synthesis I (2 0) Cr 2 FS *Prereq 104 160 Engl 105 Chem 167 or 177* Application of mathematics and chemistry concepts for the solution of civil engineering problems Introduction to critical thinking as related to Bloom s Taxonomy of educational objectives Technical communication for civil engineers Introduction to self directed learning Concepts and applications of engineering economis

C E 204 Civil Engineering Synthesis II (2 0) Cr 2 FS *Prereq 111 203 Phys 221 E M 274* Application of mathematics chemistry physics engineering mechanics and engineering economics for the solution of advanced civil engineering problems Application of critical thinking processes for problem solutions Applied engineering economics CE technical communications Self directed learning Sophomore assessment

C E 298 Cooperative Education Cr R FS SS *Prereq Permission of department chair* First professional work period in the cooperative education program Students must register for this course before commencing work

C E 303 Professional Issues in Civil Engineering (2 0) Cr 2 FS *Prereq 204 Sp Cm 212* Engineering ethics Professional law Professional liability Leadership Team building and continuous quality improvement Engineering business management principles Engineering economics Professional practice issues Project management Self-directed and life long learning Reinforcement of Bloom s higher level learning

C E 304 Project Life Cycle (2 0) Cr 2 FS *Prereq 303* Civil engineering project life cycle including planning design acquisition construction and maintenance processes Project management and economic social and political issues Civil engineering successes and failures (case studies) Critical thinking in the design and construction process Junior assessment

C E 326 Principles of Environmental Engineering (2 2) Cr 3 F S *Prereq Chem 167 or 178 Math 166 credit or enrollment in E M 378* Introduction to environmental problems water quality indicators and requirements potable water quality and quantity objectives water sources and treatment methods water pollution control objectives and treatment methods survey of solid and hazardous waste management and air pollution control Nonmajor graduate credit

C E 332 Structural Analysis I (2-2) Cr 3 FS *Prereq E M 324* Loads shear moment and deflected shape diagrams for beams and framed structures Approximate methods Deformation calculations Application of flexibility methods to frames and continuous beams Application of moment distribution and stiffness methods to continuous beams and braced frames Influence lines for determinate and indeterminate beams using Muller Breslau principle Computer applications to analyze beams and frames Nonmajor graduate credit

C E 333 Structural Steel Design I (2 2) Cr 3 FS *Prereq 332 E M 327* Design and behavior of the elements of steel structures proportioning members and connections using load and resistance factor design Introduction to allowable stress design Preliminary design of building frames Nonmajor graduate credit

C E 334 Reinforced Concrete Design I (2 2) Cr 3 FS SS *Prereq 332 E M 327* Analysis and design of beams one way slabs and columns Preliminary design of building frames using pattern loading and moment coefficients Nonmajor graduate credit

C E 350 Introduction to Transportation Planning (3 0) Cr 3 S *Prereq 3 credits in statistics junior classification* An introductory course for planning urban and regional transporation systems within government Applications and impacts of legislation financing four step planning process population trends land use societal impacts public transporta tion master plans and traffic impact studies Organization and coordination of the transportation planning function Term paper and class participation required Not available for graduation credit for students in civil engineering

C E 355 Principles of Transportation Engineering (2 0) Cr 2 FS *Prereq 111 203 Phys 221 a course in statistics from the approved departmental list* Introduction to planning and operations of transporta tion facilities Vehicle/operation/infrastructure characteristics Technological economic and environmental factors Travel demand modeling and capacity analysis Nonmajor graduate credit

C E 360 Soil Engineering (2 3) Cr 3 FS *Prereq E M 324 credit or enrollment in Geol 201* Introduction to soil engineering and testing Identification and classification tests soil water systems principles of settlement stresses in soils and shear strength testing slope stability retaining walls bearing capacity Nonmajor graduate credit

C E 372 Engineering Hydrology and Hydraulics (3 2) Cr 4 F S *Prereq E M 378 a course in statistics from the approved department list* The hydrologic cycle precipitation infiltration runoff evapotranspira tion groundwater and streamflow Hydrograph analysis flood routing frequency analysis and urban hydrology Applied hydraulics including pipe and channel flow with design applications in culverts pumping water distribution storm and sanitary sewer systems Design project required Nonmajor graduate credit

C E 382 Design of Concretes (1-6) Cr 3 FS *Prereq 360* Physical and chemical properties of bituminous portland and other cements aggregate properties and blending mix design and testing of concretes admixtures mixing handling placing and curing principles of pavement thickness design Nonmajor graduate credit

C E 383 Design of Portland Cement Concrete (0-2) Cr 1 FS *Prereq 360* For Con E students only Physical and chemical properties of portland cement and p c concrete Mix design and testing of p c concrete

C E 396 Summer Internship Cr R SS *Prereq Permission of department chair completion of two terms in residence in civil engineering employment in civil engineering or related field* Summer professional work period Students must register for this course prior to commencing work

C E 397 Engineering Internship Cr R FS *Prereq Permission of department chair* One semester maximum per academic year professional work period Students must register for this course prior to commencing work

C E 398 Cooperative Education Cr R FS SS *Prereq 298 permission of department chair* Second professional work period in the cooperative education program Students must register for this course before commencing work

C E 403 Program and Outcome Assessment Cr R FS *Prereq Verification of undergraduate application for graduation by the end of the first week of class Permission of instructor for students who are scheduled for summer graduation* Assessment of CE Curriculum and educational objectives

C E 417 Land Surveying (2 3) Cr 3 S *Prereq 111* Legal principles affecting the determination of land boundaries public domain survey systems Locating sequential and simultaneous conveyances Record research plat preparation and land description Study of selected court cases Nonmajor graduate credit

C E 420 Environmental Engineering Chemistry (Dual listed with 520) (2 3) Cr 3 F *Prereq Chem 177 and 178 Math 166* Principles of chemical and physical phenomena applicable to the treatment of water and wastewater and natural waters including chemical equilbria reaction kinetics acid base equilibria chemical precipitation redox reactions and mass transfer principles Individual and group projects required Nonmajor graduate credit

C E 421 Environmental Biotechnology (Dual listed with 521) (2 2) Cr 3 F *Prereq 326* Fundamentals of biochemical and microbial processes applied to environmental engineering processes role of microorganisms in wastewater treatment and bioremediation bioenergetics and kinetics metabolism of xenobiotic compounds waterborne pathogens parasites and disinfection Nonmajor graduate credit

C E 428 Water and Wastewater Treatment Plant Design (2 3) Cr 3 S *Prereq 326* Physical chemical and biological processes for the treatment of water and wastewater including air stripping coagulation and flocculation sedimentation filtration adsorption chemical oxidation/disinfection fixed film and suspended growth biological processes and sludge management

C E 446 Bridge Design (2 2) Cr 3 Alt S offered 2005 *Prereq 333 334* Bridge design in structural steel and reinforced concrete Application of AASHTO Bridge Design Specifications Analysis techniques for complex structures Preliminary designs include investigating alternative structural systems and materials Final designs include preparation of design calculations and sketches Nonmajor graduate credit

C E 447 Building Design (2 2) Cr 3 Alt S offered 2004 *Prereq 333 334* Building design in structural steel and reinforced concrete Investigation of structural behavior of frameworks Lateral load resisting systems Application of current building codes and design specifications Review of building designs Preliminary designs include investigating alternative structural systems Final designs include preparation of design calculations and sketches Nonmajor graduate credit

C E 451 Urban Transportation Planning and Modeling (Dual listed with 551) (2 2) Cr 3 F *Prereq 350 or 355* Transportation data sources and cost analysis transportation system management travel demand and network modeling transport legislation and financing intelligent transportation systems planning sustainable transportation concepts Use of popular travel demand software and applications of geographic information systems and global positioning systems

C E 453 Highway Design (3 3) Cr 4 FS *Prereq 304 355 372 382* Introduction to traffic engineering and highway planning Design construction and maintenance of highway facilities earthwork drainage structures pavements Preparation of environmental impact statement A complete design project is required Computer applications Nonmajor graduate credit

C E 460 Foundations (3 0) Cr 3 FS *Prereq 360* Fundamentals of foundation engineering Exploration sampling and in situ tests Shallow and deep foundations Settlement and bearing capacity analyses Stability of excavations and earth retaining structures Nonmajor graduate credit

C E 473 Groundwater Hydrology (Dual listed with 573) (3-0) Cr 3 F *Prereq 372* Principles of groundwater flow hydraulics of wells superposition slug and pumping tests streamlines and flownets and regional groundwater flow Contaminant transport Computer modeling Nonmajor graduate credit

C E 485 Civil Engineering Design I (1 2) Cr 2 FS *Prereq 304 Sp Cm 212* The civil engineering design process interacting with the client identification of the engineering problems development of a technical proposal identification of design criteria codes and standards development of feasible alternatives selection of best alternative oral presentation and poster

C E 486 Civil Engineering Design II (1-4) Cr 3 FS *Prereq 326 333 or 334 382 credit or enrollment in 428 or 453* The engineering design computations case histories of design inadequacies environmental impact safety and health in the work place cost estimating planning and scheduling contract documents and synthesis of previous coursework using a group project

C E 490 Independent Study By conference Cr 1 to 6 FS *Prereq Permission of instructor* Independent study in any phase of civil engineering Pre enrollment contract required
H Honors

C E 498 Cooperative Education Cr R FS SS *Prereq 398 permission of department chair* Third and subsequent professional work periods in the cooperative education program Students must register for this course before commencing work

Courses Primarily for Graduate Students, open to qualified undergraduate students

C E 501 Preconstruction Project Engineering and Management (3-0) Cr 3 Alt F offered 2003 and Alt S offered 2005 *Prereq Con E 221 and 421* Application of engineering and management control techniques to construction project development from conceptualization to notice to proceed Determinants of construction project success conceptual estimating design and engineering planning for automated construction techniques constructability review procedures planning for safety value engineering

C E 502 Construction Project Engineering and Management (3-0) Cr 3 Alt S offered 2004 Alt F offered 2003 *Prereq Con E 221 and 421* Application of engineering and management control techniques to construction projects Construction project control techniques equipment selection and utilization project administration construction process simulation Quality Management and productivity improvement programs

C E 503 Construction Management Functions and Processes (3 0) Cr 3 Alt F offered 2004 *Prereq Con E 421* Analysis of critical construction management skills Analysis of organizational systems related to construction management Case studies Analysis of theories of motivation planning leadership organizational change etc as they relate to field construction operations

C E 505 Design of Construction Systems (3-0) Cr 3 Alt F offered 2003 Alt S offered 2005 *Prereq 334 360 Con E 322 and 340* Advanced design of concrete formwork and falsework systems Design for excavation and marine construction including temporary retaining structures and cofferdams Aggregate production operations including blasting crushing and conveying systems Rigging system design

C E 506 Case Histories in Construction Documents (3 0) Cr 3 Alt S offered 2004 Alt F offered 2003 *Prereq Con E 221 credit or enrollment in Con E 421* Study of cases involving disputes claims and responsibilities encountered by management in construction contract documents Analysis of methods of resolving differences among the owner architect engineer and construction contractor for a project

C E 510 InformationTechnologies for Construction (3 0) Cr 3 Alt F offered 2004 *Prereq Con E 421 Engr 160 or C E 160 or equivalent* Information technologies including microcomputer based systems management information systems automation technologies computer aided design and expert systems and their application in the construction industry Overview of systems acquisition communications and networking

C E 513 Geodetic and Satellite Surveying (2-3) Cr 3 Alt SS offered 2004 *Prereq 111* Triangulation and trilateration observation and computation Precise leveling Electronic distance measuring instrument calibration Geodetic astronomy for latitude and longitude determination Global positioning systems of satellite observation and computation

C E 517 Analytical Photogrammetry and Geographic Information Systems (2 3) Cr 3 Alt F offered 2004 *Prereq 111* Theory and practice of stereoplotting systems Planning and execution of photogrammetric projects Concepts principles and methods of analytical photogrammetry Creation of digital terrain models and basemaps for geographic information systems (GIS) Use of computer aided design and GIS software

C E 519 Remote Sensing and Digital Photogrammetry (3-0) Cr 3 Alt S offered 2005 *Prereq 517* Electromagnetic spectrum and theoretical basis of remote sensing Remote sensing systems including multispectral scanners microwave and radar images Image analysis of digital data from various databases using a variety of software packages Observation of strips and blocks of digital data and their adjustment Calibration of photogrammetric systems

C E 520 Environmental Engineering Chemistry (Dual listed with 420) (2-3) Cr 3 F *Prereq Chem 177 and 178 Math 166* Principles of chemical and physical phenomena applicable to the treatment of water and wastewater and natural waters including chemical equilibria reaction kinetics acid-base equilibria chemical precipitation redox reactions and mass transfer principles Individual and group projects required Additional term paper and oral presentation Extensive laboratory practicals

C E 521 Environmental Biotechnology (Dual listed with 421) (2-2) Cr 3 F *Prereq 326* Fundamentals of biochemical and microbial processes applied to environmental engineering processes role of microorganisms in wastewater treatment and bioremediation bioenergetics and kinetics metabolism of xenobiotic compounds waterborne pathogens and parasites and disinfection Additional term paper and oral presentation

C E 522 Water Pollution Control Processes (2-2) Cr 3 S *Prereq 521* Fundamentals of biochemical processes aerobic growth in a single CSTR multiple events in complex systems and techniques for evaluating kinetic parameters unit processes of activated sludge system attached growth systems stabilization and aerated lagoon systems biosolids digestion and disposal nutrient removal and anaerobic treatment systems

C E 523 Physical ChemicalTreatment Process (2-2) Cr 3 S *Prereq 520* Principles and design of physical chemical processes including coagulation flocculation chemical precipitation sedimentation filtration adsorption membrane processes ion exchange and disinfection laboratory exercises and demonstrations Individual and group projects required

C E 524 Air Pollution (3 0) Cr 3 Alt S offered 2004 *Prereq Two of Phys 221 Chem 178 and either Math 166 or 3 credits in statistics* Air quality legislation Sources and effects of pollutants Physics and chemistry of air pollution Modeling point sources Global warming ozone depletion meteorological and geographic aspects Air pollution control settling cyclones filtration electrostatic precipitation adsorption afterburning improved incineration Modeling transportation sources Abatement of transportation related emissions

C E 525 Industrial Wastewater and Resource Recovery (3 1) Cr 3 S Alt S offered 2005 *Prereq Two chemistry courses Math 166* Water management improvement in industry pollution reduction at source Material and energy balances Industrial wastewater treatment and process selection Recovery of metals by oxidation/reduction precipitation filtration adsorption and ion exchange Recovery or conversion of organic materials in wastewater into useful byproducts by bioprocessing Recovery of resources from biomass and sludges Extensive case studies

C E 527 Solid Waste Management (3 0) Cr 3 Alt F offered 2003 *Prereq 326* Planning and design of solid waste management systems includes characterization and collection of domestic commercial and industrial solid wastes waste minimization and recycling energy and materials recovery composting incineration and landfill design

C E 529 Hazardous Waste Management (3-0) Cr 3 Alt S offered 2005 *Prereq 326* Regulatory requirements for the classification transport storage and treatment of hazardous wastes Analysis and design of alternatives for treatment and disposal technologies including physical chemical and biological treatment solidification incineration and secure landfill design Regulatory requirements and procedures for hazardous waste contaminated site investigations and risk analysis Analysis and design of remedial action alternatives for site restoration

C E 532 Structural Analysis II (3 0) Cr 3 F *Prereq 332* Displacements by virtual work unit load Analysis of indeterminate structural problems by the force and stiffness methods Direct stiffness method for 2 D frames grids 3 D frames Additional topics for the stiffness method

C E 533 Structural Steel Design II (3 0) Cr 3 Every third semester offered F 2004 *Prereq 333* Development of the AISC design equations for tension members columns beams beam-columns and plate girders by LRFD and ASD methods Elastic and inelastic buckling of members and member elements Torsion of W shapes

C E 534 Reinforced Concrete Design II (2 2) Cr 3 Every third semester offered F 2003 *Prereq 334* Design of reinforced concrete long columns floor slabs building frames isolated footings and combined footings Design and behavior considerations for torsion biaxial bending structural joints and shear friction Introduction to cold formed composite steel and composite floor slab design

C E 535 Prestressed Concrete Structures (3-0) Cr 3 Every third semester offered S 2004 *Prereq 334* Design of prestressed concrete structures review of hardware stress calculations prestress losses deflections shear design section proportioning special topics

C E 536 Masonry and Timber Design (2 2) Cr 3 Every third semester offered S 2004 *Prereq 334* Behavior and design of clay and concrete masonry beams columns walls and structural systems Behavior and design of timber and laminated timber beams columns connections and structural systems

C E 541 Dynamic Analysis of Structures (3 0) Cr 3 F *Prereq E M 345 and credit or enrollment in 532* Single and multi-degree-of freedom systems Free and forced vibrations Linear and nonlinear response Modal analysis Response spectra Computer programs for dynamic analysis Seismic analysis

C E 542 Structural Analysis by Finite Elements (3-0) Cr 3 S *Prereq 532* Use of the finite element method for the analysis of complex structural configurations Plane stress plate and shell finite elements General purpose finite element programs

C E 545 Seismic Design (3 0) Cr 3 S *Prereq 333 334* Seismic hazard in the United States Engineering characteristics of ground motions Structural damage in past earthquakes Capacity design philosophy for seismic resistant design Conceptual design of structures Capacity design process including design of structural members

C E 547 Analysis and Design of Plate and Slab Structures (3 0) Cr 3 F *Prereq 334 E M 514 Math 266* Bending and buckling of thin plate components in structures utilizing classical and energy methods Analysis of shell roofs by membrane and bending theories

C E 550 Advanced Highway Design (3 0) Cr 3 S *Prereq 453* Evaluation of rural and urban street and highway design theory Establishment of design criteria application to street and highway systems and to intersections and interchanges drainage design and urban freeway design aspects Computer applications

C E 551 Urban Transportation Planning and Modeling (Dual-listed with 451) (2 2) Cr 3 F *Prereq 350 or 355* Transportation data sources and cost analysis transportation system management travel demand and network modeling transport legislation and financing intelligent transportation systems planning sustainable transportation concepts Use of popular travel demand software and applications of geographic information systems and global positioning systems Term project required for graduate credit

C E 552 Traffic Safety Operations, and Mainte nance (2 2) Cr 3 Alt S offered 2004 *Prereq 355* Engineering aspects of highway traffic safety Reduction of accident incidence and severity through highway design and traffic control Accident analysis Legal implications Safety in highway design maintenance and operation

C E 553 Traffic Engineering (2 2) Cr 3 F *Prereq 355* Driver pedestrian and vehicular characteristics Traffic characteristics highway capacity traffic studies and analyses Principles of traffic control for improved highway traffic service Application of intersection corridor or network analysis computer evaluation and optimization tools

C E 554 Advanced Technology in Transporation (3 0) Cr 3 F *Prereq 350 355 graduate standing in transportation or civil engineering or consent of instructor* Advanced traffic control systems including signal systems technology and field assets Regional traffic management and communications centers Traffic surveillance monitoring and incident management Advanced traveler information systems The automated highway

C E 556 Air and Rail Transportation (2 2) Cr 3 Alt S offered 2005 *Prereq 355 or admission to Transportation* Airport planning and design Airspace runway taxiway and apron design Railroad engineering and operations

C E 557 Transportation Systems Analysis (3-0) Cr 3 Alt F offered 2003 *Prereq 355 3 credits in statistics or probability* Travel studies and analysis of data Travel projections Public transportation forecasts and analyses Statewide regional and local transportation system planning Corridor travel planning Optimiza-tion of systems

C E 558 Transportation Systems Development and Management Laboratory (2-2) Cr 3 Alt F offered 2004 *Prereq 350 or 355* Study of designated problems in traffic engineering urban transportation planning and urban development Forecasting and evaluation of social economic and environmental impact of proposed solutions considerations of alternatives Formulation of recommendations and publication of a report Presentation of recommenda tions in the host community

C E 559 Transportation Infrastructure/Asset Management (3 0) Cr 3 Alt S offered 2005 *Prereq 355 or 453 382* Engineering management techniques for maintaining and managing infrastructure assets Systematic approach to management through value engineering engineering economics and life cycle cost analysis Selection and scheduling of mainte nance activities Analysis of network wide resource needs Project level analysis

C E 560 Fundamentals of Soil Mechanics (3 0) Cr 3 F *Prereq 360* Limiting stress analysis stress paths introduction to critical state soil mechanics constitutive models soil strength under various drainage conditions seepage pore pressure parameters consolidation slope stability and retaining wall applications

C E 561 Applied Foundation Engineering (2-3) Cr 3 F *Prereq 460* Lateral earth pressure theories and retaining structures Field investigations in situ testing foundations on expansive soils and analysis and design of shallow and deep foundations Foundation engineering reports

C E 564 Application of Numerical Methods to Geotechnical Design (3 0) Cr 3 Alt S offered 2005 *Prereq 560* Application of numerical methods to analysis and design of foundations underground structures and soil structure interaction Application of slope stability software Layered soils bearing capacity and settlement for complex geometries wave equation for piles and foundation vibrations

C E 565 Fundamentals of Geomaterials Behavior (2 3) Cr 3 F *Prereq 382* Atoms and molecules crystal chemistry clay minerals structure of solids phase transformations and phase equilibria Surfaces and interfacial phenomena colloid chemistry mechanical properties Applications to soils and civil engineering materials Overview of state-of the-art instrumental techniques for analysis of the physico-chemical properties of soils and civil engineering materials

C E 566 Applied Concretes and Pavements (2 3) Cr 3 S *Prereq 382* Advanced portland cement and bituminous concrete (SUPERPAVE) mix designs Aggregates Admixtures Production and construction quality control and inspection Nondestructive testing Pavement thickness design Materials engineering reports Concrete and asphalt options offered alternate semesters
A Bituminous concrete—offered fall
B Portland cement—offered spring

C E 567 Geomaterials Stabilization (2 2) Cr 3 Alt S offered 2005 *Prereq 565* Soil and aggregate physical and chemical stabilization procedures Soil stabilization analysis and design Ground modification methods Geosynthetics application and design

C E 569 Environmental Geotechnology (3 0) Cr 3 S *Prereq 360* Soil/water and soil/water/contaminant interaction Geoenvironmental site investigation and site assessment technologies Hazardous waste landfill design construction and performance focusing on liner and cover systems Hazardous waste site remediation

C E 570 Applied Hydraulic Design (2-2) Cr 3 Alt F offered 2003 *Prereq 372* Flow characteristics in natural and constructed channels principles of hydraulic design of culverts bridge waterway openings spillways hydraulic gates and gated structures pumping stations and miscellaneous water control structures pipe networks mathematical modeling Design project

C E 571 Surface Water Hydrology (3 0) Cr 3 S *Prereq 372* Analysis of hydrologic data including precipitation infiltration evapotranspiration direct runoff and streamflow theory and use of frequency analysis theory of streamflow and reservoir routing use of deterministic and statistical hydrologic models Fundamentals of surface water quality modeling point and non point sources of contamination Design project

C E 572 Analysis and Modeling Aquatic Environments (3-0) Cr 3 Alt F offered 2004 *Prereq 571* Principles of surface water flows and mixing Introduction to hydrologic transport and water quality simulation in natural water systems Advection diffusion and dispersion chemical and biologic kinetics and water quality dynamics Applications to temperature dissolved oxygen primary productivity and other water quality problems in rivers lakes and reservoirs Deterministic vs stochastic models

C E 573 Groundwater Hydrology (Dual listed with 473) (3-0) Cr 3 F *Prereq 372* Principles of groundwater flow hydraulics of wells super position slug and pumping tests streamlines and flownets and regional groundwater flow Contaminant transport Computer modeling Individual and group projects

C E 574 Environmental Impact Assessment (3 0) Cr 3 Alt S offered 2004 *Prereq 4 courses in natural biological or engineering sciences and senior or above classification* Review of federal and state requirements for environmental impact assessment requirements of the National Environmental Policy Act and Council on Environmental Quality methods of evaluating the environmental impacts on the physical biological socioeconomic cultural/historical human health and psychological environments public participation in EIS review and evaluate project environmental impact statements An environmental impact assessment of a proposed project will be completed in small teams

C E 575 Soil and Groundwater Remediation (3 0) Cr 3 Alt S offered 2005 *Prereq 573 or Geol 511* Introduction to technologies used for remediation of contaminated soil and groundwater including pump and treat carbon absorption soil venting air sparging air stripping and in situ bioremediation

C E 590 Special Topics Cr 1 to 5 each time elected FS Pre enrollment contract required

C E 591 Seminar in Environmental Engineering (1 0) Cr R FS *Prereq Graduate classification* Contemporary environmental engineering issues Outside speakers Review of ongoing research in environmental engineering Offered on a satisfactory fail grading basis only

C E 594 Special Topics in Construction Engineering and Management Cr 1 to 3 FS *Prereq Con E 322 Con E 340 and permission or instructor* Emphasis for a particular offering will be selected from the following topics
A Planning and Scheduling
B Computer Applications for Planning and Scheduling
C Cost Estimating
D Computer Applications for Cost Estimating
E Project Controls
F Computer Applications for Project Controls
G Integration of Planning Scheduling and Project Controls
J Trenchless Technologies

C E 595 Research Methods in Construction Engineering and Management (0 1) Cr 1 F *Prereq Credit or enrollment in 501 502 503 or 505* Assigned readings and reports on research methods to solve construction engineering and management problems such as robotics project controls automation etc Identification of research methods and priorities selection and development of research design and critique of research in construction engineering and management

C E 599 Creative Component Cr 1 to 3 Pre enrollment contract required Advanced topic for creative component report in lieu of thesis

An undergraduate student must have an academic standing in upper one half of his/her class in order to enroll in any 500 level civil engineering course

Courses for Graduate Students

C E 622 Advanced Topics in Environmental Engineering (2-0) Cr 2 FS *Prereq Permission of environmental engineering graduate faculty* Advanced concepts in environmental engineering Emphasis for a particular offering will be selected from the following topics
A Water Pollution Control
B Water Treatment
C Solid and Hazardous Waste
D Water Resources

C E 628 Bioremediation Engineering (3 0) Cr 3 Alt F offered 2004 *Prereq 520 and 521* Biodegradation and bioremediation of major contaminants pathways of metabolism for major electron acceptor conditions cometabolism factors influencing biodegradation (e g sorption bioavailability) methods to overcome limitations using various bioremediation technologies and molecular tools

C E 649 AdvancedTopics in Structural Engineering (3 0) Cr 3 FS *Prereq Permission of structural engineering graduate faculty* Advanced concepts in structural engineering topics Emphasis for a particular offering will be selected from the following topics
A Behavior of Metal Structures
B Design of Concrete Shells
D Advanced Matrix Analysis of Structures
E Dynamic Design of Structures
F Reliability Assessment of Structures

C E 690 AdvancedTopics Cr 1 to 3 Pre enrollment contract required

C E 699 Research Cr 6 Pre enrollment contract required

Classical Studies

www iastate edu/~fing_info/Classics/homepage html

(Interdepartmental Undergraduate Program)

Program Committee M Mook Chair G Betcher J Cunnally J Hagge M Henry D Hollander D Hunter J McGlew M Mook P O Neill J Thomas

The Classical Studies program is a cross-disciplinary program in the College of Liberal Arts and Sciences which offers an integrated curriculum of courses in the languages literatures history and thought of ancient Greece and Rome from prehistoric times to the reign of the Emperor Constantine Complete and current information about the Program may be found on line at www iastate edu/ ~classics/

Courses in Classical Studies provide background for students whose major fields of study or career interests include Anthropology English Foreign Languages and Literatures History Music Philosophy Women s Studies law medicine and related fields Students who wish to pursue an interdisciplinary major in Classical Studies should consult the Program Chair

A student who wishes to declare a minor must successfully complete the following requirements (a) Greek 201 or Latin 201 (b) 273 or 275 (c) 402 or 403 or 404 (d) six additional credits from the courses listed below (primary or departmental) or as approved by the program committee (History majors may substitute 310 for 402 or 403 or 404)

Courses open for nonmajor graduate credit 310 367 402 403 404 430

Primary Courses

Cl St 273 Greek and Roman Mythology (3 0) Cr 3 F SS Survey of the legends myths of the classical world with emphasis on the principal gods and heroes and their relation to ancient social psychological and religious practices some attention may be given to important modern theories
H Honors (4 0) Cr 4

Cl St 275 The Ancient City (3-0) Cr 3 F Examination of ancient urban life including historical context physical space material culture religion literature and art examination of civic identity (the polis) Contrast between the concepts of urban and rural Examples drawn from specific ancient cities some attention to modern methods of recovering the conditions of ancient urban life and the fundamental concept of the city in European history
H Honors (4-0) Cr 4

Cl St 310 Ancient Philosophy (Same as Phil 310) See *Philosophy* Nonmajor graduate credit

Cl St 350 Rhetoric and the History of Ideas (Same as Engl 350) See *English*

Cl St 353 World Literature Western Foundations through Renaissance (Same as Engl 353) See *English*

Cl St 367 Christianity in the Roman Empire (Same as Relig 367) See *Religious Studies* Nonmajor graduate credit

Cl St 372 Greek and Roman Drama (3 0) Cr 3 S *Prereq 273 or 275 or one year of Latin or Greek* Cultural significance and development of drama in ancient Athens and Rome selected readings in English from dramatists such as Aeschylus Sophocles Euripides Aristophanes Menander Plautus Terence and Seneca
H Honors (4 0) Cr 4

Cl St 373 Greek and Roman Epic (3 0) Cr 3 F *Prereq 273 or 275 or one year of Latin or Greek* Focuses on the cultural and political significance of epic in Greece and Rome Particular emphasis may be given to the development of the heroic code and its implications for Greco-Roman culture Readings in English from authors such as Homer and Vergil
H Honors (4 0) Cr 4

Cl St 374 Women in the Ancient Mediterranean World (Same as Hist 374 W S 374) (3-0) Cr 3 S *Prereq Any one course in Cl St W S Latin or Greek* Chronological and topical survey of the status of women in the Ancient Mediterranean World study of constructs of the female and the feminine Readings from ancient and modern sources Emphasis on either the Greek World or Hellenistic Egypt and Rome may be repeated once

Cl St 376 Classical Archaeology (3 0) Cr 3 S *Prereq 273 or 275 or one year of Latin or Greek* Chronological survey of the material culture of the ancient Greece Roman world and the role of archaeological context in understanding the varied aspects of ancient Greek or Roman culture Among other topics economy architecture arts and crafts trade and exchange religion and burial customs will be explored May be repeated for a maximum of 6 credits
A Bronze Age (Minoan and Mycenaean palatial cultures) and Early Iron Age Greece (ca 3000 700 BC)
B Archaic through Hellenistic Greece (ca 700 30 BC)

Cl St 394 The Archaeology of Greece An Introduction (2 0) Cr 2 S Introduction to the topography history archaeology monuments and art of Greece from the Bronze Age through the Ottoman period attention given to the culture of modern Greece preparatory to study abroad in Greece (Cl St 395)

Cl St 395 Study Abroad The Archaeology of Greece Cr 2-6 SS *Prereq 394* Supervised on site instruction in the archaeology monuments and art of Greece from the Bronze Age through the Ottoman *period attention given to the culture of modern* Greece

Cl St 402 Ancient Greece (Same as Hist 402) See *History* Nonmajor graduate credit

Cl St 403 Ancient Rome (Same as Hist 403) See *History* Nonmajor graduate credit

Cl St 404 Ancient Rome (Same as Hist 404) See *History* Nonmajor graduate credit

Cl St 410 Persuasion in the Athenian Democracy (Same as Sp Cm 410) (3-0) Cr 3 S *Prereq 273 or 275 or one year of Latin or Greek* This course examines the origin structure and development as well as the social and political functions of rhetoric in 5th and 4th century B C Athens against a background of citizenship in the Athenian democracy

Cl St 430 Western PoliticalThought Plato to Machiavelli (Same as Pol S 430) See *Political Science* Nonmajor graduate credit

Cl St 480 Seminar in Classical Studies (3 0) Cr 3 *Prereq 30 credits in Classical Studies or related courses permission of Program Chair* Advanced study of a selected topic in Classical Studies Research paper or project selected by the student

Cl St 490 Independent Study Cr 1 to 6 each time taken *Prereq 7 credits in classical studies at the 200 level or higher permission of the Program Chair* Designed to meet the needs of students who wish to study specific topics in classical civilization in areas where courses are not offered or to pursue such study beyond the limits of existing courses

Courses for Graduate Students, major or minor, open to qualified undergraduates

Cl St 512A Proseminar in Ancient European History (Same as Hist 512A) See *History*

Cl St 594A Seminar in Ancient European History (Same as Hist 594A) See *History*

Primary Courses (Offered by Other Departments)

Art H 383 Greek and Roman Art See *Art and Design*

Greek 101 Elementary Classical Greek I See *Foreign Languages and Literatures*

Greek 102 Elementary Classical Greek II See *Foreign Languages and Literatures*

Greek 201 Intermediate Classical Greek See *Foreign Languages and Literatures*

Greek 332 Introduction to Classical Greek Literature See *Foreign Languages and Literatures*

Greek 441 Advanced Readings in Greek Literature See *Foreign Languages and Literatures*

Greek 442 AdvancedTopics in Greek Literature See *Foreign Languages and Literatures*

Hist 280 Introduction to History of Science I See *History*

Latin 101 Elementary Latin I See *Foreign Languages and Literatures*

Latin 102 Elementary Latin II See *Foreign Languages and Literatures*

Latin 201 Intermediate Latin See *Foreign Languages and Literatures*

Latin 332 Introduction to Latin Literature See *Foreign Languages and Literatures*

Latin 441 Advanced Readings in Latin Literature See *Foreign Languages and Literatures*

Latin 442 AdvancedTopics in Latin Literature See *Foreign Languages and Literatures*

Community and Regional Planning

J Timothy Keller, Chair of Department

Professors Mahayni Shinn

Associate Professors Borich Bradbury Huntington Mattson

Associate Professors (Emeritus) Knox Malone

Assistant Professors Owusu Suen

Assistant Professors (Adjunct) Andrle Hadden Plazak

Instructors Clapp

Undergraduate Study

For undergraduate curriculum in community and regional planning leading to the degree bachelor of science see *College of Design Curricula*

Community and regional planning is a professional field of study aimed at assessing the ever-changing socioeconomic and physical environments of our communities and planning for their future Planners evaluate and seize opportunities to understand and solve problems Most planners work at the local level but they are concerned with issues that affect the world the preservation and enhancement of the quality of life in a community the protection of the environment the promotion of equitable economic

opportunity and the management of growth and change of all kinds

Planning has its roots in landscape architecture architecture engineering law economics and public administration Most contemporary planners are trained in the physical and social sciences so they can understand the society and economy in which plans must be implemented Planning demands technical competence as well as creativity plus pragmatism and an ability to envision alternatives to the physical and social environments in which we live

Graduates of the Community and Regional Planning department will be capable of performing in entry level positions in public planning agencies or with planning consulting firms Graduates are able to integrate planning knowledge and skills in practical applications to current planning issues and to communicate in written and oral form

Graduates of the Community and Regional Planning Department are expected to have knowledge of the structure and functions of urban settlements the history of planning aspects of plan and policy making and familiarity with one area of specialized knowledge Graduates should have skills in problem formulation quantitative analysis written/oral and graphic communications collaborative approaches to these and in synthethesizing and applying knowledge to practice Graduates are expected to assess the impact of values in terms of equity and social justice economic welfare and efficiency environmental sustainability and cultural heritage in the context of citizen involvement in decision making

The curriculum is accredited by the Planning Accreditation Board of the American Institute of Certified Planners and the Association of Collegiate Schools of Planning thus providing the student with an education which when combined with experience supports the individual s eligibility for membership in the American Institute of Certified Planners

The department cooperates in the undergraduate minors in design studies and environmental studies

Graduate Study

The department offers work for the master of community and regional planning degree with areas of concentration in land use and transportation community design and development and rural and environmental planning In addition students can design their area of concentration if it does not fit in any of the three areas with the assistance of their major professor

Degree requirements include completion of a 2 year 48-credit program including a thesis of 9 credits or a professional planning report of 4 credits Students with a bachelor degree in community and regional planning from an accredited planning school can waive up to 9 credits from the following list of classes CRP 501 511 521 523 532 and 592 The ability to waive up to 9 credits is determined by a review of the coursework completed during undergraduate study the grades received (only a grade of B or higher is acceptable) and the student s planning experience The decision to waive up to 9 credit hours of the masters program should be made before first time registration for classes through a petition to the DOGE

The program of graduate study is accredited by the Planning Accreditation Board of the American Institute of Certified Planners and the Association of Collegiate Schools of Planning

The planning core consists of C R P 501 511 521 523 532 561 570 and 592

No foreign language is required for the degree master of community and regional planning

Satisfactory completion of the core requirements and the acceptance of a thesis (9 credits) or a professional planning report (4 credits) are required for the M C R P degree In addition the student is encouraged to complete three months of acceptable work experience in a planning office between the first and second year of study

Double degree programs are offered with architecture (M C R P/M Arch) business (M C R P/M B A) public administration (M C R P/M PA) and landscape architecture (M C R P/M L A) The department participates in the interdepartmental minor in housing and in the interdepartmental major in transportation

Courses open for nonmajor graduate credit 365 376

Courses Primarily for Undergraduate Students

C R P 253 Survey of Community and Regional Planning (3 0) Cr 3 F A historical survey of planning the nature and problems of urban areas and the goals procedures and results of urban planning

C R P 270 Forces Shaping Our Metropolitan Environment (Same as Dsn S 270) (3 0) Cr 3 S Must be taken prior to completing 9 credits in C R P Introduction to the social political physical and economic forces as they shape metropolitan areas and their interrelationships A comprehensive picture of metropolitan development showing important roles other urban disciplines play in the planning process and the interrelationships of the disciplines

C R P 272 Planning Analysis and Techniques I (2-2) Cr 3 S *Prereq Com S 103* Existing and emerging techniques for preparation of community planning studies Sources of planning information and data Survey techniques including survey instruments sampling methods sample size for demographic studies Land use surveys for comprehensive and transportation planning Student s oral and graphic presentation of analytical results Laboratory emphasizes practical uses and computer applications for data analysis

C R P 274 Planning Analysis and Techniques II (2 2) Cr 3 F *Prereq 272* Use of quantitative methods for analysis of population land use economic and transportation make-up of a community activities and location intensity and timing of land uses and public services Student s oral and graphic presentation of analytical results Laboratory emphasizes practical uses and computer applications for data analysis

C R P 291 World Cities and Globalization (Same as Dsn S 291) (3 0) Cr 3 F *Prereq Sophomore classification* World cities and globalization in developed and developing countries Topics include globalization world cities and regions uneven economic development the international division of labor multinational corporations international environmentalism tourism popular culture and place based identity

C R P 293 Environmental Planning (Same as Dsn S 293 Env S 293) (3 0) Cr 3 F *Prereq Sophomore classification* Comprehensive overview of the field of environmental relationships and the efforts being made to organize control and coordinate environmen tal aesthetic and cultural characteristics of land air and water

C R P 320 Urban Form (Same as Dsn S 320) (3-0) Cr 3 S *Prereq 253 or 270 or permission of instructor* Examines how urban form is shaped what constitutes good urban form and what are the trends in emerging urban forms Descriptive explanatory and normative theories of urban form and the relation ships between urban form and social economic political cultural and institutional forms

C R P 330 Practicum Cr 1 to 3 may be repeated up to a maximum of 3 credits FS SS *Prereq Major in community and regional planning* Structured work experience under close supervision of a professional planner Practical planning experience relationships between theory and practice professional responsibili ties and the scope of various planning roles Practicum may be repeated Offered on a satisfactory-fail grading basis only

C R P 331 Professional Practice Seminar (Dual listed with 531) Cr 1 S *Prereq Major in community and regional planning* Preparation for working in a planning office discussion of expectation of employer presentations from planning professionals and discussion of differences/similarities between public and private planning offices Offered on a satisfactory fail grading basis only

C R P 365 Technology and the City (Same as Dsn S 365) (3 0) Cr 3 F *Prereq Completion of one semester in a design engineering social science or history major* Historical development of urban areas and their change over time Impact of technological change on development the role that technical and design professionals (including civil engineers architects landscape architects and city planners among others) have played Nonmajor graduate credit

C R P 376 Urban Rural and Regional Economics (Same as Econ 376) See *Economics* Nonmajor graduate credit

C R P 383 Theory of the Planning Process (3 0) Cr 3 S *Prereq 253 or 270 junior status* The nature of planning and its relation to social and economic planning levels of planning place of planning in decision making steps in the planning process uses and limitation of knowledge in planning relation of facts and values

C R P 410 Professional Work Experience Cr R FS SS *Prereq Permission of department chair* Approved professional work experience

C R P 415 Housing (Dual listed with 515 same as Dsn S 415) (3 0) Cr 3 F *Prereq 253 or 270* An in depth review of the problems and issues related to housing planning and policy dealing primarily with inter relationships and interdependencies among the socio-cultural economic and physical aspects of housing Analysis of housing policy making processes in the U S a comprehensive review of the housing policy and planning systems in selected developed and developing nations

C R P 416 Urban Design and Planning Practice (Dual listed with 516) (3 1) Cr 4 F *Prereq 253 or 270* Principles of urban design and their application to residential and commercial development Review processes and criteria for subdivision design and site planning

C R P 417 Urban Revitalization (Dual listed with 517 same as Dsn S 417) (3-0) Cr 3 Alt S offered 2004 *Prereq 253 or 270* The nature extent causes and theories of urban decline Relationship between neighborhood change and the urban development process public policy implications Planning methods available to further revitalization and preservation efforts

C R P 425 Growth Management (Dual listed with 525 same as Dsn S 425) (3 0) Cr 3 Alt F offered 2003 *Prereq Junior classification* Review of techniques used to manage growth related change and to implement plans Capital investment strategies public land acquisition and protection development impact analysis impact mitigation including impact fees phased growth systems urban/ suburban/rural relationships and land preservation

C R P 427 Social Policy Planning (Dual listed with 527) (3 0) Cr 3 Alt S offered 2005 *Prereq 253 270 or junior classification* An overview of the theory and methods of social policy planning with particular attention given to the spatial relationships of policy formation allocation of scarce resources and the delivery of public services as an integrated part of comprehensive community planning

C R P 429 Planning in Developing Countries (Dual listed with 529 same as Dsn S 429) (3-0) Cr 3 S *Prereq Junior classification* A variety of planning related issues including rural urban migration development of national policies and programs urban decay rural development strategies housing problems in a developing country

C R P 432 Community Development Planning and Programming (Dual listed with 532) (1 9) Cr 4 FS SS *Prereq 272 274 senior classification* Integration of planning methods and theory in dealing with a community planning problem Analysis of problem and formulation of strategies for implementa tion Preparation of a community planning report

C R P 435 Planning in Small Towns (Dual listed with 535.) (3-0) Cr 3. Alt F, offered 2004. *Prereq: 253, 270 or junior classification.* Contemporary planning problems in small towns and the design of viable strategies to enhance their social and economic position in today's society.

C R P 442 Site Analysis and Development Design (Dual listed with 542; same as Dsn S 442.) (3-0) Cr 3. S. *Prereq: 253, 272.* Must be taken prior to completing 12 credits in LA. Introduction to site analysis using landscape architecture and environmental principles but drawing also on basic engineering concepts. Work will evolve from analysis to land development design based on that analysis.

C R P 445 Transportation Policy Planning (Dual listed with 545.) (3-0) Cr 3. F. *Prereq: C E 350 or equivalent.* Comprehensive overview of key policy issues related to transportation planning and investment in the United States and abroad; policy issues explored include safety, environmental impact, sustainable communities, and economics. Develop ment Tools like policy analysis and planning are studies in conjunction with each policy issue explored. Issues of concern to state, metropolitan, and local governments.

C R P 451 Introduction to Geographic Information Systems (Dual listed with 551.) (2-2) Cr 3. S. Introduction to geographic information systems including discussions of GIS hardware, software, data structures, data acquisition, analytical techniques, and implementation procedures. Laboratory emphasizes practical applications and uses of GIS.

C R P 452 Geographic Data Management and Planning Analysis (Dual listed with 552.) (2-2) Cr 3. F. *Prereq: C R P 451 or equivalent.* Extensive coverage of geo-relational database concept and design. GIS database creation and maintenance, geographic data manipulation and analysis, GIS output generation and geographic data presentation. Laboratory emphasis, practical applications and uses of GIS.

C R P 455 Community Economic Development (Dual listed with 555.) (3-0) Cr 3. Alt S, offered 2005. *Prereq: Sophomore classification.* The nature and process of economic development in the context of community development. Recent changes and trends and their implications for local and regional develop- ment. Selected case studies and applications. Contemporary community economic development issues.

C R P 475 Urban Planning/Urban Management (Dual listed with 575.) (3-0) Cr 1 for each module, 5 weeks each. F. *Prereq: 253 or 270 and junior classification.* The role planning plays as a part of the management and decision making process: policy initiation, development, and implementation, management approaches and tools.
A. Urban Planning and Management.
B. Citizen Participation/Conflict Management.
C. Grant Writing.

C R P 481 Regional and State Planning (Dual listed with 581.) (3-0) Cr 3. Alt S, offered 2004. *Prereq: 253 or 270.* Analysis of theories, policies, and functions at the metropolitan, regional, and state levels with emphasis on area wide governance structures and strategies for guiding development.

C R P 484 Sustainable Communities (Dual listed with 584; same as Dsn S 484; Env S 484.) (3-0) Cr 3. S. *Prereq: Senior status.* The theory and application of sustainability to the physical and social planning of communities. We will examine environmental ethics as a basis for sustainability, the history of the idea itself and the movement toward indicators as outcome measurements both in the US and internationally. We then explore how these ideas have been or might be applied in communities here and abroad.

C R P 490 Independent Study Cr 1 to 3. FS SS. *Prereq: Written approval of instructor and department chair on required form.* Investigation of an approved topic commensurate with student's interest and ability. Offered on a satisfactory/fail grading basis only. H: Honors.

C R P 491 Environmental Law (Dual listed with 591; same as Dsn S 491; Env S 491.) (3-0) Cr 3. S. *Prereq: 6 credits in natural sciences.* Legal precedents and alternative policies for environmental protection, rights to and regulations for uses of water, air and land. Federal environmental control acts and leading federal court cases.

C R P 492 Planning Law Administration and Implementation (Dual listed with 592.) (3-0) Cr 3. F. *Prereq: Junior classification and 253 or 270.* The basis in constitutional, common, and statutory law for the powers of plan effectuation. Problems of balancing public and private interests as revealed in the study of leading court cases. Administration of planning agencies and programs.

Courses Primarily for Graduate Students, open to qualified undergraduate students

C R P 501 Quantitative Methods for Planning Data Analysis (3-0) Cr 3. F. *Prereq: Graduate classification.* Applications of quantitative methods in planning with emphasis on the collection, description, analysis, presentation, and interpretation of planning data. Primary data collection using survey techniques. Secondary data types and sources of planning information for population projection and demographic analysis.

C R P 510 Professional Work Experience Cr R. FS SS. *Prereq: Permission of department chair.* Approved professional work experience.

C R P 511 Introduction to Community and Regional Planning (3-0) Cr 3. F. *Prereq: Graduate classification.* Development of planning in the United States: history and evolution of the planning profession and constructs of current practice. Theoretical basis of planning.

C R P 515 Housing (Dual-listed with 415; same as Dsn S 515.) (3-0) Cr 3. F. *Prereq: Permission of instructor and graduate classification.* An in-depth review of the problems and issues related to housing planning and policy dealing primarily with interrelation ships and interdependencies among the socio-cultural, economic, and physical aspects of housing. Analysis of housing policy making processes in the U S; a comparative review of the housing policy and planning systems in selected developed and developing nations.

C R P 516 Urban Design and Planning Practice (Dual listed with 416.) (3-1) Cr 4. F. *Prereq: Graduate classification.* Principles of urban design and their application to residential and commercial develop ment. Review processes and criteria for subdivision design and site planning.

C R P 517 Urban Revitalization (Dual listed with 417; same as Dsn S 517.) (3-0) Cr 3. Alt S, offered 2004. *Prereq: Graduate classification.* The nature, extent, causes, and theories of urban decline. The relationship between neighborhood change and the urban development process and its public policy implica tions; the planning methods used to further revitalization and preservation efforts.

C R P 521 Land Use Planning (3-0) Cr 3. F. *Prereq: Graduate classification.* Theories of the origin and growth of urban places and the dynamics of urban structure and land use. Methods and techniques for making land use plans dealing with orderly, efficient, and equitable development and arrangement of land uses within the planning process. Examination of the interrelationships among land use, transportation, environment, and infrastructure and public facilities.

C R P 523 Economic Analysis and the Financing of Public Planning Projects (3-0) Cr 3. S. *Prereq: Graduate classification.* The economic and fiscal make up of a community, specifically focusing on the certain tools - shift/share, capital facilities planning, and fiscal impact analysis - that are utilized to analyze a community's social and economic vitality. Special emphasis will be placed on examining revenue enhancing policies beyond the town's tax structure that are necessary for the payment of public projects including tax increment financing, impact fees, and debt financing.

C R P 525 Growth Management (Dual listed with 425; same as Dsn S 525.) (3-0) Cr 3. Alt F, offered 2003. *Prereq: Graduate classification.* Review of techniques used to manage growth related change and to implement plans. Capital investment strategies, public land acquisition and protection, development impact analysis, impact mitigation including impact fees, phased growth systems, urban/suburban/rural relationships, and land preservation.

C R P 527 Social Policy Planning (Dual listed with 427.) (3-0) Cr 3. Alt S, offered 2005. *Prereq: Graduate classification.* The theory and methods of social policy planning with particular attention to the spatial relationships of policy formation, allocation of scarce resources, and the delivery of public services as an integrated part of comprehensive community planning.

C R P 529 Planning in Developing Countries (Dual-listed with 429; same as Dsn S 529.) (3-0) Cr 3. S. *Prereq: Graduate classification.* A variety of planning and planning related issues including rural urban migration, development of national policies and programs, urban decay, rural development strategies, housing problems in a developing country.

C R P 530 Practicum Cr 3. FS SS. *Prereq: Graduate classification in community and regional planning.* Practical planning experience. Structured work in range of tasks under close supervision of a professional planner. Relationships between theory and practice, exposure to variety of roles in functioning specialties. Offered on a satisfactory/fail grading basis only.

C R P 531 Professional Practice Seminar (Dual listed with 331.) Cr 1. S. *Prereq: Major in community and regional planning.* Preparation for working in a planning office, discussion of expectations of employer, presentations from planning professionals and discussion of differences/similarities between public and private planning offices. Offered on a satisfactory/fail grading basis only.

C R P 532 Community Development Planning and Programming (Dual listed with 432.) (1-9) Cr 4. FSS. *Prereq: 521, 522.* Integration of planning methods and theory in dealing with a community planning problem. Analysis of problem and formulation of strategies for implementation. Preparation of a community planning report.

C R P 535 Planning in Small Towns (Dual listed with 435.) (3-0) Cr 3. Alt F, offered 2004. *Prereq: Graduate classification.* Contemporary planning problems in small towns and the design of viable strategies to enhance their social and economic position in today's society.

C R P 542 Site Analysis and Development Design (Dual listed with 442; same as Dsn S 542.) (3-0) Cr 3. S. *Prereq: Graduate classification.* Must be taken prior to completing 12 credits in LA. Introduction to site analysis using landscape architecture and environmental principles but drawing also on basic engineering concepts. Work will evolve from analysis to land development design based on that analysis.

C R P 545 Transportation Policy Planning (Dual listed with 445.) (3-0) Cr 3. F. *Prereq: Graduate classification.* Comprehensive overview of key policy issues related to transportation planning and investment in the United States and abroad; policy issues explored include safety, environmental impact, sustainable communities, and economic develop- ment. Tools like policy analysis and planning are studied in conjunction with each policy issue explored. Issues of concern to state, metropolitan, and local governments.

C R P 551 Introduction to Geographic Information Systems (Dual listed with 451.) (2-2) Cr 3. S. Introduction to geographic information systems including discussions of GIS hardware, software, data structures, data acquisition, analytical techniques, and

implementation procedures Laboratory emphasized practical applications and uses of GIS

C R P 552 Geographic Data Management and Planning Analysis (Dual listed with 452) (2 2) Cr 3 F *Prereq 551 or instructor permission* Extensive coverage of geo relational database concept and design GIS database creation and maintenance geographic data manipulation and analysis GIS output generation and geographic data presentation Laboratory emphasis practical applications and uses of GIS

C R P 555 Community Economic Development (Dual listed with 455) (3 0) Cr 3 Alt S offered 2005 *Prereq Graduate classification* The nature and process of economic development in the context of community development Recent changes and trends and their implications for local and regional develop ment Selected case studies and applications Contemporary community economic development issues

C R P 556 Economic Development in Small Communities Cr 1 F Offered off campus through Continuing Education on two consecutive Fridays and Saturdays *Prereq Permission of instructor* Community development perspectives entrepreneur ial approaches leadership theories total quality management concepts and strategic planning skills

C R P 561 Seminar in Planning Theory (3 0) Cr 3 S *Prereq Permission of instructor and graduate classification* Current planning theories comprehen sive land use advocacy participatory radical and transactive planning models Decision making and organization models as they affect planning practice Value conflicts and conflict resolution

C R P 570 Seminar in Planning Research (1 0) Cr 1 S Prereq *Graduate classification in community and regional planning* Topics vary from year to year Emphasis on thesis and professional report writing Offered on a satisfactory fail grading basis only

C R P 572 Interpretive Practice and Research (3 0) Cr 3 S *Prereq Graduate classification* An introduc tion to interpretive research methods Theories and practice of qualitative methods as they are applied in research and professional settings

C R P 575 Urban Planning/Urban Management (Dual listed with 475) (3-0) Cr 1 per module 5 weeks each F *Prereq Graduate classification* The role planning plays as a part of the management and decision making process policy initiation develop- ment and implementation management approaches and tools
A Urban Planning Urban Management
B Citizen Participation/Conflict Management
C Grant Writing

C R P 581 Regional and State Planning (Dual listed with 481) (3 0) Cr 3 Alt S offered 2004 *Prereq Graduate classification* Analysis of theories policies and functions at the metropolitan regional and state levels with emphasis on area wide governance structures and strategies for guiding development

C R P 584 Sustainable Communities (Dual listed with 484 same as Dsn S 584) Cr 3 S *Prereq Graduate classification* The theory and application of sustainability to the physical and social planning of communities We will examine environmental ethics as a basis for sustainability the history of the idea itself and the movement toward indicators as outcome measurements both in the US and internationally We then explore how these ideas have been or might be applied in communities here and abroad

C R P 590 Special Topics Cr 1 to 3 FS SS *Prereq Graduate classification and written approval of instructor and department chair on required form*
A Planning Administration
B Local Economic Development
C Urban Design
D Housing
E Neighborhood Renewal
F Social Planning
G Regional Economic Development
H Environmental Planning
I Transportation Planning
J Policy Analysis
K State Planning
L Planning in Developing Countries
M GIS

C R P 591 Environmental Law (Dual listed with 491 same as Dsn S 591 Env S 491 L A 591) (3 0) Cr 3 S *Prereq Graduate classification* Legal precedents and alternative policies for environmental protection rights to and regulations for uses of water air and land Federal environmental control acts and leading federal court cases

C R P 592 Planning Law Administration and Implementation (Dual listed with 492) (3-0) Cr 3 F *Prereq Graduate classification* The basis in constitutional common and statutory law for the powers of plan effectuation Problems of balancing public and private interests as revealed in the study of leading court cases Administration of planning agencies and programs

Courses for Graduate Students

C R P 598 Professional Planning Report (Arr) Cr Var FS SS Independent student research on planning topic The course will serve as a capstone experience for the student demonstrating ability to integrate planning knowledge and skills in the practical application of the student s abilities on a current planning issue The completed report must be submitted to and approved by the POS committee as evidence of the mastery of the principles of community and regional planning

C R P 699 Research Cr Var FS SS

Complex Adaptive Systems

(Interdepartmental Graduate Minor)

Advisory Committee D Ashlock Chair H H Chou J Decker G Sheble L Tesfatsion

The Complex Adaptive Systems (CAS) minor provides graduate students with an understanding of the interrelationships among the various methodologies associated with Artificial Life methodologies Of special importance in the program is the interplay of techniques between biological systems and computer emulations of such systems for applications in various fields as Economics Engineering and Mathematics

Graduates understand the ways in which artificial life techniques may be applied to their major field of study They have an appreciation and understanding of the cross-disciplinary aspects of artificial life techniques Students who complete a minor in this graduate program are able to describe and report on various artificial life techniques as applied to many fields even outside their own field of application

Work in the CAS minor is offered for students pursuing any graduate degree The primary cooperat ing departments are Economics Computer Science Electrical and Computer Engineering Mechanical Engineering Mathematics Psychology and Biology

Each student s Masters Program of Study (POS) must include at least 9 CAS relevant course credits chosen in consultation with the student s POS committee and the CAS program plus two credits (one credit each time taken) of the CAS seminar and three credits of CAS 503 (see below) Each student s Ph D Program of Study must include at least 12 CAS relevant courses credits chosen in consultation with the student s POS committee and the CAS program plus two credits (one credit each time taken) of the CAS seminar and three credits of CAS 503 Ph D students who also minored in CAS at the master s level must take one additional CAS relevant course (3 cr) and two additional credits of CAS seminar Courses that satisfy CAS requirements may also be used to satisfy major requirements if such double counting is acceptable to the major program

Interested students may contact the chairperson of the advisory committee for complete lists of courses and of CAS faculty members

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

CAS 502 Complex Adaptive Systems Seminar (Same as E E 502 Com S 502) (1-0) Cr 1 FS *Prereq Admission to CAS minor* Understanding core techniques in artificial life are based on basic readings in complex adaptive systems Understand techniques of complex system analysis methods including Evolutionary computation Neural nets Agent based simulatic ns (Agent based Computational Economics) Large scale simulations are to be emphasized e g power grids whole ecosystems

CAS 503 Complex Adaptive Systems Concepts and Techniques (Same as E E 503 Com S 503) (3 0) Cr 3 S *Prereq Admission to CAS minor* Understand ing of Computer Modeling of Complex Systems Complex adaptive systems approach to the study of evolutionary computation neural computation cellular computation computational models of immune systems complexity theory computational economics and other fields of applications

Computer Engineering

(Administered by the Department of Electrical and Computer Engineering)

Subrahmanyam Venkata Chair of Department

Professors J Bowler Dalal Geiger Horton Jiles Kamal Kothari Lamont Melsa Rover Sheble Somani Venkata Vittal Weber Woods

Professors (Collaborators) Hassoun Khammash L Udpa S Upda

Distinguished Professors (Emeritus) Brown Fouad Lord Nilsson Pohm

University Professors (Emeritus) Jones

Professors (Emeritus) Anderson Brearley Brockman Comstock Fanslow Hale Hsieh Koerber Kopplin Potter Read Smay Stewart Swift Townsend Triska

Associate Professors Ajjarapu Aluru Bartlett Berleant Chang Chen Cruz Neira Davidson Davis Dickerson Jacobson Kleitsch Kruempel Kumar McCalley Russell Tuttle Tyagi

Associate Professors (Adjunct) N Bowler

Associate Professors (Emeritus) Bond Carlson Coady McMechan Mericle Pavlat Scott Stephenson

Assistant Professors Balasubramaniam Chu Daniels Dogandzic Elia Govindarasu Guan Ma Patterson Salapaka Song Tirthapura Wang Zhang

Assistant Professors (Adjunct) Amin Bode Mina

Assistant Professors (Collaborators) Barton Chandramouli Lee

Undergraduate Study

For undergraduate curriculum in computer engineering leading to the degree bachelor of science see *College of Engineering Curricula* This curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology

The Electrical and Computer Engineering (ECPE) Department at Iowa State University provides undergraduate students with the opportunity to learn electrical and computer engineering fundamentals to study applications of the most recent advances in state of the art technologies and to prepare for the practice of engineering The student faculty interaction necessary to realize this opportunity occurs within an environment that is motivated by the principle that excellence in undergraduate education is enhanced by an integrated commitment to successful long term research and outreach programs

The computer engineering curriculum offers specializations in computer architecture and digital

design software systems information security networking and VLSI Students may also take elective courses in control systems electromagnetics microelectronics VLSI power systems and communications and signal processing

The mission of the computer engineering program at Iowa State University is to enable the graduated student to make significant and substantive contributions to solving computer engineering problems throughout the student s professional career The following objectives are identified as critical to the accomplishment of this mission

A Objective I Impart and enhance knowledge in the domain of computer engineering The graduated student should understand
1 engineering and basic science fundamentals including mathematics probability statistics physical sciences and information technology
2 the design and manufacturing processes
3 the fundamentals of business including entrepreneurship and cost/revenue streams

B Objective II Expand and hone engineering abilities The graduated student should be able to
1 identify and solve engineering problems
2 analyze and design electrical computer and multidisciplinary systems
3 design and conduct experiments and analyze resulting data
4 use modern engineering hardware and software tools such as computers and instrumentation

C Objective III Instill and nurture social awareness abilities and understanding The graduated student should
1 desire to engage in lifelong learning and should expect and embrace change
2 be able to function effectively as a member of a multidisciplinary team to communicate effectively and to think critically and creatively both independently and with others
3 apply standards of professional conduct in view of the value of science and technology in a global/societal context

As a complement to the instructional activity the ECPE Department provides opportunities for each student to have experience with broadening activities Through the Cooperative Education and Internship Program students have the opportunity to gain practical industry experience See *College of Engineering Cooperative Programs* Through the Undergraduate Research Program students have the opportunity to participate in advanced research activities and through international exchange programs students learn about engineering practices in other parts of the world Well qualified juniors and seniors in Computer Engineering who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both B S and M S degrees See *Graduate Study* for more information

Students are required to prepare and to maintain a portfolio of their technical and non technical skills This portfolio is evaluated for student preparation during the student s curriculum planning process Results of the evaluation are used to advise students of core strengths and weaknesses Prerequisite material exams may be given at key points in the curriculum These exams are to assist student evaluation of progress made during the academic experience as the material covered in several courses are the foundation of more advanced courses These outcome assessments are also used to assess and to improve the quality of the curriculum

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with major in computer engineering and minor work to students with other majors Minor work for computer engineering majors is usually selected from a wide range of courses outside computer engineering

The degree master of science with thesis is recommended for students who intend to continue toward the doctor of philosophy degree or to undertake a career in research and development The nonthesis master of science degree requires a creative component

The normal prerequisite to major work in computer engineering is the completion of undergraduate work substantially equivalent to that required of computer engineering students at this university It is possible for a student to qualify for graduate study in computer engineering even though the student s undergraduate or prior graduate training has been in a discipline other than computer engineering Supporting work if required will depend on the student s background and area of research interest Prospective students from a discipline other than computer engineering are required to submit with the application for admission a statement of the proposed area of graduate study

The department requires submission of GRE aptitude test scores by applicants from other countries All students whose first language is not English and who have no U S degree must submit TOEFL examination scores Ph D students must pass a department qualifying examination

The Department of Electrical and Computer Engineering is a participating department in the interdepartmental M S and Ph D degree programs in Bioinformatics and Computational Biology Students interested in these programs may earn their degrees while working under an adviser in Electrical and Computer Engineering

The Department of Electrical and Computer Engineering is also a participating department in the interdepartmental Master of Science in Information Assurance program Students interested in studying Information Assurance topics may earn a degree in Computer Engineering or in Information Assurance (See bulletin section on *Information Assurance*)

Well qualified juniors and seniors in Computer Engineering who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both B S and M S degrees Under concurrent enrollment students are eligible for assistantships and simultaneously take undergraduate and graduate courses Details are available in the Student Services Office and on the department s web site

Courses open for nonmajor graduate credit all 300 and 400 level courses except 310 370 396 397 398 466 490 491 492 494 and 498

Courses Primarily for Undergraduate Students

Cpr E 166 Professional Programs Orientation (Same as E E 166) (1 0) Cr R FS Overview of the nature and scope of electrical engineering and computer engineering professional Portfolio construction Departmental rules student services operations degree requirements program of study planning career options and student organizations

Cpr E 185 Introduction to Computer Engineering and Problem Solving (2-2) Cr 3 *Prereq Credit or enrollment in Math 141* Introduction to Computer Engineering and teamwork Project based examples from computer engineering Group skills needed to work effectively in teams Group problem solving Individual interactive skills for small and large groups Computer based projects Solving engineering problems and presenting solutions through technical reports Solution of engineering problems using the C language

Cpr E 203 Electronic Devices and Circuits (Same as E E 203) (3 3) Cr 4 FS *Prereq E E 201 Math 267 Phys 222 and credit or enrollment in 210* Emphasis on mathematical tools Operational amplifier models and applications DC large signal and small signal frequency independent and frequency dependent models and characteristics for diodes bipolar junction transistors and field-effort transistors SPICE simulation applied to electronic circuit analysis and design IC technology for MOS and bipolar analysis and design Characteristics of IC logic families Laboratory design projects

Cpr E 210 Introduction to Digital Design (3 2) Cr 4 FS *Prereq Sophomore classification* Number systems and representation Boolean algebra and logic minimization Combinational and sequential logic design Arithmetic circuits and finite state machines Use of programmable logic devices Introduction to computer aided schematic capture systems simulation tools and hardware description languages Design of a simple digital systems

Cpr E 211 Introduction to Microcontrollers (3-2) Cr 4 FS *Prereq 210 Com S 207 or 227* Introduction to microprocessor instruction sets Assembly language programming and interfaces to higher level languages Input/output programming Interrupt handling Hardware/software design tradeoffs and issues Design projects

Cpr E 298 Cooperative Education Cr R FS SS *Prereq Permission of department* First professional work period in the cooperative education program Students must register for this course before commencing work

Cpr E 305 Computer Organization and Design (3-2) Cr 4 FS *Prereq 211 or Com S 321* Introduction to computer organization Evaluating performance of computer systems instruction set design computer arithmetic and processor design Datapath and control pipelining and pipelined control design Memory organization Interfacing processors and peripherals Laboratory component using HDLs Nonmajor graduate credit

Cpr E 308 Operating Systems Principles and Practice (3-3) Cr 4 FS *Prereq 305 310* Operating system concepts processes threads IPC scheduling algorithms deadlocks memory management file systems I/O systems Linux based kernel level lab experiments Nonmajor graduate credit

Cpr E 310 Theoretical Foundations of Computer Engineering (3 0) Cr 3 FS *Prereq Credit or enrollment in Cpr E 211 Com S 228* Propositional logic and methods of proof set theory and its applications mathematical induction and recurrence relations functions and relations counting and discrete probability trees and graphs applications in computer engineering

Cpr E 334 Integrated Circuit Design (Same as E E 334) (3 3) Cr 4 FS *Prereq E E 203* Overview of integrated circuit technology Advanced MOSFET models bipolar junction transistors Small signal analysis IC amplifier configurations biasing and frequency response MOS digital design Introduction to CAD tools Laboratory design projects Nonmajor graduate credit

Cpr E 370 Toying with Technology (Same as Mat E 370) See *Materials Engineering*

Cpr E 396 Summer Internship Cr R SS *Prereq Permission of department* Summer professional work period

Cpr E 397 Engineering Internship Cr R FS *Prereq Permission of department* One semester maximum per academic year professional work period

Cpr E 398 Cooperative Education Cr R FS SS *Prereq 298 permission of department* Second professional work period in the cooperative education program Students must register for this course before commencing work

Cpr E 425 High Performance Computing for Scientific and Engineering Applications (Same as Com S 425) See *Computer Science* Nonmajor graduate credit

Cpr E 426 Introduction to Parallel Algorithms and Programming (Dual listed with 526 same as Com S 426) (3 2) Cr 4 F *Prereq 308 or Com S 321 Com S 311* Models of parallel computation performance measures basic parallel constructs and communication primitives parallel programming using MPI parallel algorithms for selected problems including sorting matrix tree and graph problems fast Fourier transforms Nonmajor graduate credit

Cpr E 430 Advanced Protocols and Network Security (Dual listed with 530.) (3-0) Cr 3. *Prereq 305.* Detailed examination of networking standards protocols and their implementation. TCP/IP protocol suite, network applications, protocols, IP routing, network security issues. Emphasis on laboratory experiments. Nonmajor graduate credit.

Cpr E 434 Analog and Digital VLSI Design (Same as E E 434.) (3-3) Cr 4. *Prereq E E 334.* Semiconductor processes and fabrication, device models, physical layout, simulation, synthesis and fabrication. Design and use of analog and digital building blocks. Behavioral level descriptions of digital circuits and synthesis using standard cells. Nonmajor graduate credit.

Cpr E 435 Analog VLSI Circuit Design (Same as E E 435.) (3-3) Cr 4. S. *Prereq 434.* Basic analog integrated circuit and system design including design space exploration, performance enhancement strategies, operational amplifiers, references, integrated filters, and data converters. Nonmajor graduate credit.

Cpr E 454 Distributed and Network Operating Systems (Dual listed with 554; same as Com S 454.) See *Computer Science.* Nonmajor graduate credit.

Cpr E 458 Real Time Systems (Dual listed with 558.) (3-0) Cr 3. *Prereq 308 or Com S 352.* Fundamental concepts in real time systems. Real time task scheduling paradigms. Resource management in uniprocessor real time systems, multiprocessor real-time systems, distributed real time systems, and real-time networks. Feedback control real time scheduling, case study of real time system architectures, operating systems, and programming languages. Nonmajor graduate credit.

Cpr E 465 Digital Integrated Circuit Design (Same as E E 465.) (3-3) Cr 4. S. *Prereq 334.* Digital design of integrated circuits employing very large scale integration (VLSI) methodologies. High level hardware design languages, logic synthesis and silicon compilers, datapath architectures and systems on a chip (SOC) considerations, VLSI chip hardware design project. Nonmajor graduate credit.

Cpr E 466 Multidisciplinary Engineering Design (Same as E E 466, I E 466, Mat E 466.) (1-4) Cr 3. F. S. *Prereq Student must be within two semesters of graduation and receive permission of instructor.* Application of team design concepts to projects of a multidisciplinary nature. Concurrent treatment of design, manufacturing, and life cycle considerations. Application of design tools such as CAD, CAM, and FEM. Design methodologies, project scheduling, cost estimating, quality control, manufacturing processes. Development of a prototype and appropriate documentation in the form of design journals, written reports, oral presentations, and computer models and engineering drawings.

Cpr E 483 Hardware Software Integration (3-3) Cr 4. S. *Prereq 305.* Design of microprocessors with hardware description language and programmable logic devices. Use of microprocessors as system components. Bus architectures and standard interfaces. Embedded software development. Development of embedded systems by integrating embedded software and microprocessors. Laboratory oriented design projects. Nonmajor graduate credit.

Cpr E 485 Java and Internet Programming (2-2) Cr 3. S. *Prereq Com S 309.* The Java programming language emphasizing internet related capabilities. JavaScript topics. Nonmajor graduate credit.

Cpr E 486 Object Oriented Software Specification and Design (3-0) Cr 3. F. *Prereq 308 Com S 309.* Study of methods, techniques, and tools associated with the various types of specification and design activities, architectural design, component design, interface specification, data specification and design, and algorithm specification and design. Object-oriented specification and design using Unified Modeling Language (UML) and Design Patterns. Term projects to provide hands-on experience in dealing with complex specification and design issues. Nonmajor graduate credit.

Cpr E 489 Computer Networking and Data Communications (3-0) Cr 3. FS. *Prereq 305 or E E 324.* Survey of modern computer networking and data communications. Contemporary concepts, facilities, practices, implementations, and issues. TCP/IP, OSI protocols, client server programming. Nonmajor graduate credit.

Cpr E 490 Independent Study Cr arr. *Prereq Senior classification in computer engineering.* Investigation of an approved topic.
H: Honors.

Cpr E 491 Senior Design Project I and Professionalism (Same as E E 491.) (2-3) Cr 3. FS. *Prereq E E 322 or Cpr E 308, completion of 24 credits in the E E core professional program or 29 credits in the Cpr E core professional program, Engl 314.* Preparing for entry to the workplace. Selected professional topics. Use of technical writing skills in developing project plan and design report, project poster. First of two semester team-oriented project design and implementation experience.

Cpr E 492 Senior Design Project II (Same as E E 492.) (1-3) Cr 2. FS. *Prereq Cpr E 491 or E E 491.* Emphasis on the successful implementation and demonstration of the design completed in 491 or Cpr E 491 and the evaluation of project results. Technical writing of final project report, oral presentation of project achievements.

Cpr E 494 Portfolio Assessment (Same as E E 494.) (1-0) Cr R. *Prereq Credit or enrollment in 491.* Portfolio update and evaluation. Interviewing skills with portfolios.

Cpr E 498 Cooperative Education Cr R. FS. SS. *Prereq 398 permission of department.* Third and subsequent professional work periods in the cooperative education program. Students must register for this course before commencing work.

Courses Primarily for Graduate Students, open to qualified undergraduate students

Cpr E 501 Analog and Mixed Signal VLSI Circuit Design Techniques (Same as E E 501.) (3-3) Cr 4. F. *Prereq 434.* Design techniques for analog and mixed signal VLSI circuits. Amplifiers, operational amplifiers, transconductance amplifiers, finite gain amplifiers and current amplifiers. Linear building blocks, differential amplifiers, current mirrors, references, cascading and buffering. Performance characterization of linear integrated circuits, offset, noise, sensitivity and stability. Layout considerations, simulation, yield and modeling for high performance linear integrated circuits.

Cpr E 505 CMOS and BiCMOS Data Conversion Circuits (Same as E E 505.) (3-3) Cr 4. Alt. S., offered 2004. *Prereq 434 or 501.* Theory, design and applications of data conversion circuits (A/D and D/A converters) including architectures, characterization, quantization effects, conversion algorithms, spectral performance, element matching, design for yield and practical implementation issues.

Cpr E 507 VLSI Communication Circuits (Same as E E 507.) (3-0) Cr 3. Alt. S., offered 2005. *Prereq 434 or 501.* Phase locked loops, frequency synthesizers, clock and data recovery circuits, theory and implementation of adaptive filters, low noise amplifiers, mixers, power amplifiers, transmitter and receiver architectures.

Cpr E 511 Design and Analysis of Algorithms (Same as Com S 511.) See *Computer Science.*

Cpr E 525 Numerical Analysis of High Performance Computing (Same as Com S 525, Math 525.) (3-0) Cr 3. S. *Prereq 308 or one of Math 273, 471, 481, experience in scientific programming, knowledge of FORTRAN or C.* Development, analysis and testing of efficient numerical methods for use on state of the art high performance computers. Applications of the methods to the student's area of research.

Cpr E 526 Introduction to Parallel Algorithms and Programming (Dual listed with 426; same as Com S 526.) (3-2) Cr 4. F. *Prereq 308 or Com S 321, Com S 311.* Models of parallel computation, performance measures, basic parallel constructs and communication primitives, parallel programming using MPI, parallel algorithms for selected problems including sorting, matrix, tree and graph problems, fast Fourier transforms.

Cpr E 530 Advanced Protocols and Network Security (Dual listed with 430; same as InfAs 530.) (3-0) Cr 3. *Prereq 305.* Detailed examination of networking standards, protocols and their implementation. TCP/IP protocol suite, network application protocols, IP routing, network security issues. Emphasis on laboratory experiments.

Cpr E 531 Information System Security (Same as InfAs 531.) (3-0) Cr 3. *Prereq 489 or 530 or Com S 586 or MIS 535.* Computer and network security, basic cryptography, security policies, multilevel security models, attack and protection mechanisms, legal and ethical issues.

Cpr E 532 Information Warfare (Same as InfAs 532.) (3-0) Cr 3. S. Prereq 531. Computer system and network security, implementation, configuration, testing of security software and hardware, network monitoring, Authentication, firewalls, vulnerabilities, exploits, countermeasures. Ethics in information assurance. Emphasis on laboratory experiments.

Cpr E 533 Cryptography (Same as Math 533.) See *Mathematics.*

Cpr E 534 Legal and Ethical Issues in Information Assurance (Same as InfAs 534.) (3-0) Cr 3. S. *Prereq 531.* Legal and ethical issues in computer security. State and local codes and regulations. Privacy issues.

Cpr E 537 Wireless Network Security (3-0) Cr 3. S. *Prereq Credit or enrollment in 489 or 530.* Introduction to the physical layer and special issues associated with security of the airlink interface. Wireless networking, base stations, mobile stations, airlink access, jamming, spoofing, signal intercept, wireless LANs, wireless modems, cellular radiotelephones, optical links, signal modeling, propagation modeling.

Cpr E 540 Principles and Practice of Compiling (Same as Com S 540.) See *Computer Science.*

Cpr E 541 High Performance Communication Networks (3-0) Cr 3. *Prereq 530 or Com S 586.* Selected topics from recent advances in local area networks, metropolitan area networks, asynchronous transfer mode, high speed optical networks, high speed switch architectures, multicasting for teleconferencing applications, wireless and mobile computing.

Cpr E 542 Optical Communication Networks (3-0) Cr 3. *Prereq 489.* Optical components and interfaces, optical transmission and reception techniques, wavelength division multiplexing, network architectures and protocol for first generation single and multihop optical network, routing and wavelength assignment in second generation wavelength routing networks, linear lightwave networks.

Cpr E 545 Fault Tolerant Systems (3-0) Cr 3. *Prereq 305.* Faults and their manifestations, errors, failures, reliability and availability techniques. Designing highly reliable systems, redundancy management, fault detection, location and reconfiguration. Testing, design for testability, self checking and fail safe circuits, coding techniques. System level fault diagnosis, fault tolerant communication, fault tolerant multiprocessor systems. Reliable software design, low-overhead high availability techniques. Evaluation methods.

Cpr E 549 Advanced Algorithms in Computational Biology (Same as Com S 549, BCB 549.) (3-0) Cr 3. S. *Prereq Com S 311.* Design and analysis of algorithms for applications in computational biology, pairwise and multiple sequence alignments, approximation algorithms, string algorithms including in-depth coverage of suffix trees, semi numerical string algorithms, algorithms for selected problems in fragment assembly, phylogenetic trees, and protein folding.

Cpr E 554 Distributed and Network Operating Systems (Dual listed with 454 same as Com S 554) See *Computer Science*

Cpr E 556 Scalable Software Engineering (3-0) Cr 3 *Prereq 486* Study of methods techniques and tools for design development and evolution of complex software aspect–oriented programming domain specific software technologies automation for reliable and scalable software engineering program analysis comprehension and transformation

Cpr E 557 Computer Graphics and Geometric Modeling (Same as I E 557 M E 557) (3 0) Cr 3 F *Prereq M E 421 programming experience in C* Fundamentals of computer graphics technology Data structures Parametric curve and surface modeling Solid model representations Applications in engineering design analysis and manufacturing

Cpr E 558 Real-Time Systems (Dual listed with 458) (3 0) Cr 3 *Prereq 308 or Com S 352* Fundamental concepts in real time systems Real-time task scheduling paradigms Resource management issues in uniprocessor real time systems multiproces sor real time systems distributed real time systems and real-time networks Feedback control real time scheduling case study of real time system architectures operating systems and programming languages

Cpr E 560 Algorithmic Methodologies in Computer Aided Design (3 0) Cr 3 *Prereq Experience with any high level computer language* Theoretical methods and practical case studies in the area of computer-aided design for VLSI on the following topics essentials of data structures NP completeness graph algorithms dynamic program ming linear and nonlinear programming branch and bound methods greedy algorithms backtracking techniques divide and conquer algorithms Markov chains

Cpr E 563 Modeling and Optimization of Interconnect in Deep Submicron Design (3 0) Cr 3 *Prereq 465* Modeling and optimization techniques for high performance digital and analog interconnect designs RLC extraction Interconnect modeling Elmore delay model moment computation asymptotic waveform evaluation Pade Via Lanczos *pole analysis transmission lines* Driver modeling Interconnect optimization topology optimization device sizing wire sizing buffer insertion high performance clock sizing

Cpr E 564 Synthesis and Optimization of Digital Circuits (3 0) Cr 3 S *Prereq 305* Algorithms and techniques to generate application specific VLSI circuits from high-level behavioral modeling in hardware description languages Hardware models architectural level synthesis and optimization *scheduling algorithms resource sharing* and binding logic level synthesis and optimization sequential logic optimization system-level synthesis hardware software co-design

Cpr E 566 Physical Design of VLSI Systems (3-0) Cr 3 Physical design of VLSI systems Partitioning algorithms Placement and floorplanning algorithms Routing-global and detailed Layout compaction Physical design of FPGAs and MCM s Interconnect optimization Performance-driven layout synthesis

Cpr E 567 CAD Algorithms for VLSI Design (3 0) Cr 3 Simulation algorithms for VLSI circuits Formulation of circuit equations Transistor-level modeling Solution of circuit equations Transient analysis and sensitivity analysis Latency and timing analysis Logic/timing simulations Mixed mode simulation Asymptotic waveform evaluation (AWE) Parallel algorithms

Cpr E 575 Introduction to Virtual Reality (3-0) Cr 3 *Prereq Com S 311 or M E 420* Introduction to virtual reality concepts and applications Physiology of the human perception system immersive displays 3 D devices 3 D sound real time software development sample applications in science and engineering Practical issues in creating effective virtual environments will be emphasized

Cpr E 582 Computer Systems Performance (3 0) Cr 3 *Prereq 305 310* Review of probability and stochastic processes concepts Markovian processes Markovian queues renewal theory semi Markovian queues multiprocessor architectures computer networks switching systems

Cpr E 583 Reconfigurable Computing Systems (Same as Com S 583) (3 0) Cr 3 *Prereq Background in computer architecture design and organization* Introduction to adaptive/reconfigurable computing FPGA technology and architectures spatial computing architectures systolic and bit serial architectures adaptive network architectures bus based and static dynamic rearrangeable interconnection structure architectures reconfigurable computing architectures for processors pipeline and caches

Cpr E 585 Advanced Computer Architecture (Same as Com S 585) (3 0) Cr 3 F *Prereq 305* Quantitative principles of computer architecture design instruction set design processor architecture pipelining and superscalar design instruction level parallelism memory organization cache and virtual memory systems multiprocessor architecture cache coherency interconnection networks and message routing I/O devices and peripherals

Cpr E 586 Advanced Microprocessor Architecture (3 0) Cr 3 *Prereq 585* Design and analysis of advanced microprocessor architecture trends and issues in state-of the art microprocessor design superscalar out-of-order dynamic pipeline instruction level parallelism control and data speculation advanced cache/memory architecture performance analysis and simulation tools and VLSI tradeoffs

Cpr E 587 Text Mining Text Processing and the Internet (3 0) Cr 3 *Prereq 486 or Com S 309 or Com S 311* Mining retrieval and other processing of text including text and hypermedia on the world wide web Human computer interaction in the context of text and hyper media Topics of particular interest to enrolled students

Cpr E 588 Embedded Computer Systems (3-0) Cr 3 *Prereq 308* Design implementation and testing of embedded computer systems Co-design of hardware and software Concurrency real time control hardware/software interfaces and error handling

Cpr E 589 Multimedia Systems (3-0) Cr 3 S *Prereq 308 or Com S 352* Fundamentals concepts in multimedia systems Resource management issues in distributed/networked multimedia systems QoS routing and multicasting Traffic shaping Task and message scheduling Internet QoS Adaptive multimedia applications over the Internet Operating system support for multimedia Storage architecture and scalable media servers Compression techniques synchronization techniques processor architectures for multimedia

Cpr E 590 Special Topics Cr 1 to 6 each time elected Formulation and solution of theoretical or practical problems in computer engineering

Cpr E 592 Seminar in Computer Engineering Cr 1 to 4 each time elected *Prereq Permission of instructor* Projects or seminar in Computer Engineering

Cpr E 594 Selected Topics in Computer Engineering (3 0) Cr 3 each time selected

Cpr E 599 Creative Component Cr var

Courses for Graduate Students

Cpr E 626 Parallel Algorithms for Scientific Applications (Same as Com S 626) (3-0) Cr 3 *Prereq 526* Algorithm design for high performance computing Applications to finite element and finite difference methods for numerical simulations sparse matrix computation multidimensional tree data structure and particle-based methods random numbers and Monte Carlo applications algorithms for computational biology

Cpr E 697 Engineering Internship (Same as E E 697) Cr R *Prereq Permission of department chair graduate classification* One semester and one summer maximum per academic year professional work period Offered on a satisfactory fail basis only

Cpr E 699 Research Cr var

Computer Science

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Carl K Chang Chair of Department

Professors Bergman C Chang Fernandez Baca Honavar Kothari Leavens J Lutz Maddux Miller Slutzki Wong

Professors (Emeritus) Brearley Oldehoeft Stewart Thomas

Associate Professors Aluru J M Chang Chaudhuri Cruz Neira Gadia Huang R Lutz Prabhu Tyagi

Associate Professors (Adjunct) Kendall

Assistant Professors Aduri Chou Eulenstein Jia Lumpe Margaritis Miner Ruan Tavanapong Tian

Undergraduate Study

The curriculum in Liberal Arts and Sciences leading to a bachelor of science degree with a major in computer science is designed to prepare students for positions as computer scientists with business industry or government or for graduate study in computer science This program has been accredited by the Computing Sciences Accreditation Board Inc

To complete an undergraduate degree in Computer Science a student must satisfy the requirements of the College of Liberal Arts and Sciences (see Liberal Arts and Sciences Curriculum) and include the following courses within the group requirements Phil 343 Sp Cm 212 14 credits of math and statistics including Math 165 Math 166 Stat 330 and at least one math course from Math 265 266 304 307 314 or 317 a minimum of 12 credits of natural science including Phys 221 222 and at least one additional natural science course from the following list A Ecl 312 Anthr 202 307 BBMB 221 Biol 201 201L 202 202L 312 Bot 304 Chem 163 231 Ent 370 Env S 324 FS HN 167 Gen 260 Geol 101 102 201 306 311 412 Mat E 207 211 Mteor 206 301 Psych 310 *Zool* 155 156 258 310 *English proficiency* requirement Engl 104 105 and one of Engl 302 305 309 or 314 The minimum grade accepted in each of the three required English courses is a C

Students wishing to pursue the B S degree in computer science must first successfully complete the premajor program consisting of the following courses and minimum grade requirements

Course	Minimum Grade
104	C
227	C-
228	C
Math 165	C

Students majoring in computer science must successfully complete this premajor program prior to taking any other courses in the Department Thus for computer science majors this premajor serves as a necessary prerequisite to all the other courses offered by the Department

A minimum of 44 credits is required for the B S degree in computer science The required courses are Com S 101 104 203 Cpr E 210 Com S 227 228 309 311 321 330 331 342 352 362 or 363 In addition two advanced level courses must be selected from the following groups

Group W 440 454 476

Group B 401 425 430 461 472 474

Group N 418 Math 421 Math 471 Math 481 Cpr E 484 Cpr E 485 Cpr E 489 M E 519

Courses in Group W require written reports and those in Group B require both oral and written reports Students must take one course from Group B and one course from any group

Students must earn a C or better in each course in the department which is a prerequisite to a course listed in the student s degree program

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with a major in Computer Science The doctor of philosophy may also be earned with computer science as a co-major with some other discipline Additionally the department offers minor work to students majoring in other departments

Established research areas include algorithms artificial intelligence computational complexity computer architecture bioinformatics computational biology computer networks database systems formal methods information assurance machine learning and neural networks multimedia operating systems parallel and distributed computing programming languages robotics and software engineering There are also numerous opportunities for interdisciplinary research

Typically students beginning graduate work in Computer Science have completed a bachelor s degree or equivalent in Computer Science However some students with undergraduate majors in other areas such as mathematical physical or biological science or engineering become successful graduate students in Computer Science

For the degree master of science a minimum of 31 semester credits are required A thesis demonstrating research and the ability to organize and express significant ideas in computer science is required Com S 591 is required and it is taken during the first semester of a normal Graduate program

The purpose of the doctoral program is to train students to do original research in Computer Science Each student is also required to attain knowledge and proficiency commensurate with a leadership role in the field The Ph D requirements governed by the student s program of study committee within established guidelines of the department and the graduate college include coursework demonstrated proficiency in three areas of Computer Science a research skills requirement a preliminary examination and a doctoral dissertation and final oral examination

The department recommends that all graduate students majoring in Computer Science teach as part of their training for an advanced degree

Courses open for nonmajor graduate credit 309 311 321 330 331 342 352 362 363 381 401 411 425 426 430 440 454 455 461 471 472 474 476 481 484

Courses Primarily for Undergraduate Students

Com S 101 Orientation (1 0) Cr R Half semester FS Introduction to the procedures and policies of Iowa State University and the Department of Computer Science test outs honorary societies etc Issues relevant to student adjustment to college life will also be discussed Offered on a satisfactory fail grading basis only

Com S 103 Computer Applications (3 2) Cr 4 FS Introduction to computer literacy and applications Applications Windows Internet browser/HTML word processing spreadsheets database management and presentation software Literacy history of computing structure of computers telecommunications computer ethics computer crime and history of programming languages No prior computer experience necessary

Com S 104 Introduction to Computers (3 2) Cr 4 F Use of personal computer and workstation operating systems and software Overview of machine architecture and telecommunications Project-oriented approach to word processing spreadsheet presentation database management Internet usage HTML and other software Beginning programming in Visual Basic Unix Topics from computer history programming languages algorithm development and societal impact No prior computer experience necessary This course is for computer science pre majors

Com S 107 Applied Computer Programming (3 0) Cr 3 FS *Prereq 103 Math 104 or 140 or 150* Introduction to computer programming for non majors using a language such as the Visual Basic language Basics of good programming and algorithm development Graphical user interfaces

Com S 201 Computer Programming in COBOL (3 0) Cr 3 FS *Prereq 107 or 207 or 227* Computer programming in COBOL Emphasis on the design writing debugging and testing of business applications programs in a transaction-oriented environment

Com S 203 Careers in Computer Science (1-0) Cr R Half semester FS Computer science as a profession Introduction to career fields open to computer science majors Relationship of coursework to careers Presentations by computer science professionals Offered on a satisfactory-fail grading basis only

Com S 207 Programming I (3 1) Cr 3 FS *Prereq Math 150 or placement into Math 140/141/142 or higher* An introduction to computer programming using an object oriented programming language Emphasis on basics of good programming techniques and style through extensive practice in top-down design writing running and debugging small programs Procedural abstraction Use of abstract data types This course is designed for nonmajors Credit may not be applied toward graduation for both 207 and 227

Com S 208 Programming II (3 1) Cr 3 FS *Prereq 207 credit or enrollment in Math 151 160 or 165* An introduction to data structures and algorithm analysis Recursion List and file processing Dynamic data structures Data abstraction and implementation Emphasis on design writing documenting and testing medium sized programs This course is designed for nonmajors Credit may not be applied toward the major

Com S 227 Introduction to Object oriented Programming (3 1) Cr 3 FS *Prereq 104 or 107 or prior programming experience credit or enrollment in Math 165* An introduction to object-oriented design and programming techniques Symbolic and numerical computation Recursion and iteration Modularity procedural and data abstraction specifications and subtyping Object-oriented techniques Imperative programming Emphasis on principles of programming and object oriented design through extensive practice in design writing running debugging and reasoning about programs This course is designed for majors Credit may not be applied toward graduation for both 207 and 227

Com S 228 Introduction to Data Structures (3 1) Cr 3 FS *Prereq 227 Math 165 credit or enrollment in 104 and Math 166* An object oriented approach to data structures and algorithms Object-oriented analysis design and programming with emphasis on data abstraction inheritance and subtype polymorphism Abstract data type specification and correctness Collections and associated algorithms including stacks queues trees searching sorting graphs and file processing Analysis of algorithms Emphasis on object-oriented design writing and documenting medium sized programs This course is designed for majors

Com S 290 Independent Study Cr arr FS *Prereq Permission of instructor* Offered on a satisfactory fail grading basis only
H Honors

Com S 309 Software Development Practices (3 1) Cr 3 FS *Prereq 228 Engl 104* A practical introduction to methods for managing software development Process models requirements analysis structured and object oriented design coding testing maintenance cost and schedule estimation metrics Programming projects Nonmajor graduate credit

Com S 311 Design and Analysis of Algorithms (3 1) Cr 3 FS *Prereq 228 Math 166 Engl 104 and either 330 or Cpr E 310* Basic techniques for design and analysis of efficient algorithms Sorting searching graph algorithms computational geometry string processing and NP-completeness Design techniques such as dynamic programming and the greedy method Asymptotic worst-case average case and amortized analyses Data structures including heaps hash tables binary search trees and red black trees Programming projects Credit may not be applied toward graduation for both 311 and 381 Nonmajor graduate credit

Com S 321 Introduction to Computer Architecture and Machine Level Programming (3-1) Cr 3 FS *Prereq 228 Cpr E 210 and Engl 104* Introduction to computer architecture and organization Emphasis on evaluation of performance instruction set architecture datapath and control memory-hierarchy design and pipelining Assembly language on a simulator Nonmajor graduate credit

Com S 330 Discrete Computational Structures (3 1) Cr 3 FS *Prereq 228 Math 166 and Engl 104* Concepts in discrete mathematics as applied to computer science Logic proof techniques set theory relations graphs combinatorics discrete probability and number theory Nonmajor graduate credit

Com S 331 Theory of Computing (Same as Ling 331) (3 1) Cr 3 FS *Prereq Math 166 Engl 104 and either 330 or Cpr E 310* Models of computation finite state automata pushdown automata and Turing machines Study of grammars and their relation to automata Limits of digital computation unsolvability and Church Turing thesis Chomsky hierarchy and relations between classes of languages Nonmajor graduate credit

Com S 342 Principles of Programming Languages (3 1) Cr 3 FS *Prereq 321 Engl 104 330 or Cpr E 310 and either 309 362 or 363* Organization of programming languages emphasizing language design concepts and semantics Study of language features and major programming paradigms especially functional programming Programming projects Nonmajor graduate credit

Com S 352 Introduction to Operating Systems (3 1) Cr 3 FS *Prereq 321 Engl 104 and either 362 or 363* Survey of operating system issues Introduction to hardware and software components including processors peripherals interrupts management of processes threads and memory deadlocks file systems protection virtual machines and system organization and introduction to distributed operating systems Programming projects Nonmajor graduate credit

Com S 362 Object Oriented Analysis and Design (3 0) Cr 3 FS *Prereq 228 and Engl 104* Object oriented requirements analysis and systems design Design notations such as the United Modeling Language Design Patterns Group design and programming with large programming projects Nonmajor graduate credit

Com S 363 Introduction to Database Management Systems (3 0) Cr 3 FS *Prereq 228 and Engl 104* Relational object-oriented and semistructured data models and query languages SQL ODMG and XML standards Database design using entity relationship model data dependencies and object definition language Application development in SQL-like languages and general purpose host languages with application program interfaces Information integration using data warehouses mediators and wrappers Programming Projects Nonmajor graduate credit

Com S 381 Introduction to Data Structures for Biologists (4 0) Cr 4 S *Prereq 207 or equivalent programming experience* An object-oriented approach to programming and data structures for biologists Object oriented programming Strings Stacks Queues Recursion Lists Trees Graphs Sorting Algorithm Analysis The course is designed to provide the fundamentals of data structures and programming for biology students that already have basic

programming skills Not for major credit Credit may not be applied toward graduation for both 311 and 381 Nonmajor graduate credit

Com S 398 Cooperative Education Cr R Required of all cooperative students *Prereq Permission of department chair* Students must register for this course prior to commencing each work period

Com S 401 Computer Based Information Systems (2 2) Cr 3 F *Prereq Engl 105 Sp Cm 212 an additional 9 Com S credits at the 200 level or above and either 362 or 363* Systems concepts and implementations for supporting production-oriented information systems data and terminal access methods operating systems implementations database management systems implementations data dictionary considerations data communication considerations lab experiments and implementations Oral and written reports Nonmajor graduate credit

Com S 418 Introduction to Computational Geometry (Dual listed with 518) (3 0) Cr 3 Alt S offered 2005 *Prereq 311 or permission of instructor Engl 105 Sp Cm 212* Introduction to data structures algorithms and analysis techniques for computational problems that involve geometry Line segment intersection polygon triangulation and visibility problems range queries point location arrangements and duality Voronoi diagrams and Delaunay triangulation convex hulls Other selected topics Programming assignments Nonmajor graduate credit

Com S 421 Logic for Mathematics and Computer Science (Same as Math 421) See *Mathematics*

Com S 425 High Performance Computing for Scientific and Engineering Applications (Same as Cpr E 425) (3 1) Cr 3 S *Prereq 311 330 Engl 105 Sp Cm 212* Introduction to high performance computing using different computing platforms including parallel computers and workstation clusters Discussion of performance visualization and software development issues Sample applications from science and engineering Practical issues in high performance computing will be emphasized via a number of programming projects and case studies Oral and written reports Nonmajor graduate credit

Com S 426 Introduction to Parallel Algorithms and Programming (Dual listed with 526 same as Cpr E 426) See *Computer Engineering* Nonmajor graduate credit

Com S 430 Advanced ProgrammingTools (3 1) Cr 3 F *Prereq 311 362 or 363 Engl 105 Sp Cm 212* Topics in advanced programming techniques and tools widely used by industry (e g event-driven programming and graphical user interfaces standard libraries client/server architectures and techniques for distributed applications) Emphasis on programming projects in a modern integrated development environment Oral and written reports Nonmajor graduate credit

Com S 440 Principles and Practice of Compiling (Dual listed with 540) (3-1) Cr 3 S *Prereq 331 342 Engl 105 Sp Cm 212* Theory of compiling and implementation issues of programming languages Programming projects leading to the construction of a compiler Projects with different difficulty levels will be given for 440 and 540 Topics lexical syntax and semantic analyses syntax-directed translation runtime environment and library support Written reports Nonmajor graduate credit

Com S 454 Distributed and Network Operating Systems (Dual listed with 554 same as Cpr E 454) (3 1) Cr 3 Alt S offered 2005 *Prereq 311 352 Engl 105 Sp Cm 212* Laboratory course dealing with practical issues of design and implementation of distributed and network operating systems and distributed computing environments (DCE) The client *server paradigm* inter process communications layered communication protocols synchronization and concurrency control and distributed file systems Graduate credit requires additional in-depth study of advanced operating systems Written reports Nonmajor graduate credit

Com S 455 Simulation Algorithms and Implementation (Dual listed with 555) (3 0) Cr 3 F *Prereq 311and 330 Stat 330 Engl 104 Sp Cm 212* Introduction to discrete-event simulation with a focus on computer science applications including performance evaluation of networks and distributed systems Overview of algorithms and data structures necessary to implement simulation software Discrete and continuous stochastic models random number generation elementary statistics simulation of queuing and inventory systems Monte Carlo simulation point and interval parameter estimation Graduate credit requires additional in-depth study of concepts Oral and written reports Nonmajor graduate credit

Com S 461 Database Systems Concepts and Internals (3 1) Cr 3 F *Prereq 311 Engl 105 Sp Cm 212 and Com S 363* Data models Algebraic first order and user oriented query languages Data storage access methods query execution and transaction management Parallel and distributed databases Special purpose databases Information integration using data warehouses mediators wrappers *and data mining Oral and written reports* Nonmajor graduate credit

Com S 471 Computational Linear Algebra and Fixed Point Iteration (Same as Math 471) See *Mathematics* Nonmajor graduate credit

Com S 472 Principles of Artificial Intelligence (Dual listed with 572) (3 1) Cr 3 F *Prereq 311 330 or Cpr E 310 Stat 330 Engl 105 Sp Cm 212 Com S 342 or comparable programming experience* Specification design implementation and selected applications of intelligent software agents and multi agent systems Computational models of intelligent behavior including problem solving knowledge representation reasoning planning decision making learning perception action communication and interaction Reactive deliberative rational adaptive learning and communicative agents and multiagent systems Artificial intelligence programming Graduate credit requires a research project and a written report Oral and written reports Nonmajor graduate credit

Com S 474 Elements of Neural Computation (3 1) Cr 3 S *Prereq 311 330 or Cpr E 310 Stat 330 Math 165 Engl 105 Sp Cm 212 Com S 342 or comparable programming experience* Introduction to theory and applications of neural computation and computational neuroscience Computational models of neurons and *networks of neurons* Neural architectures for associative memory knowledge representation inference pattern classification function approximation stochastic search decision making and behavior Neural architectures and algorithms for learning including perceptions support vector machines kernel methods bayesian learning instance based learning *reinforcement learning unsupervised learning* and related techniques Applications in Artificial Intelligence and cognitive and neural modeling Hands-on experience is emphasized through the use of simulation tools and laboratory projects Oral and written reports Nonmajor graduate credit

Com S 477 Problem SolvingTechniques for Applied Computer Science (Dual listed with 577) (3 0) Cr 3 F *Prereq 228 330 or Cpr E 310 Math 166 and Math 307 (or Math 317) or consent of the instructor* Selected topics in applied mathematics and modern heuristics that have found applications in areas such as geometric modeling graphics robotics vision human machine interface speech recognition computer animation etc Polynomial interpolation roots of polynomials resultants solution of linear and nonlinear equations approximation data fitting fast Fourier transform linear programming nonlinear optimization Lagrange multipliers genetic algorithms integration of ODEs curves curvature Frenet Formulas cubic splines and Bezier curves Programming components Written report for graduate credit

Com S 481 Numerical Solution of Differential Equations and Interpolation (Same as Math 481) See *Mathematics* Nonmajor graduate credit

Com S 490 Independent Study Cr arr FS *Prereq 6 credits in computer science permission of instructor* No more than 9 credits of 490 may be counted toward graduation Offered on a satisfactory-fail grading basis only
H Honors

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Com S 502 Complex Adaptive Systems Seminar (Same as CAS 502 E E 502) (1 0) Cr 1 FS *Prereq Admissions to CAS minor* Understanding core techniques in artificial life are based on basic readings in complex adaptive systems Understand techniques of complex system analysis methods including Evolutionary computation Neural nets Agent based simulations (Agent based Computational Economics) *Large scale simulations are to be emphasized* e g power grids whole ecosystems

Com S 503 Complex Adaptive Systems Concepts and Techniques (Same as CAS 503 E E 503) (3 0) Cr 3 S *Prereq Admission to CAS minor* Understanding of Computer Modeling of Complex Systems Complex adaptive systems approach to the study of evolutionary computation neural computation cellular computation computational models of immune systems complexity theory computational economics and other fields of application

Com S 507 Numerical Solution of Ordinary Differential Equations (Same as Math 507) See *Mathematics*

Com S 511 Design and Analysis of Algorithms (Same as Cpr E 511) (3-0) Cr 3 F *Prereq 311* A study of basic algorithm design and analysis techniques Advanced data structures amortized analysis and randomized algorithms Applications to sorting graphs and geometry NP completeness and approximation algorithms

Com S 512 Formal Methods in Software Engineering (3 0) Cr 3 S *Prereq 311 330* A survey of formal methods relevant to the software life-cycle process including requirements specifications design implementation testing and maintenance Implications of formal results for software prototyping and automated testing

Com S 515 Software System Safety (3 0) Cr 3 F *Prereq 309 or 311 342* An introduction to the analysis design and testing of software for safety critical and high integrity systems Analysis *techniques formal verification* fault identification and recovery model checking and certification issues Emphasizes a case-based and systematic approach to software s role in safe systems

Com S 518 Introduction to Computational Geometry (Dual listed with 418) (3-0) Cr 3 Alt S offered 2005 *Prereq 311 or permission of instructor* Introduction to data structures algorithms and analysis techniques for computational problems that involve geometry Line segment intersection polygon triangulation and visibility problems range queries point location arrangements and duality Voronoi diagrams and Delaunay triangulation convex hulls Other selected topics Programming assignments A scholarly report must be submitted for graduate credit

Com S 525 Numerical Analysis of High Performance Computing (Same as Cpr E 525 Math 525) See *Computer Engineering or Mathematics*

Com S 526 Introduction to Parallel Algorithms and Programming (Dual listed with 426 same as Cpr E 526) See *Computer Engineering*

Com S 531 Theory of Computation (3 0) Cr 3 S *Prereq 331* A systematic study of the fundamental models and analytical methods of theoretical computer science Computability the Church-Turing thesis decidable and undecidable problems and the elements of recursive function theory Time complexity logic Boolean circuits and NP complete ness Finite state and pushdown computation

Com S 540 Principles and Practice of Compiling (Dual listed with 440 same as Cpr E 540) (3 1) Cr 3 S *Prereq 331 342 Engl 105 Sp Cm 212* Theory of compiling and implementation issues of programming languages Programming projects leading to the construction of a compiler Projects with different difficulty levels will be given for 440 and 540 Topics lexical syntax and semantic analyses syntax-directed translation runtime environment and library support Written reports

Com S 541 Programming Languages (3 1) Cr 3 F *Prereq 342 or 440* Survey of the goals and problems of language design Formal and informal studies of a wide array of programming language features including type systems naming state and control Creative use of functional and declarative programming paradigms

Com S 548 Fundamental Algorithms in Computational Biology (Same as BCB 548 Gen 548) (3 0) Cr 3 S *Prereq 311 and some knowledge of programming* Introduction design and analysis of fundamental algorithms and methods for molecular biology Topics include pairwise sequence alignment alignment heuristics biological database and retrieval systems multiple sequence alignment phylogenetic trees physical mapping genome rearrangements DNA chips fragment assembly protein folding and genetic networks

Com S 549 Advanced Algorithms in Computational Biology (Same as BCB 549 Cpr E 549) (3 0) Cr 3 S *Prereq 311 and either 228 or 208* Design and analysis of algorithms for applications in computational biology pairwise and multiple sequence alignments approximation algorithms string algorithms including in depth coverage of suffix trees semi numerical string algorithms algorithms for selected problems in fragment assembly phylogenetic trees and protein folding No background in biology is assumed Also useful as an advanced algorithms course in string processing

Com S 550 Evolutionary Problems for Computational Biologists (Same as BCB 550 Gen 550) (3 0) Cr 3 F *Prereq 311 and some knowledge of programming* Discussion and analysis of basic evolutionary principles and the necessary knowledge in computational biology to solve real world problems Topics include character and distance based methods phylogenetic tree distances and consensus methods and approaches to extract the necessary information from sequence-databases to build phylogenetic trees

Com S 551 ComputationalTechniques for Genome Assembly and Analysis (Same as BCB 551) (3 0) Cr 3 F *Prereq 311 and some knowledge of programming* Huang Introduction to practical sequence assembly and comparison techniques Topics include global alignment local alignment overlapping alignment banded alignment linear space alignment word hashing DNA protein alignment DNA cDNA alignment comparison of two sets of sequences construction of contigs and generation of consensus sequences Focus on development of sequence assembly and comparison programs

Com S 552 Principles of Operating Systems (3 0) Cr 3 S *Prereq 352* A comparative study of high level language facilities for process synchronization and communication Formal analysis of deadlock concurrency control and recovery and system performance Protection issues including capability based systems access and flow control encryption and authentication

Com S 554 Distributed and Network Operating Systems (Dual listed with 454 same as Cpr E 554) (3 1) Cr 3 Alt S offered 2005 *Prereq 311 352* Laboratory course dealing with practical issues of design and implementation of distributed and network operating systems and distributed computing environments (DCE) The client server paradigm inter process communications layered communication protocols synchronization and concurrency control and distributed file systems Graduate credit requires additional in-depth study of advanced operating systems Written reports

Com S 555 Simulation Algorithms and Implementation (Dual listed with 455) (3 0) Cr 3 F *Prereq Com S 311and 330 Stat 330* Introduction to discrete event simulation with a focus on computer science applications including performance evaluation of networks and distributed systems Overview of algorithms and data structures necessary to implement simulation software Discrete and continuous stochastic models random number generation elementary statistics simulation of queuing and inventory systems Monte Carlo simulation point and interval parameter estimation Graduate credit requires additional in-depth study of concepts Oral and written reports

Com S 556 Analysis Algorithms for Stochastic Models (3 0) Cr 3 S *Prereq Com S 331 Math 307 and Stat 330* Introduction to the use of stochastic models to study complex systems including network communication and distributed systems Data structures and algorithms for analyzing discrete state models expressed in high level formalisms State space and reachability graph construction model checking Markov chain construction and numerical solution computation of performance measures product form models approximations and advanced techniques

Com S 561 Principles of Database Systems (3 0) Cr 3 S *Prereq 311 363* Database models Algebraic first order and user oriented query languages Database schema design Physical storage access methods and query processing Transaction management concurrency control and crash recovery Database security Parallel and distributed databases and special purpose databases Data warehousing and data mining

Com S 562 Implementation of Database Systems (3 0) Cr 3 F *Prereq 461 or 561* Implementation topics and projects are chosen from the following Storage architecture buffer management and caching access methods design parsing and compilation of query languages and update operations application programming interfaces (APIs) user interfaces query optimization and processing and transaction management for relational object-oriented semistructured (XML) and special purpose database models client server architectures metadata and middleware for database integration web databases

Com S 572 Principles of Artificial Intelligence (Dual listed with 472) (3 1) Cr 3 F *Prereq 311 331 Stat 330 Com S 342 or comparable programming experience* Specification design implementation and selected applications of intelligent software agents and multi agent systems Computational models of intelligent behavior including problem solving knowledge representation reasoning planning decision making learning perception action communication and interaction Reactive deliverative rational adaptive learning and communicative agents Artificial intelligence programming Graduate credit requires a research project and a written report Oral and written reports

Com S 573 Machine Learning (3 1) Cr 3 S *Prereq 311 331 362 Stat 330* Algorithmic models of learning Design analysis implementation and applications of learning algorithms Learning of concepts classification rules functions relations grammars probability distributions value functions models skills behaviors and programs Agents that learn from observation examples instruction induction deduction reinforcement and interaction Computational learning theory Data mining and knowledge discovery using artificial neural networks support vector machines decision trees Bayesian networks association rules dimensionality reduction feature selection and visualization Learning from heterogeneous distributed dynamic data and knowledge sources Learning in multi agent systems Selected applications in automated knowledge acquisition pattern recognition program synthesis bioinformatics and Internet based information systems

Com S 574 Intelligent Multiagent Systems (3-0) Cr 3 S *Prereq Stat 330 Com S 331 Com S 572 or Com S 573 or Com S 472 or Com S 474* Specification design implementation and applications of multi agent systems Intelligent agent architectures agent infrastructures languages and tools for design and implementation of distributed multi agent systems multi agent organizations communication interaction cooperation team formation negotiation competition and learning Agent based distributed computing Agent-oriented software engineering Applications in distributed intelligent information networks for information retrieval inference and discovery from heterogeneous autonomous distributed dynamic information sources

Com S 576 Motion Strategy Algorithms and Applications (Dual listed with 476) (3 1) Cr 3 F *Prereq Engl 105 Sp Cm 212 Com S 311 or M E 519 or consent of instructor* Recent techniques for developing algorithms that automatically generate continuous motions while satisfying geometric constraints Applications in areas such as robotics and graphical animation Basic path planning Kinematics configuration space and topological issues Collision detection Randomized planning Nonholonomic systems Optimal decisions and motion strategies Coordination of multiple bodies Representing and overcoming uncertainties Visibility based motion strategies Implementation of software that computes motion strategies Written reports

Com S 577 Problem SolvingTechniques for Applied Computer Science (Dual-listed with 477) (3 0) Cr 3 F *Prereq 228 330 or Cpr E 310 Math 166 and Math 307 (or Math 317) or consent of the instructor* Selected topics in applied mathematics and modern heuristics that have found applications in areas such as geometric modeling graphics robotics vision human machine interface speech recognition computer animation etc Polynomial interpolation roots of polynomials resultants solution of linear and nonlinear equations approximation data fitting fast Fourier transform linear programming nonlinear optimization Lagrange multipliers genetic algorithms integration of ODEs curves curvature Frenet Formulas cubic splines and Bezier curves Programming components

Com S 583 Reconfigurable Computing Systems (Same as Cpr E 583) See *Computer Engineering*

Com S 585 Advanced Computer Architecture (Same as Cpr E 585) See *Computer Engineering*

Com S 586 Computer Network Architectures (3 0) Cr 3 F *Prereq 511 552 or Cpr E 489* Design and implementation of computer communication networks layered network architectures local area networks data link protocols distributed routing transport services network programming interfaces network applications error control flow/congestion control interconnection of heterogeneous networks TCP/IP ATM networks network security and web computing

Com S 587 Principles of Distributed and Network Programming (3 0) Cr 3 F *Prereq 352 or Cpr E 489 or equivalent* Programming paradigms for building modern distributed applications including multithreaded client server programming distributed object frameworks and programming languages Web-based computing Directory services Mobile computing Network multimedia applications Reliability and manageability of networked systems including aspects of distributed system security verification of concurrent systems and network management

Com S 590 SpecialTopics Cr arr *Prereq Permission of instructor* Offered on a satisfactory fail grading basis only

Com S 591 Graduate Orientation Seminar (1-0) Cr 1 F *Prereq Graduate classification* Topics include an introduction to ISU computing facilities M S and Ph D degree requirements career choices ethics literature searching technical presentations technical writing ethics in writing and discussion of research

interests and projects by members of the graduate faculty *Offered on a satisfactory-fail grading basis only*

Com S 594 Computational Molecular Biology (Same as BCB 594 Gen 594 Math 594) (3 0) Cr 3 S *Prereq BCB 484 BCB 495 Stat 432 or equivalent courses and programming experience (C C++ or Pearl)* State-of-the art introduction to bioinformatics with emphasis on concepts and principles combined with hands-on (keyboard) applications Topics typically include molecular databases score based sequence analysis amino acid substitution scoring matrices query search problems dynamic programming and other methods for pairwise sequence alignment motif identification multiple sequence alignment construction of phylogenetic trees from sequence data gene structure prediction protein structure prediction

Com S 596 Genomic Data Processing (Same as BCB 596 Gen 596) (3 0) Cr 3 F *Prereq Some knowledge of programming* Chou Practical aspects of genomic data processing Emphasis on projects that carry out major steps in data processing using important bioinformatic tools Topics include base calling raw sequence cleaning and contaminant removal shotgun assembly procedures and EST clustering methods genome closure strategies and practices sequence homology search and function prediction annotation and submission of GenBank reports and data collection and dissipation through the Internet

Courses for Graduate Students

Com S 610 Seminar Cr arr Offered on a satisfac tory fail grading basis only

Com S 611 AdvancedTopics in Analysis of Algorithms (3 0) Cr 3 Alt S offered 2005 *Prereq 511 531* Advanced algorithm analysis and design techniques Graph algorithms algebraic algorithms NP-completeness probabilistic and parallel algorithms intractable problems

Com S 612 Distributed Algorithms (3 0) Cr 3 Alt S offered 2004 *Prereq 511 or 531* An advanced course in the theory of distributed computation Synchronous asynchronous and partially synchronous distributed systems Consensus mutual exclusion and clock synchronization Broadcast and multicast Shared memory and message passing systems Wait free object simulations Distributed shared memory fault tolerance and randomization

Com S 624 AdvancedTopics in Computer Architecture (3-0) Cr 3 Alt S offered 2004 *Prereq 524* Current topics in computer architecture design and implementation Advanced pipelining cache and memory design techniques Interaction of algorithms with architecture models and implementations Tradeoffs in architecture models and implementations

Com S 625 Issues in Parallel Programming and Performance (3 0) Cr 3 Alt S offered 2005 *Prereq 511 Cpr E 585* Parallel solutions of numerical and non numerical problems implementation of parallel programs on parallel machines performance and other computational issues in parallel programming

Com S 626 Parallel Algorithms for Scientific Applications (Same as Cpr E 626) See *Computer Engineering*

Com S 631 Computational Complexity (3 0) Cr 3 Alt F offered 2004 *Prereq 531* Advanced study in the quantitative theory of computation Time and space complexity of algorithmic problems The structure of P NP PH PSPACE and other complexity classes especially with respect to resource bounded reducibilities and complete problems Complexity relative to auxiliary information including oracle computation and relativized classes randomized algorithms advice machines Boolean circuits Kolmogorov complexity and randomness

Com S 633 Randomness in Computation (3 0) Cr 3 Alt F offered 2003 *Prereq 531* Advanced study of the role of randomness in computation Randomized algorithms derandomization and probabilistic complexity classes Kolmogorov complexity algorithmic information theory and algorithmic randomness Applications chosen from cryptography interactive proof systems computa tional learning lower bound arguments mathematical logic and the organization of complex systems

Com S 634 Theory of Games Knowledge and Uncertainty (3-0) Cr 3 Alt S offered 2005 *Prereq 330* Fundamentals of Game Theory individual decision making strategic and extensive games mixed strategies backward induction Nash and other equilibrium concepts Discussion of Auctions and Bargaining Repeated Bayesian and evolutionary games Interactive Epistemology reasoning about knowledge in multiagent environment properties of knowledge agreements and common knowledge Reasoning about and representing uncertainty probabilities and beliefs Uncertainty in multiagent environments Aspects and applications of game theory knowledge and uncertainty in other areas especially Artificial Intelligence and Economics will be discussed

Com S 641 Semantic Models for Programming Languages (3 0) Cr 3 Alt S offered 2004 *Prereq 531 541* Operational and other mathematical models of programming language semantics Type systems and their soundness Application of semantics to program correctness language design and translation

Com S 652 Topics in Distributed Operating Systems (3-0) Cr 3 Alt F offered 2003 *Prereq 552* Concepts and techniques for network and distributed operating systems Communications protocols processes and threads name and object manage ment synchronization consistency and replications for consistent distributed data fault tolerance protection and security distributed file systems design of reliable software performance analysis

Com S 661 AdvancedTopics in Database Systems (3 0) Cr 3 Alt F offered 2004 *Prereq 461 or 561* Advanced topics chosen from the following database design data models query systems query optimization incomplete information logic and databases multimedia databases temporal spatial and belief databases semistructured data concurrency control parallel and distributed databases information retrieval data warehouses wrappers mediators and data mining

Com S 672 Computational Models of Learning (3 0) Cr 3 Alt S offered 2004 *Prereq Stat 330 Com S 331 Com S 572 or Com S 573 or Com S 472 or Com S 474* Algorithmic models of learning Computational learning theory PAC learning Bayesian Learning Minimum description length Information theoretic and related frameworks Selected topics in deductive learning inductive learning reinforcement learning active learning distributed learning incremental learning multi task learning multi strategy learning causal inference grammatical inference learning with structured representations and automated scientific discovery Selected applications

Com S 673 AdvancedTopics in Artificial Intelligence and Cognitive Modeling (3 0) Cr 3 Alt S offered 2005 *Prereq Stat 330 Com S 331 Com S 572 or Com S 573 or Com S 472 or Com S 474* Advanced study of selected topics from among the following knowledge representation and inference including theoretical and philosophical foundations computational approaches to representation of inference using and reasoning about knowledge beliefs goals actions and behaviors Intelligent agents and Multi-agent systems including agent architectures agent infrastructures languages and tools for design and implementation of distributed multi-agent systems multi agent learning organiza tions communication interaction cooperation negotiation Distributed intelligent information networks for information retrieval inference and discovery from heterogeneous autonomous distributed dynamic information sources with emphasis on applications in bioinformatics and information assurance

Com S 699 Research Cr arr Offered on a satisfactory fail grading basis only Approval of instructor

Construction Engineering

(Administered by the Department of Civil Construc tion and Environmental Engineering)

CharlesT Jahren Professor in Charge

Professors (Emeritus) Jellinger

Associate Professors Gu Jahren Jaselskis Strong

Associate Professors (Emeritus) Chase

Assistant Professors Walters

Assistant Professors (Adjunct) Sirotiak

Instructors (Adjunct) Cackler

Lecturers Cormicle

Undergraduate Study

For undergraduate curriculum in construction engineering leading to the degree bachelor of science see *College of Engineering Curricula* This curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineer ing and Technology

Construction engineering is a curriculum administered by the Department of Civil and Construction Engineering For details of the curriculum in construction engineering leading to the degree bachelor of science see the *College of Engineering Curricula* General objectives which are common to all departments in engineering are stated in the *College of Engineering Objectives of Curricula in Engineering* The curriculum in construction engineering is designed with the objective to prepare students for life-long careers in the constantly changing technical and managerial environment of the construction industry Students who successfully complete the curriculum will be prepared for entry into the field or for further study at the graduate level in construction engineering or related fields of study such as law business and other engineering disciplines

Construction engineers need to possess strong fundamental knowledge of engineering design and management principles including knowledge of business procedures economics and human behavior Graduates of this curriculum may expect to engage in design of temporary structures coordina tion of project design systems design cost estimating planning and scheduling company and project management materials procurement equipment selection and cost control With the emergence of design build construction the role of the construction engineer is expanding the need for trained professionals that understand both aspects of the project delivery environment The curriculum offers opportunities to study emphases concerned with building heavy mechanical or electrical construction

The process of construction involves the organization administration and coordination of labor resource requirements temporary and permanent materials equipment supplies and utilities money technology and methods These must be integrated in the most efficient manner possible to complete construction projects on schedule within the budget and according to the standards of quality and performance specified by the project owner or designer The curriculum blends engineering management and business sciences into a study of the processes of construction whereby designer s plans and specifica tions are converted into physical structures and facilities To achieve this a construction engineering graduate should have

- confidence
- initiative
- demonstrated leadership ability
- proficiency in engineering design which includes an ability to

apply knowledge of mathematics science and

engineering

- design and conduct experiments as well as to analyze and interpret data

to identify formulate and solve engineering problems

- design a system component or process to meet desired needs

•an understanding of

the overall construction process

the estimating process

the planning and scheduling process

- contracts and laws

business and management

- of ethical reasoning

contemporary issues in the industry

construction engineering and the industry s impact on society

- business and construction engineering terminology

•an ability to

function in multi disciplinary teams

communicate orally graphically and in writing

•a desire for life long learning and intellectual and professional growth

•an awareness of modern techniques skills and technologies for construction

The curriculum develops the ability of students to be team workers creative thinkers and effective communicators This is achieved by providing students with opportunities to

•interact with practicing professionals

•gain work experience during summer jobs internship and cooperative education assignments that emphasize the knowledge required of construc tion engineers

•develop leadership skills by participating in student organizations

•develop analyze and interpret alternative solutions to open ended problems

•Study abroad

The construction industry is becoming increasingly global Courses in humanities social sciences U S diversity and international perspectives are included in the curriculum to broaden the student s perspective of the work environment In addition the department has several exchange program opportunities for students to participate in study abroad programs Interested and qualified students have the opportunity to participate in the cooperative education program or internship program to supplement academic work with work experience See *Cooperative Education Programs College of Engineering*

Construction engineering students are encouraged to participate in life long learning continuous profes sional development and to achieve professional engineer registration and/or registration as a certified professional constructor Qualified construction engineering students within 30 credits of completing their undergraduate degree may apply for concurrent enrollment in the Graduate College See *Civil Engineering Graduate Study* for more information

Graduate Study

An area of specialization in construction engineering is offered within the graduate program of the Depart ment of Civil Construction and Environmental Engineering See *Civil Engineering Courses and Programs*

Courses are offered for minor work to students taking major work in other curricula or in interdepartmental programs

Courses open for nonmajor graduate credit 322 340 351 380 421 441

Courses Primarily for Undergraduate Students

Con E 110 Introduction to Construction Engineer ing (3-4) Cr R S 2 weeks The nature and scope of the construction industry Overview of the profession and education for the constructor Saturday field trip

Con E 210 Professional Development (1 0) Cr 1 FS *Prereq Sophomore classification in construction engineering* Employment opportunities résumé preparation job search and interviewing Professional registration and ethics current industry issues safety professional and industry associations

Con E 221 Contractor Organization and Manage- ment of Construction (4 0) Cr 4 FS *Prereq Completion of basic program and Engr 170* Entry level course for construction engineering integration of significant statistical engineering economics and management issues related to efficient construction company operations Probability and statistics time value of money methods of evaluating alternative projects organization operations construction company administration marketing insurance and bonding project safety labor law productivity total quality management and motivation and leadership

Con E 241 Construction Materials and Methods (2 3) Cr 3 FS *Prereq 221* Introduction to materials and methods of building construction and to construction drawings Foundation structural framing floor roof and wall systems Blueprint reading and quantity takeoff techniques

Con E 245 Construction Contract Documents (2 0) Cr 2 FS *Prereq 221* Definition interpretation and utilization of drawings specifications agree ments bidding forms general conditions bonds subcontracts shop drawings and related documents

Con E 251 Mechanical/Electrical Materials and Methods (0 3) Cr 1 FS *Prereq Credit or enrollment in 241* Introduction to the materials and methods for mechanical and electrical construction systems and drawings HVAC water and waste water vertical transportation power distribution lighting and fire protection Blueprint reading and quantity takeoff Specialty contractor organization and management

Con E 298 Cooperative Education Cr R FS SS *Prereq Permission of department* First professional work period in the cooperative education program Students must register for this course before commencing work

Con E 322 Construction Equipment and Heavy Construction Methods (2 3) Cr 3 FS *Prereq 241* Selection and acquisition of construction equipment Application of engineering fundamentals and economics to performance characteristics and production of equipment Heavy construction methods and economic applications Nonmajor graduate credit

Con E 340 Concrete and Steel Construction (2 3) Cr 3 FS *Prereq Credit or enrollment in 322 E M 324* Planning and field engineering for concrete and steel construction Design and applications of concrete formwork to construction Erection of structural steel Nonmajor graduate credit

Con E 351 Mechanical and Electrical Systems (3 0) Cr 3 FS *Prereq 251 Phys 222* Comprehensive coverage of mechanical systems electrical systems plumbing fire protection security vertical transporta- tion lighting acoustics and communications The course includes analysis techniques and design principles for each system A comprehensive design project is required for a major building project Nonmajor graduate credit

Con E 380 Engineering Law (3-0) Cr 3 FS *Prereq Junior classification* Introduction to law and judicial procedure as they relate to the practicing engineer Contracts professional liability professional ethics licensing bidding procedures intellectual property products liability Emphasis on development of critical thinking process abstract problem analysis and evaluation Nonmajor graduate credit

Con E 396 Summer Internship Cr R SS *Prereq Permission of department* Summer professional work period Students must register for this course before commencing work

Con E 397 Engineering Internship Cr R FS *Prereq Permission of department* Professional work period one semester maximum per academic year Students must register for this course before commencing work

Con E 398 Cooperative Education Cr R FS SS *Prereq 298 permission of department* Second professional work period in the cooperative education program Students must register for this course before commencing work

Con E 421 Construction Estimating (2 3) Cr 3 FS *Prereq 340 245* Conceptual estimating Bid preparation for buildings highways heavy mechanical trades Estimating costs for material labor equip ment overhead and profit Quantity surveys unit costs production rates and pricing methods Subcontract bid analysis and bid procedure Cost analysis and cost control Nonmajor graduate credit

Con E 441 Construction Planning Scheduling and Control (2 0) Cr 2 FS *Prereq Credit or enrollment in 421* Integration of previous construction coursework into the planning scheduling and management of time costs and other resources Emphasis on preparation and analysis of network schedules Comprehensive planning and scheduling project Computer applications Nonmajor graduate credit

Con E 461 Construction Engineering Design (1 8) Cr 4 FS *Prereq 351 380 441 student must be within two semesters of graduating* Application of team design concepts to a construction engineering project Conceptual planning Detailed analysis Advanced cost and schedule applications Contract negotiation Development of a complete project history Technical presentations (oral and written)

Con E 490 Independent Study Cr 1 to 5 each time taken FS SS *Prereq Permission of instructor* Individual study in any phase of construction engineering Pre enrollment contract required

Con E 498 Cooperative Education Cr R FS SS *Prereq 398 permission of department* Third and subsequent professional work periods in the cooperative education program Students must register for this course before commencing work

Criminal Justice Studies

(Interdepartmental Undergraduate Program)

Matthew J DeLisi, Program Coordinator

The criminal justice studies minor a cross-disciplinary course of study in the College of Liberal Arts and Sciences offers an opportunity for students to learn about the components of the criminal and juvenile justice systems to become acquainted with the issues and problems affecting these systems to apply theoretical concepts to real world problems and to plan a career in criminal or juvenile justice

Students who declare a minor in criminal justice studies are required to complete 15 credit hours of course work Students must take five of the following six courses CJ St 240 241 320 332 340 or 341 Students are also required to complete a minimum of 3 credit hours of internship experience (CJ St 460) Completion of the minor requires 18 total credits

Courses open for nonmajor graduate credit CJ St 332

Primary Courses

CJ St 240 Introduction to the U S Criminal Justice System (3-0) Cr 3 F Provides systemic overview of law polic organization and behavior prosecution and defense sentencing the judiciary community corrections penology and capital punishment The course demonstrates the role of discretion in all of these agencies as well as the sociological influences of age race gender and social class on criminal justice system processes

CJ St 241 Youth and Crime (Same as Soc 241) See *Sociology*

CJ St 320 American Judicial Process (Same as Pol S 320) See *Political Science*

CJ St 332 Philosophy of Law (Same as Phil 332) See *Philosophy* Nonmajor graduate credit

CJ St 340 Deviant and Criminal Behavior (Same as Soc 340) See *Sociology*

CJ St 341 Criminology (Same as Soc 341) See *Sociology*

CJ St 460 Criminal and Juvenile Justice Practicum (Same as Soc 460) See *Sociology*

Curriculum and Instruction

www edu iastate edu/ci/

Thomas Andre, Chair of the Department

University Professors Williams

Professors Abelson Andre Carter Davis Duffelmeyer Greenbowe Hand Martin McCormick Messenger W Miller Owen Phye Tanner Thompson Willis

Distinguished Professors (Emeritus) Moyer Rasmussen

University Professors (Emeritus) Brown

Professors (Emeritus) Barnhart Bath Baum Breiter Burkhalter Charles Coulson Daly Dilts Downs Henney Hoerner Hunter Keller Rudolph Schloerke Schneider Smith Thomas Volker Williams Zbaracki

Associate Professors V Allen Bloom Blount Caldwell Carlson Foegen Fuhler Gentzler Hargrave Hausafus Kelly Merkley G Miller Munsen Payne Schilling Sharp Stuart Torrie

Associate Professors (Adjunct) Rosenbusch

Associate Professors (Collaborators) Appelgate Garloff

Associate Professors (Emeritus) Amos Ebert Irwin

Assistant Professors L Allen Clough Leigh C Lubienski S Lubienski Niederhauser Olson

Assistant Professors (Adjunct) Andreotti McShay Rieck Schmidt Sommerville Stubben

Assistant Professors (Emeritus) Chatfield

Instructors (Adjunct) Connor

Missions and Goals

The mission of the Department of Curriculum and Instruction is to serve the people of Iowa the Nation and the World through discovery learning and engagement efforts that enhance and develop human potential and equity through education and that promote understanding of learning teaching and education as disciplines

In our discovery mission we strive
•to conduct the highest quality research and scholarship that significantly contribute to educational theory and practice and
•to be known locally nationally and internationally as a department of distinction

In our learning mission we strive to be a recognized high quality teacher preparation department that
•prepares highly effective teachers and educational leaders
•prepares graduate students and post doctoral professionals who become leaders in their respective fields and
•conducts significant ongoing research and evaluation on the process of effective teacher preparation

In our engagement mission we strive to develop partnerships within and beyond the university that
•enhance the quality and effectiveness of education in practice and
•serve our discovery and learning missions

Undergraduate Study

The Department of Curriculum and Instruction provides the professional education coursework that leads to licensure of pre service teachers Students major in early childhood education - birth through third grade or elementary education K-6 Students who are interested in teaching at the secondary level (7 12) major in a specific discipline and complete the courses necessary for their teaching license Early childhood education and elementary education majors must complete a professional course sequence C I 201 204 250 332 and 406

The department offers a minor in educational computing that may be earned by completing the following courses C I 201 Com S 107 or Com S 207 or Cpr E/Mat E 370 C I 280A 280B 302 403 and 405 or 407

Early Childhood Education

For the undergraduate curriculum in early childhood education leading to the degree bachelor of science see *College of Education Curriculum*

The curriculum in early childhood education is planned for students preparing to teach young children and work with their families This program leads to careers in working with young children who are typically developing and those with special needs from birth through age eight Graduates in this curriculum may teach in early childhood (preschool and primary) classrooms or home based programs with emphasis on inclusive services graduates may be employed by either public or private agencies including schools The program is administered jointly by the Department of Curriculum and Instruction in the College of Education and the Department of Human Development and Family Studies in the College of Family and Consumer Sciences

Students who enroll in early childhood education must make application to and be accepted into the teacher education program prior to enrolling in advanced elementary education courses For admission and licensure requirements see *College of Education* Every student must meet the performance outcome standards for teacher licensure Designated performance indicators (DPIs) for these standards will be assessed in each course Students will receive both formative and summative evaluations of their progress toward meeting these outcomes throughout their program at ISU A detailed explanation of the standards DPIs and assessment process may be found in the *Teacher Education Handbook* which may be accessed at www educ iastate edu/teached/ homepage htm or bought at the *University Book* Store The same information is also available from the student s academic advisor

Graduates of the early childhood education program will be able to demonstrate through professional practice their understanding of academic disciplines teaching and learning the nature of students from Kindergarten through third grade and how to adapt instruction for diversity More specifically graduates will be able to demonstrate their understanding of concepts and structures of disciplines tools of inquiry how students learn and develop and the effects of individual differences on learning Graduates will be able to demonstrate a broad range of instructional strategies including knowledge of technology applicable to instruction In their teaching graduates will demonstrate the ability to stimulate active inquiry with collaboration and supportive interaction among their students In appropriate settings graduates will demonstrate their ability to develop professional relationships with colleagues parents and families and agencies that support students and their learning

Elementary Education

For the undergraduate curriculum in elementary education leading to the degree bachelor of science see *College of Education Curriculum*

The curriculum in elementary education is planned for students preparing to teach at the elementary school level This program leads to careers in working with school aged children Kindergarten through sixth grade Graduates in this curriculum may teach in elementary classrooms in either public or private school districts

Endorsements in English/language arts basic science social studies mathematics and multicategorical resource teaching are available for elementary education students An endorsement for teaching foreign language in elementary schools is available through the Department of Foreign Languages and Literatures

Students who enroll in elementary education must make application to and be accepted into the teacher education program prior to enrolling in advanced elementary education courses For admission and licensure requirements see *College of Education* Every student must meet the performance outcome standards for teacher licensure Designated performance indicators (DPIs) for these standards will be assessed in each course Students will receive both formative and summative evaluations of their progress toward meeting these outcomes throughout their program at ISU A detailed explanation of the standards DPIs and assessment process may be found on the department s website (www educ iastate edu/ci/) and in the *Teacher Education Handbook* which may be accessed at the same address or bought at the University Book Store The same information is also available from the student s academic advisor

Graduates of the elementary education program will be able to demonstrate through professional practice their understanding of academic disciplines teaching and learning the nature of the student and how to adapt instruction for diversity More specifically graduates will be able to demonstrate their understanding of concepts and structures of disciplines tools of inquiry how students learn and develop and the effects of individual differences on learning Graduates will be able to demonstrate a broad range of instructional strategies including knowledge of technology applicable to instruction In their teaching graduates will demonstrate the ability to stimulate active inquiry with collaboration and supportive interaction among their students In appropriate settings graduates will demonstrate their ability to develop professional relationships with colleagues parents and agencies that support students and their learning

Secondary Education

For specific requirements for each area of specializa tion see *Teacher Education* and curricula for the college in which the chosen degree major is sought

Students seeking recommendations for a license to teach in the secondary schools must be admitted to the teacher education program and pursue a program that includes the following C I 201 204 333 406 415 426 (students seeking licensure in science do not take C I 426) special methods and student teaching in the area of specialization

All students who are recommended by Iowa State University for teacher licensure must meet the requirements of the teacher education program and be recommended by the College of Education Each student must meet the performance outcome standards for teacher licensure Designated performance indicators (DPIs) will be assessed in each major Students will receive both formative and summative evaluations of their progress toward meeting these outcomes throughout their program at ISU A detailed explanation of the standards DPIs and assessment process may be found in the *Teacher Education Handbook* which may be found at www educ iastate edu/teached/homepage htm or bought at the University Book Store For more information students should contact the academic advisors in their major Each student will be enrolled in the department in which he or she plans to major and must meet the graduation requirements of that department and the college in which it is located

Graduate Study

The Departments of Curriculum and Instruction and Educational Leadership and Policy Studies offer work for the degrees master of science master of education and doctor of philosophy with a major in education and minor work to students taking major work in other departments Within the education major in the Department of Curriculum and Instruction a student may earn an education degree with no area of specialization (master s and doctorate) or specialize in elementary education (master s only) historical philosophical and comparative studies in education (master s only) special education (master s only) or curriculum and instructional technology (master s and doctorate) A professional certificate program in special education is available to graduate students who seek a teaching endorsement in special education but do not wish to pursue a master s degree See *Educational Leadership and Policy Studies* for further discussion of the education major with specialization in adult and extension education counselor education educational administration higher education and research and evaluation

Students may choose an area of specialization for study Available areas include curriculum and instructional technology elementary education and special education The specialization in curriculum and instructional technology is designed to prepare candidates as researchers and practitioners in the fields of curriculum and instructional technology The specialization in elementary education is designed to prepare candidates for teaching and curricular leadership positions in elementary settings The special education specialization is designed to prepare candidates as practitioners and researchers in the field of mild disabilities Graduate endorsement programs in learning disabilities behavioral disorders multicategorical education special education consultant K 12 school media specialist and reading are administered through the Department of Curriculum and Instruction Students may also opt not to select an area of specialization

Prerequisite to major graduate work in education is preparation substantially equivalent to the completion of one of the undergraduate curricula in education offered at Iowa State University or graduate preparation in a discipline to be used as a teaching field in a community college or university and adequate proof that the student ranks above average in scholastic ability and promise of professional competence

The foreign language requirement if any for the Ph D degree will be determined by the student s program of study committee If no foreign language is required the total program must consist of a minimum of 78 semester credits at least 12 of which must be earned outside the education major and at least 16 of which must be earned outside the area of specialization Statistics and research methods may not be included in the 16 credits Should foreign language be included the program of study committee may adjust the minimum program requirement downward but in no instance may the program of study be less than 72 semester credits Students whose native language is not English may substitute competence in English All applicants for the Ph D must submit Graduate Record Examination (GRE) scores

Other graduate programs related to education (including General Graduate Studies) may be planned for students on the basis of previous education and experiences as well as future plans and needs Students should refer to Agricultural Education and Studies Family and Consumer Sciences Education Health and Human Performance Industrial Technology Educational Leadership and Policy Studies and General Graduate Studies or to graduate level course offerings within other departments

Courses open for nonmajor graduate credit
C I 457 486 Sp Ed 457

Curriculum and Instruction (C I) Courses Primarily for Undergraduate Students

C I 115 First Year Orientation Cr R F Overview of elementary and early childhood education curricular opportunities transitions to college and community life and university procedures Required of all first semester freshmen majoring in elementary or early childhood education and advised in the College of Education Offered on a satisfactory-fail grading basis only

C I 201 Introduction to Instructional Technology (2 2) Cr 3 Overview of instructional technology with an emphasis on uses in education Instructional applications of computers for problem based learning including tool software interactive multimedia Web page development and use of digital video and sound Pedagogical considerations in the use of technology Laboratory work with hardware and software that facilitate teaching and learning

C I 204 Social Foundations of American Education (3 0) Cr 3 FS SS Goals of schooling including the roles of teachers today historical development of schools educational reforms and alternative forms and current philosophical issues Human relations aspects of teaching and discussions about teaching as a career

C I 206 Learning of Science (1 0) Cr 1 S *Prereq Concurrent enrollment in Mteor 206* Critical analysis of personal and K 12 student learning of science concepts Use of computer simulations to ground student learning experiences constructivist approach to learning science with emphasis on metacognition design of science lesson plans

C I 215 Sophomore Orientation Cr R FS Review of elementary education requirements Program planning Required of all sophomores majoring in elementary education Offered on a satisfactory fail grading basis only

C I 245 Strategies in Teaching (2 0) Cr 2 FS SS *Prereq 204 HD FS 220 or 221 or 226 (or concurrent enrollment in one of these courses) concurrent enrollment in C I 268 eligibility for admission to teacher education program* Introduction to elemen tary education teaching strategies classroom management and curriculum organization Open to students in the elementary education curriculum or the early childhood education curriculum

C I 250 Education of the Exceptional Learner in a Diverse Society (Same as Sp Ed 250) See *Special Education*

C I 268 Strategies Practicum (0 2) Cr 1 FS SS *Prereq 204* Clinical experience to be taken concurrently with 245 Offered on a satisfactory fail grading basis only

C I 280 Pre Student Teaching Experience Cr 0 5 to 2 each time taken maximum of 8 credits FS SS 280A may be taken alone May be taken more than once for credit toward graduation For enrollment in 280B I 280A must be either a prerequisite or taken concurrently Field experience in area educational settings 2 1/2 hour blocks of time needed for field experience Offered on a satisfactory fail grading basis only
A Teacher Aide Cr 1 or 2
B Educational Computing Cr 1 or 2 (2 credits by permission only)
C Native American Tutoring Cr 1
D Museum Education Cr 1
E Multicultural Youth Experience Cr 1 or 2
F International Student Cr 1 or 2 (Permission of instructor required)
I Multicategorical F Cr 1 (concurrent with Sp Ed 330)
J Mathematics Cr 1
K Science Cr 1
L Early Field Experience Cr 5
M Secondary Science Cr 2
N Cohort Field Experience Cr 1 (permission of department required)

C I 281 The Special Needs Student Experience (0 4) Cr 2 each time taken maximum of 6 credits FS SS Seminars and visits to public schools serving special students One week practicum at the Iowa School for the Deaf and the Iowa Braille and Sight Saving School Offered on a satisfactory fail grading basis only

C I 282 The Urban Student Experience (0 2) Cr 1 or 2 each time taken maximum of 4 credits FS SS Seminars and visits to urban schools and to organizations serving urban students Offered on a satisfactory fail grading basis only

C I 290 Independent Study Cr 1 to 3 *Prereq 6 credits in education permission of department head*

C I 302 Using Computers in the Classroom (2 2) Cr 3 FS *Prereq 201 or Com S 107* Integrating computer applications into the curriculum designing classroom applications for tool software selecting and evaluating software for the classroom issues and trends in computer based instruction

C I 315 Transfer Orientation Cr R FS Overview of elementary education requirements curricular opportunities and university procedures Program planning Required of all transfer students majoring in elementary education Offered on a satisfactory fail grading basis only

C I 332 Educational Psychology of Young Learners (3 0) Cr 3 FS SS *Prereq C I 201 Psych 230 or HD FS 102 open only to majors in Early Childhood Education or Elementary Education* Psychological theory relevant to classroom learning cognition motivation classroom management and assessment for children from birth to grade 6 Implications of theory for teaching children and for assessing learning in educational settings with young and grade school aged children

C I 333 Educational Psychology (Same as Psych 333) (3 0) Cr 3 FS SS *Prereq 201 Psych 230 or HD FS 102 application to the teacher education program or major in psychology* Classroom learning with emphasis on cognitive development cognitive learning theory and instructional techniques Major emphasis on measurement theory and the classroom assessment of learning outcomes

C I 347 Nature of Science (Dual listed with 547) (3 0) Cr 3 *Prereq 280M* The intersection of issues in the history philosophy and psychology of science and their application to and impact on science teaching and learning science teacher education and science education research

C I 367 Teaching Literacy in the Primary Grades (4 0) Cr 4 *Prereq 245 250 HD FS 221 240 admission to teacher education concurrent enrollment in 468F Sp Ed 368 HD FS 343* Theories teaching strategies materials and learning experiences for kindergarten through third grade students Formal and informal assessment strategies and instructional methods for diverse learners

C I 377 The Teaching of Reading and Language Arts in the Primary Grades (K-3) (4 0) Cr 4 *Prereq 245 250 HD FS 226 240 admission to teacher education program concurrent enrollment in 448 468A 468C* Theories teaching strategies and instructional materials pertinent to teaching reading writing listening and speaking to children in kindergarten through third grade

C I 378 The Teaching of Reading and Language Arts in the Intermediate Grades (4 6) (4-0) Cr 4 *Prereq 377 concurrent enrollment in 449 468B 468D* Theories and processes of literacy Application through reading and writing across the curriculum integration of language arts literature based instruction and metacognitive strategies

C I 395 Teaching Reading in Middle and Secondary Schools (Dual listed with 595) (3 0) Cr 3 FS *Prereq 204* Analysis and application of strategies to enhance students literacy development in middle and secondary school settings

C I 398 Middle School Curriculum Design and Instruction (3 0) Cr 3 *Prereq Admission to teacher education* Emphasis on the middle school components of interdisciplinary teaming curriculum *frameworks instructional strategies teacher-based* guidance and assessment

C I 399 Middle School Student Growth and Development (3-0) Cr 3 *Prereq Psych 230* Study of the physical emotional intellectual and social development of 10 to 15 year old middle school students with emphasis on implications for schools and teachers Includes strategies for classroom management and working with parents Issues of risk resiliency substance abuse suicide and sexuality will also be examined

C I 403 Advanced Design and Development of Interactive Multimedia (2 2) Cr 3 FS *Prereq 302* Application of principles of instructional design and learning theory to development of interactive multimedia Selection use troubleshooting and maintenance of hardware and software used in multimedia development Analysis of research related to effective use of multimedia in education

C I 405 Applications of the Internet in Education (3-0) Cr 3 *Prereq 201* Integrating communication and information technologies into educational settings Designing and constructing Web-based instructional materials that support various educational theories and approaches Effective Web based design advanced HTML and search strategies with critical examination of interactive Web-based instructional projects in classrooms

C I 406 Multicultural Gender Fair Education (3-0) Cr 3 FS SS *Prereq 201 333 junior classification admission to teacher education program* Awareness and nature of cultural pluralism need for multicultural gender fair education multicultural concepts and theories cultural groups their perceptions needs and contributions problems and issues regarding ethnocentrism prejudice and discrimination based on race class sex/gender and language in the school environment curriculum infusion and transformation multicultural gender fair interaction design and execution of teaching strategies

C I 407 Principles and Practices of Flexible and Distance Education (Dual listed with 507) (2 0) Cr 2 FSS *Prereq 201 convenient access to the Web* This course will be offered in flexible and distance learning (FDL) modes mainly utilizing telecommunications including the Internet Review of FDL cases in a variety of contexts and pedagogic styles research into relevant topics Identification of underlying principles and frameworks for best practice in this field

C I 415 Senior Seminar Cr R FS SS *Prereq Senior classification admitted to teacher education program concurrent enrollment in 426* Overview of requirements for teacher certification in Iowa and other states functions of Education Student Services examined Interviewing procedures

C I 416 Supervised Student Teaching Cr var FS *Prereq GPA 2 5 full admission to teacher education senior classification 201 378 443 448 449 reservation required* Supervised teaching experience *in the elementary grades*
A Primary grades
B Intermediate grades
C Foreign Languages
D International Student Teaching Primary grades
E International Student Teaching Intermediate grades

C I 417 Student Teaching (Same as Engl 417 F Lng 417) Cr var each time taken FS *Prereq Engl 494 or F Lng 496 or Math 497 or Music 466 or LAS 492 or 493A and 493B or Sp Cm 495B admission to teacher education approval of coordinator during semester before student teaching* Evaluation of instruction lesson planning and teaching in the liberal arts and sciences

C I 418 Secondary Science Methods I (2-0) Cr 2 *Prereq 280M 347 or concurrent enrollment in 347 concurrent enrollment in 468J* Development of a *research-based framework for teaching science* that includes student goals congruent student actions the character and role of science inquiry teaching behaviors and strategies contemporary learning theories and self evaluation

C I 419 Secondary Science Methods II (2-0) Cr 2 *Prereq 280M 247 392 concurrent enrollment in 468K* Advancing a research based framework for teaching science in a variety of school settings emphasizing the teacher s role the development and revision of science curriculum management strategies technology and student assessment

C I 426 Principles of Secondary Education (Dual listed with 526) (3 0) Cr 3 FS SS *Prereq 201 senior classification admitted to teacher education program concurrent enrollment in 415* The curriculum how to make accommodations for students with special needs human relations student evaluation support services classroom management organization of schools legal aspects of schools professionalism and career planning A planned field experience is a professional growth activity included in the course Students often enroll in 480 concurrently with this course

C I 427 Project Opportunity Capstone (1-0) Cr 1 S Issues in education as related to beginning teachers assessment classroom management law special education effective teaching reflectivity technology Offered on a satisfactory fail grading basis only

C I 433 Teaching Social Studies in the Primary Grades (2 0) Cr 2 FS *Prereq 367 HD FS 221 concurrent enrollment in 438 439 Sp Ed 355 455* Study development and application of current methods for providing appropriate social studies learning experiences for primary grade children Instructional strategies curriculum content and formal and informal assessment strategies for diverse learners

C I 438 Teaching Mathematics in the Primary Grades (2 0) Cr 2 FS *Prereq 367 HD FS 221 Math 195 concurrent enrollment in 433 439 468G Sp Ed 355 455* Study development and application of current methods for providing appropriate mathemat ics learning experiences for primary grade children Formal and informal assessment strategies and instructional methods for diverse learners

C I 439 Teaching Science in the Primary Grades (2 0) Cr 2 FS *Prereq 367 HD FS 221 concurrent enrollment in 433 438 468I Sp Ed 455* Study development and application of current methods for providing appropriate science learning experiences and processes for primary grade children Formal and informal assessment strategies and instructional methods for diverse learners

C I 443 The Teaching of Social Studies (3 0) Cr 3 FS SS *Prereq 377* Study development and application of current methods curriculum materials and assessment strategies for providing appropriate social studies learning experiences for primary and *intermediate grade children*

C I 448 Teaching Children Mathematics (3-0) Cr 3 FS *Prereq Math 195 196 concurrent enrollment in 377 468A 468C* Study development and application of current methods for providing appropriate mathematical learning experiences for primary and intermediate children Includes critical examination of factors related to the teaching and learning of mathematics

C I 449 The Teaching of Science (3 0) Cr 3 FS *Prereq 377 concurrent enrollment in 378 468B 468D junior classification* Procedures for teaching science to children Emphasis on developmental implications teaching processes and methods current programs and assessment of learning in science

C I 450 Ethnicity and Learning (3 0) Cr 3 FS *Prereq 245* Examination of cultural relevance in education Development and application of strategies and techniques for implementing multicultural goals and multiethnic perspectives in the elementary school classroom setting

C I 451 Ethnicity and Learning Practicum (1-4) Cr 3 *Prereq 450* Field experience in a multiethnic or ESL (English as a Second Language) classroom setting Students must have one full day or two half days open each week in order to participate

C I 456 Integrating Technology into the Reading and Language Arts Curriculum (Dual listed with 556) (3 0) Cr 3 S SS *Prereq 201 377* Methods and *strategies used to integrate technology into the* reading and language arts curriculum Use and evaluation of reading and language arts software for elementary classrooms

C I 457 Teaching Exceptional Learners in the Regular Classroom (Same as Sp Ed 457) See *Special Education* Nonmajor graduate credit

C I 468 Supervised Practicum in Teaching Cr 1 or 2 FS SS *Prereq 245 250 268 admission to teacher education program* Observation application of current methods and instructional experiences with children in a supervised elementary classroom while engaged in other elementary methods courses Offered on a satisfactory fail grading basis only
A Primary Grades Reading & Language Arts Cr 1
B Intermediate Grades Reading & Language Arts Cr 1
C Mathematics Cr 1
D Science Cr 1
E Foreign Language Cr 1
F Primary Grades Literacy Inclusive Cr 1
G Primary Grades Mathematics Inclusive Cr 1
I Primary Grades Science Inclusive Cr 1
J Secondary Science I Cr 2
K *Secondary Science II* Cr 2

C I 478 Diagnosis and Correction of Reading Problems (3 0) Cr 3 F *Prereq 378* Diagnosis of students with reading difficulties using formal informal and on going assessment Instructional strategies for mildly moderately and severely disabled readers

C I 480 Field Experience for Secondary Teaching Preparation (Same as Engl 480 F Lng 480) Cr 0 5 2 each time taken maximum of 2 Observation and participation in a variety of school settings after admission to the teacher preparation program Permission of area coordinator required prior to enrollment (S/F grading may be used in some offerings of some sections)

C I 486 Methods in Elementary School Foreign Language Instruction (Same as F Lng 486) See *Foreign Languages and Literatures* Nonmajor graduate credit

C I 487 Methods in Secondary School Foreign Language Instruction (Same as F Lng 487) See *Foreign Languages and Literatures*

C I 488 Supervised Tutoring in Reading (Dual listed with 588) (2-2) Cr 3 *Prereq 416 or LAS 417* Using formal and informal diagnostic procedures to plan and implement individualized reading instruction Field experience

C I 490 Independent Study Cr 1 to 3 *Prereq GPA of 2 5 or more for preceding semester*
A Music Education (Same as Music 490A) See *Music*
B Vocational and Educational Guidance
C Curriculum Construction
D Principles of Education
E Methods of Teaching
F Educational Psychology
G Instructional Technology
H Honors
I Foundations of Educational Statistics
J Multicultural Education
K Social Studies
L Literacy Education
M Mathematics Education
N Foreign Language
O Foundations of Education

C I 491 Educational Inquiry (2 0) Cr 2 F *Prereq Participation in Project Opportunity* Introduction to research terminology qualitative and quantitative

methodology data collection techniques and research resources to more closely link research and practice for prospective teachers Includes a field based research component to synthesize coursework field experiences and related research

C I 494 Practice and Theory of Teaching Literature in the Secondary Schools (Same as Engl 494) See *English*

C I 495B Teaching Speech (Same as Sp Cm 495B) See *Speech Communication*

C I 497 Teaching Secondary School Mathematics (Same as Math 497) (3 0) Cr 3 *Prereq 15 credits in college mathematics admission to teacher education 426 or 526 or concurrent enrollment in one of these courses* Theory and methods for teaching mathemat ics in grades 7-12 Includes critical examination of instructional strategies curriculum materials learning tools and assessment methods

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

C I 501 Foundations of Instructional Technology (3-0) Cr 3 FS SS *Prereq Graduate classification* Educational philosophies and theories of instructional technology Application of research to the production and use of instructional technology for learning and teaching Equipment operation

C I 502 Design and Development of Media Cr 2 to 4 S *Prereq 501 graduate classification* Principles of the design and production of instructional media Visual development and creation of traditional media and emerging technologies Laboratory experiences in the production of instructional media

C I 503 Theories of Designing Effective Learning and Teaching Environments (3 0) Cr 3 F *Prereq 501* Introduction to models and theories of instruc tional design Examination of models based on behavioral information processing and cognitive science theories Emphasis on design based constructivist theories and interpretivist epistemolo gies

C I 504 Managing and Evaluating Instructional Technology Programs (3 0) Cr 3 F *Prereq Graduate classification 501* Principles and procedures for program review assessment and analysis of media/ technology programs in education and corporate settings Management theories and methods for planning organizing influencing and operating the services in technology organizations Includes facilities planning promotion and public relations Principles of staff training proposal development and legal issues related to media/technology support services

C I 505 Introduction to Using Technology in Learning and Teaching (2-0) Cr 2 FSS *Prereq Graduate classification* Teaching and learning using computers Selection and evaluation of software and hardware for teaching and learning Research on computers Tool software Telecommunications Trends in computer based instruction

C I 506 Multicultural Gender Fair Education in Curriculum Development and Instruction (3 0) Cr 3 FS SS *Prereq 6 graduate credits in education* Theories legal bases and principles of multicultural gender fair education Pluralism and contributing cultures in the United States presence and contributions of cultural group diversity with implications for educational programs curriculum development classroom instruction materials utilization and development problems and issues strategies and techniques Inquiry and research on multicultural gender fair education issues

C I 507 Principles and Practices of Flexible and Distance Learning (Dual listed with 407) (2 0) Cr 2 FSS *Prereq 505 convenient access to the Web* This course will be offered in flexible and distance learning (FDL) modes mainly utilizing telecommunications including the Internet Review of FDL cases in a variety of contexts and pedagogic styles plus research into relevant topics Identification of underlying principles and frameworks for best practice in this field

C I 508 Algebra in the K-12 Classrooms (3-0) Cr 3 *Prereq 448 497 or graduate status* Focus on Algebraic concept explorations and associated procedures Use of research based strategies and appropriate technologies to apply fundamental ideas of patterning coordinate graphing and relationships among variables into K 12 classrooms Additional topics from number theory and mathematics history facilitate critical examination of K-12 curriculum pedagogy and assessment

C I 509 Geometry in the K 12 Classrooms (3 0) Cr 3 *Prereq 448 497 or graduate status* Euclidean and non Euclidean geometry explorations with a focus on pedagogical issues in the K 12 classroom Use of research based strategies and appropriate technolo gies to teach geometry in K 12 classrooms Additional topics from discrete mathematics history and philosophy of geometry and fractal geometries

C I 510 Advanced Integration of Technology in Education (3 0) Cr 3 S *Prereq 505* Exploration of applications of technology in educational settings Development of advanced computer applications in relationship to theories of learning and instruction

C I 516 Antiracist Curriculum Development and Implementation (2 2) Cr 3 *Prereq 9 credits in education* Introduction to historical sociological philosophical and pedagogical foundations of antiracist/multicultural education Examination of causes of racism other forms of discrimination and intergroup conflict from different theoretical perspectives and experiential exercises

C I 522 Engineering in K 12 Classrooms (1-0) Cr 1 *Prereq 448 497 or teaching license concurrent enrollment in E M 322* Explorations of engineering concepts appropriate for K 12 classrooms Use of research based teaching strategies for K-12 classrooms

C I 523 Corrective Mathematics (3 0) Cr 3 S SS *Prereq 448* Identification analysis and correction of mathematics problems within the elementary program with an emphasis on alternative teaching strategies and curriculum development

C I 526 Principles of Secondary Education (Dual listed with 426) (3-0) Cr 3 *Prereq 6 credits in education* The curriculum how to make accomadations for students with special needs human relations student evaluation support services classroom management organization of schools legal aspects of schools professionalism and career planning A planned field experience is a professional growth activity included in the course

C I 533 Educational Psychology of Learning Cognition, and Motivation (Same as Psych 533) (3-0) Cr 3 FSS *Prereq 333 or teacher licensure* Learning cognition and motivation in educational/ training settings Instructional theory and models individual differences and instructional process

C I 535 Educational Psychology of Computer Applications (3-0) Cr 3 S *Prereq 501 533* Implications of cognitive and motivational processes for the design and development of computer applications in educational and training settings Current research and theory across various topics including adaptive instruction problem solving simulations virtual environments exploratory software artificially intelligent instructional computing computers as cognitive tools and other contemporary topics

C I 541 Conceptual Change Constructivism and Science Teaching (3-0) Cr 3 *Prereq Bachelor s degree* Current learning theories within science education and their application to science classrooms Examination of models which assist the implementa tion of these theories of learning National science standards

C I 542 The Secondary School Curriculum (2 0) Cr 2 FSS *Prereq Teacher license* Curricular and co curricular programs of secondary schools recent trends in goals content organization and organization for instruction local community resources as curriculum content

C I 543 Teaching Science to Elementary School Students (3 0) Cr 3 *Prereq Teaching license* Critical examination of the discipline of science within the elementary school curriculum Emphasis on content assessment and revision of science programs using current curriculum procedures

C I 544 Science Literacy (3-0) Cr 3 *Prereq Bachelor s degree* In-depth study of science literacy Opportunities to experience and develop broadened understandings of science literacy Focal areas include the nature of science epistemology and reasoning as part of science literacy within science classrooms Pedagogical strategies to improve science literacy within classroom settings

C I 545 The Elementary School Curriculum (2 0) Cr 2 FSS *Prereq Teacher license* Curricular and co curricular programs of elementary schools recent trends in goals content organization and organization for instruction local community resources as curriculum content

C I 546 Advanced Pedagogy in Science Education (3-0) Cr 3 *Prereq Bachelor s degree* Critical examination of pedagogy emphasizing teacher behaviors and strategies methods of self-assess- ment action research and current issues and trends in science education

C I 547 Nature of Science (Dual listed with 347) (3 0) Cr 3 *Prereq Bachelor s degree* The intersection of issues in the history philosophy sociology and psychology of science and their application to and impact on science teaching and learning science teacher education and science education research

C I 551 Foundations of Reading and Language Arts (3-0) Cr 3 S SS *Prereq Teaching license* Analyzing discussing and researching the theory and practice of current literacy issues

C I 552 Corrective Reading (3-0) Cr 3 FSS *Prereq One course in reading* Identification analysis and correction of reading problems within the elementary program in five areas print knowledge integration of print knowledge oral reading fluency vocabulary and comprehension

C I 553 Reading for Adolescents with Mild Disabilities (Same as Sp Ed 553) See *Special Education*

C I 554 Reading and Responding to Children's Literature (3-0) Cr 3 *Prereq Teaching license* Research and discussion of issues surrounding the use of current children s literature in the classroom including censorship diversity and literature selection

C I 556 Integrating Technology into the Reading and Language Arts Curriculum (Dual listed with 456) (3 0) Cr 3 S SS *Prereq Teaching license* Methods and strategies used to integrate technology into the reading and language arts curriculum Use and evaluation of reading and language arts software for elementary classrooms

C I 567 Principles of Corrective Mathematics for Secondary Teachers (Same as Sp Ed 567) (3-0) Cr 3 Alt F offered odd numbered years *Prereq Secondary teaching experience* Methodology for identification analysis and correction of secondary students misconceptions of mathematics Particular emphasis on meeting interdisciplinary concerns use of technology uses and modifications of resource materials and current trends

C I 588 Supervised Tutoring in Reading (Dual listed with 488) (2 2) Cr 3 *Prereq 552* Using formal and informal diagnostic procedures to plan and implement individualized reading instruction Field experience

C I 590 Special Topics Cr 1 to 3 *Prereq 9 graduate credits in education*
A Curriculum
B Instructional Technology
C Science Education
D Secondary Education
E Environmental Education
F Multicultural Education
G Mathematics Education

H Gifted and Talented
I Elementary Education
J Foreign Language
K Educational Psychology
L Social Studies
M Literacy Education

C I 591 Supervised Field Experience (0 2 to 12) Cr 1 to 6 F S SS *Prereq 15 graduate credits in special area* Supervised on the-job field experience in special area
B Foreign Language
C Elementary Education
D Secondary Education
F Multicultural Education
G Media Center - Elementary
H Media Center Secondary

C I 593 Workshops Cr 1 to 3 *Prereq 9 graduate credits in education*
A Curriculum
B Instructional Technology
C Science Education
D Secondary Education
E Environmental Education
F Multicultural Education
G Mathematics Education
H Gifted
I Elementary Education
J Foreign Language
K Educational Psychology
L Social Studies

C I 594 Contemporary Curriculum Theory and Principles (3 0) Cr 3 *Prereq Graduate standing* Theoretical and historical perspectives of contempo rary curriculum social cultural and epistemological aspects of curriculum theory political racial feminist reconceptualist and postmodernist critiques of curriculum and schooling in the U S

C I 595 Teaching Reading in Middle and Secondary Schools (Dual listed with 395) (3-0) Cr 3 FS *Prereq Bachelor s degree in English acceptance to Master of Arts program in English* Analysis and application of strategies to enhance students literacy development in middle and secondary school settings Research project related to an instructor approved course topic

C I 596 Curriculum Problems and Inquiry (3 0) Cr 3 *Prereq 594* Analysis of contemporary problems of schooling and curriculum use of qualitative inquiry to study diverse school sites and social problems influencing public education

C I 599 Creative Component Cr 1 to 3 *Prereq 9 graduate credits in education*
A Curriculum
B Instructional Technology
C Science Education
D Secondary Education
E Environmental Education
F Multicultural Education
G Mathematics Education
I Elementary Education
J Foreign Language
K Educational Psychology
L Social Studies
M Literacy Education

Courses for Graduate Students

C I 603 Advanced Instructional Systems Design (3-0) Cr 3 S *Prereq 503* Exploration of aspects of the instructional design process including reflective practice recursion and iteration participatory design and both qualitative and quantitative formative evaluation

C I 610 Technology in Teacher Education (2 0) Cr 2 or 3 F *Prereq 505* Research on using technology in teacher education programs Application examples studied Field component involving relating material from class to a teacher education situation

C I 611 Philosophical Foundations of Instructional Technology (3 0) Cr 3 *Prereq 12 graduate credits in curriculum and instruction* Exploration of philosophies of science that serve as foundations for research and practice in instructional technology including positivism post positivism interpretivism/ constructivism and critical theory The roles of language nature of truth and reality and acceptable ways of knowing are explored in terms of their implications for instructional technology design delivery research and scholarship

C I 612 Socio-psychological Foundations of Educational Technology (3-0) Cr 3 *Prereq 12 graduate credits in curriculum and instruction* Exploration of theories of learning and associated instructional models that are the foundation for research and practice in education and educational technology including behaviorism information processing theory and cognitive science Emphasis on cognitive and social constructivist paradigms and the creation and use of constructivist learning environments supported by technology

C I 615 Seminar (0 2) Cr 1 FS SS Selected topics in curriculum and instruction an analysis of research potential evaluation of impact upon the profession implications for additional research
A Curriculum
B Instructional Technology
C Science Education
D Secondary Education
E Environmental Education
F Multicultural Education
G Mathematics Education
H Gifted and Talented
I Elementary Education
J Foreign Language
K Educational Psychology
L Social Studies
M Literacy Education

C I 690 Advanced Special Topics Cr arr *Prereq 9 graduate credits in education*
A Curriculum
B Instructional Technology
C Science Education
D Secondary Education
E Environmental Education
F Multicultural Education
G Mathematics Education
H Gifted and Talented
I Elementary Education
J Foreign Language
K Educational Psychology
L Social Studies
M Literacy Education

C I 699 Research Cr arr *Prereq 9 graduate credits in education*
A Curriculum
B Instructional Technology
C Science Education
D Secondary Education
E Environmental Education
F Multicultural Education
G Mathematics Education
H Gifted and Talented
I Elementary Education
J Foreign Language
K Educational Psychology
L Social Studies
M Literacy Education

Historical, Philosophical, and Comparative Studies in Education (HPC)

David Owen Program Coordinator

This program provides graduate experiences in historical philosophical and comparative studies in education Students develop facility in analyzing educational problems and issues critiquing policies that affect education in society and making connections between educational practice and learning

Work is offered toward the master of science with thesis or nonthesis option and the master of education These degree programs and classes are of benefit to classroom teachers educational theorists administrators university personnel youth workers religious educators and others who seek to understand better the numerous bases of contempo rary systems of education Study in this field also complements work in other areas of specialization in education

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

H P C 581 Philosophy of Education (3 0) Cr 3 *Prereq Graduate classification* The bases of American educational theory and practice Philosophical analysis of the viewpoints on education of selected individuals and groups

H P C 584 Classics of Educational Philosophy (3 0) Cr 3 *Prereq Graduate classification* Intensive study of influential statements of educational purpose organization curriculum practice and problems in the development of Western education

H P C 585 Comparative Education Traditions (3-0) Cr 3 *Prereq Graduate classification* Analysis of the cultural traditions of education outside the United States Emphasis is given to an examination of the principles upon which selected national educational systems have been built \Special attention often given to noneuropean traditions

H P C 586 Comparative Education Global and National Systems (3 0) Cr 3 *Prereq Graduate classification* Examination of global patterns ideologies and reform movements in education contrasting policies and practices in different cultural and geographic contexts the role of multilateral aid and credit agencies in influencing the development and provision of schooling consideration of principles and methods of comparative analysis of education

H P C 588 History of American Education (3-0) Cr 3 *Prereq Graduate classification* Historical analysis of selected educational policies such as equal educational opportunity governance discipline and teacher education Biographies school records and government reports are examined Antecedents to current issues are stressed

H P C 590 Special Topics Cr 1 to 5 *Prereq 9 credits in education*
A History of Education
B Philosophy of Education
C Comparative Education

H P C 591 Supervised Field Experience Cr 1 to 6 *Prereq 6 graduate credits in special area* Supervised on the job field experience in special areas

H P C 593 Workshops Cr 1 to 5 *Prereq 9 credits in education*

H P C 599 Creative Component Cr 1 to 3

Courses for Graduate Students

H P C 602 Social and Philosophical Issues in Education (3-0) Cr 3 each time taken maximum of 6 F *Prereq Graduate classification* A study in depth of selected educational issues movements or problems in American education

H P C 615 Seminar (1 to 3 0) Cr 1 to 3
A History of Education
B Philosophy of Education
C Comparative Education

H P C 690 Advanced Special Topics Cr 1 to 3

H P C 699 Research Cr arr

Special Education (Sp Ed)

Courses Primarily for Undergraduate Students

Sp Ed 250 Education of the Exceptional Learner in a Diverse Society (Same as C I 250) (3 0) Cr 3 FS *Prereq C I 204* An overview of students with diverse learning needs Emphasis on early identification educational services and strategies in inclusive settings and preparation for community living in a diverse society

Sp Ed 330 Introduction to Multicategorical Instruction (3-0) Cr 3 F *Prereq 250 concurrent enrollment in C I 280I 377* Educational services and programming for students with mild disabilities examined from a historical perspective Current trends issues programming alternatives impact of federal and state laws and practical approaches Characteristics of students with mild disabilities

(learning disabilities behavioral disorders mental disabilities)

Sp Ed 339 Collaborative Partnerships in Special Education (3 0) Cr 3 F *Prereq Concurrent enrollment in 330* Study of collaborative partnerships used in education of students with mild/moderate disabilities Includes collaboration between general and special education teachers parents paraeducators and other education professionals and agencies

Sp Ed 355 Classroom Assessment of Diverse Learners in the Primary Grades (2-0) Cr 2 S *Prereq Concurrent enrollment in 455 C I 433 438 439 468G 468I* Examination and application of strategies for determining special educational needs planning and evaluating instructional programs and monitoring student progress

Sp Ed 365 Classroom Assessment for Special Education (4 0) Cr 4 S *Prereq 330* Formal and informal diagnostic instruments Determination of special education needs Planning adaptation and evaluation of instructional programs for students with mild disabilities

Sp Ed 368 Issues in Literacy for Diverse Learners in the Primary Grades (1-0) Cr 1 F *Prereq Concurrent enrollment in C I 367 468F* Federal and state law Service delivery models Issues related to providing literacy instruction that meets the needs of diverse learners in inclusive primary settings

Sp Ed 415 Supervised Student Teaching Cr var FS *Prereq Full admission to teacher education senior classification 355 455* Reservation required Student teaching experience in inclusive primary grade classrooms

Sp Ed 416 Supervised Student Teaching Cr var FS Prereq Full admission *to teacher education senior classification student in elementary education section 330 365 436 439 457 C I 280 478 Reservation required*

Sp Ed 436 Methods of Multicategorical Instruction (3-0) Cr 3 S *Prereq C I 245 concurrent enrollment in 365 459* Instructional strategies/techniques in academic areas and materials for individual instruction and classroom management for elementary students with mild disabilities

Sp Ed 455 Instructional Methods for Diverse Learners in the Primary Grades (2 0) Cr 2 S *Prereq Concurrent enrollment in 355 C I 433 438 439 468G 468I* Instructional strategies and techniques in academic areas that support the learning of students with diverse learning needs Emphasis on accommodations modifications and alternative teaching strategies to meet individual student needs

Sp Ed 457 Teaching Exceptional Learners in the Regular Classroom (Same as C I 457) (3-0) Cr 3 FS *Prereq 250 C I 245* Emphasis on teaching techniques teacher attitudes and instructional modifications for inclusive education Nonmajor graduate credit

Sp Ed 459 Field Experience and Practicum-Students with Mild Disabilities (0 2) Cr 1 *Prereq Concurrent enrollment in 365 436* Observation and involvement with students with mild disabilities in a multicategorical classroom setting Offered on a satisfactory fail grading basis only

Sp Ed 490 Independent Study Cr 1 to 5 *Prereq 12 credits in elementary education permission of department head*

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Sp Ed 503 Introduction to Behavior Disorders (1-0) Cr 1 *Prereq Teaching license taken concurrently with 504 and 505* Characteristics identification procedures and patterns of service delivery and exemplary education programs and concerns about management of students with behavior disorders

Sp Ed 504 Introduction to Learning Disabilities (1 0) Cr 1 *Prereq Teaching license taken concurrently with 503 and 505* Conceptualizations of characteristics of learning disabilities as well as etiologies of learning problems

Sp Ed 505 Introduction to Multicategorical Instruction (1 0) Cr 1 *Prereq Teaching license taken concurrently with 503 504* Historical development of educational services current trends and issues basic theoretical and practical approaches with educational alternatives implications of state and federal statutes

Sp Ed 512 Educational Interventions for Children and Youth with Behavior Disorders (2 0) Cr 2 *Prereq Teaching license concurrent enrollment in 513 or 514* Intervention approaches to meet the academic social and emotional needs of children and youth with behavior disorders in the school setting Adapting educational materials and plans coordination of school and community

Sp Ed 513 Educational Interventions for Children with Behavior Disorders in the Elementary Schools (1 0) Cr 1 *Prereq Teaching license concurrent enrollment in 512* Application of the basic principles of educational intervention approaches to elementary school children who are identified as behaviorally disordered

Sp Ed 514 Educational Interventions for Youth with Behavior Disorders in the Secondary School (1 0) Cr 1 *Prereq Teaching license concurrent enrollment in 512* Application of the basic principles of educational intervention approaches to secondary school youth who are identified as behaviorally disordered

Sp Ed 515 Curriculum Based Assessment of Children and Youth with Learning and Behavioral Disorders (3 0) Cr 3 *Prereq Teaching license* Individual educational diagnostic procedures and techniques

Sp Ed 517 Seminar Research in Educational Interventions and Management of Children and Youth with Disabilities (2 0) Cr 2 *Prereq 512 or 531 or 541 515* Critical review of recent literature in education and psychobehavioral sciences as applied to education of students with mild to severe disabilities

Sp Ed 531 Methods for Teaching Multicategorical Classrooms (2-0) Cr 2 *Prereq 505 concurrent enrollment in 532 or 533* Remedial instructional models and materials for individualized instruction and behavior management for students with mild disabilities

Sp Ed 532 Multicategorical Strategies for Elementary Teaching (1 0) Cr 1 *Prereq Concurrent enrollment in 531* Application of teaching/learning strategies appropriate at the elementary level

Sp Ed 533 Multicategorical Strategies for Secondary Teaching (1 0) Cr 1 *Prereq Concurrent enrollment in 531* Application of teaching/learning strategies appropriate at the secondary level

Sp Ed 541 Teaching Strategies for Learning Disabilities (2-0) Cr 2 Alt F offered even numbered years *Prereq 504 concurrent enrollment in 542 or 543* Analysis instructional of techniques and materials for remedying specific learning disabilities

Sp Ed 542 Learning Disabilities Strategies for Elementary Teaching (1-0) Cr 1 Alt F offered even numbered years *Prereq Concurrent enrollment in 541* Application of instructional strategies and materials modification for elementary school students

Sp Ed 543 Learning Disabilities Strategies for Secondary Teaching (1 0) Cr 1 Alt F offered even numbered years *Prereq Concurrent enrollment in 541* Application of instructional strategies and materials modification for secondary school students

Sp Ed 553 Reading for Adolescents with Mild Disabilities (Same as C I 553) (3 0) Cr 3 S *Prereq Teaching license* Instructional strategies for enhancing the comprehension and retention of students with mild disabilities in conjunction with content area reading material

Sp Ed 555 Career Education and Transition for Youth with Learning and Behavior Disabilities (2 0) Cr 2 *Prereq Teaching license* Examination of the academic personal social employability and daily living skills needed for a satisfactory adult life Exploration of curricula programs and services to meet these needs

Sp Ed 560 Classroom Management (3-0) Cr 3 *Prereq Teaching license* Current classroom management techniques Emphasis on practical use of techniques with students in regular and special education classrooms

Sp Ed 564 Consultation/Collaboration Methods in Special Education (2-0) Cr 2 *Prereq Teaching license* Techniques for collaboratively solving classroom problems by professionals with diverse expertise and responsibilities

Sp Ed 565 Role of the Consultant (1 0) Cr 1 *Prereq 564* Explore role of the educational consultant in different settings (state department area education agency school district private) Examine roles in relationship to models (mental health collaborative organization)

Sp Ed 567 Principles of Corrective Mathematics for Secondary Teachers (Same as C I 567) See *Curriculum and Instruction*

Sp Ed 590 Special Topics Cr 1 to 5 *Prereq 15 credits in education permission of department head*

Sp Ed 591 Supervised Field Experience (0 2 to 12) Cr 1 to 6 FS SS *Prereq 15 graduate credits in special area admission to the graduate program in special education* Supervised on the-job field experience in special areas
A Learning Disabilities Elementary
B Learning Disabilities Secondary
C Behavioral Disorders—Mild Elementary
D Behavioral Disorders—Mild Secondary
E Behavioral Disorders—Moderate to Severe Elementary
F Behavioral Disorders—Moderate to Severe Secondary
G Multicategorical Elementary
H Multicategorical Secondary
I Multicategorical SCI Elementary
J Multicategorical SCI Secondary

Sp Ed 593 Workshop Cr 1 to 5 *Prereq 15 credits in education*

Sp Ed 599 Creative Component Cr 1 to 5 *Prereq 15 credits in education*

Courses for Graduate Students

Sp Ed 615 Seminar (0 2) Cr 1 *Prereq 15 credits in education* Selected topics in special education presentation discussion and analysis of published research and student or faculty research projects

Sp Ed 699 Research Cr arr *Prereq 15 credits in education*

Design Studies

(Interdepartmental Undergraduate Program)

Kate Schwennsen, Program Coordinator

The Design Studies program brings together courses that deal with the integrated study of the conceptualization production visible form uses and history of artifacts buildings and environments as well as the common qualities and connections among the design fields Students in any college may elect to take a minor in Design Studies

Minor
The undergraduate minor in Design Studies is constructed to facilitate design awareness among interested students and to provide a vehicle for interdisciplinary study within the College of Design

Students seeking a Design Studies minor complete fifteen credits including three credits of history selected from College of Design course offerings and twelve additional credits selected from College of

(learning disabilities behavioral disorders mental disabilities)

Sp Ed 339 Collaborative Partnerships in Special Education (3 0) Cr 3 F *Prereq Concurrent enrollment in 330* Study of collaborative partnerships used in education of students with mild/moderate disabilities Includes collaboration between general and special education teachers parents paraeducators and other education professionals and agencies

Sp Ed 355 Classroom Assessment of Diverse Learners in the Primary Grades (2-0) Cr 2 S *Prereq Concurrent enrollment in 455 C I 433 438 439 468G 468I* Examination and application of strategies for determining special educational needs planning and evaluating instructional programs and monitoring student progress

Sp Ed 365 Classroom Assessment for Special Education (4 0) Cr 4 S *Prereq 330* Formal and informal diagnostic instruments Determination of special education needs Planning adaptation and evaluation of instructional programs for students with mild disabilities

Sp Ed 368 Issues in Literacy for Diverse Learners in the Primary Grades (1-0) Cr 1 F *Prereq Concurrent enrollment in C I 367 468F* Federal and state law Service delivery models Issues related to providing literacy instruction that meets the needs of diverse learners in inclusive primary settings

Sp Ed 415 Supervised Student Teaching Cr var FS *Prereq Full admission to teacher education senior classification 355 455* Reservation required Student teaching experience in inclusive primary grade classrooms

Sp Ed 416 Supervised Student Teaching Cr var FS Prereq Full admission *to teacher education senior classification student in elementary education section 330 365 436 439 457 C I 280 478 Reservation required*

Sp Ed 436 Methods of Multicategorical Instruction (3-0) Cr 3 S *Prereq C I 245 concurrent enrollment in 365 459* Instructional strategies/techniques in academic areas and materials for individual instruction and classroom management for elementary students with mild disabilities

Sp Ed 455 Instructional Methods for Diverse Learners in the Primary Grades (2 0) Cr 2 S *Prereq Concurrent enrollment in 355 C I 433 438 439 468G 468I* Instructional strategies and techniques in academic areas that support the learning of students with diverse learning needs Emphasis on accommodations modifications and alternative teaching strategies to meet individual student needs

Sp Ed 457 Teaching Exceptional Learners in the Regular Classroom (Same as C I 457) (3-0) Cr 3 FS *Prereq 250 C I 245* Emphasis on teaching techniques teacher attitudes and instructional modifications for inclusive education Nonmajor graduate credit

Sp Ed 459 Field Experience and Practicum-Students with Mild Disabilities (0 2) Cr 1 *Prereq Concurrent enrollment in 365 436* Observation and involvement with students with mild disabilities in a multicategorical classroom setting Offered on a satisfactory fail grading basis only

Sp Ed 490 Independent Study Cr 1 to 5 *Prereq 12 credits in elementary education permission of department head*

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Sp Ed 503 Introduction to Behavior Disorders (1-0) Cr 1 *Prereq Teaching license taken concurrently with 504 and 505* Characteristics identification procedures and patterns of service delivery and exemplary education programs and concerns about management of students with behavior disorders

Sp Ed 504 Introduction to Learning Disabilities (1 0) Cr 1 *Prereq Teaching license taken concurrently with 503 and 505* Conceptualizations of characteristics of learning disabilities as well as etiologies of learning problems

Sp Ed 505 Introduction to Multicategorical Instruction (1 0) Cr 1 *Prereq Teaching license taken concurrently with 503 504* Historical development of educational services current trends and issues basic theoretical and practical approaches with educational alternatives implications of state and federal statutes

Sp Ed 512 Educational Interventions for Children and Youth with Behavior Disorders (2 0) Cr 2 *Prereq Teaching license concurrent enrollment in 513 or 514* Intervention approaches to meet the academic social and emotional needs of children and youth with behavior disorders in the school setting Adapting educational materials and plans coordination of school and community

Sp Ed 513 Educational Interventions for Children with Behavior Disorders in the Elementary Schools (1 0) Cr 1 *Prereq Teaching license concurrent enrollment in 512* Application of the basic principles of educational intervention approaches to elementary school children who are identified as behaviorally disordered

Sp Ed 514 Educational Interventions for Youth with Behavior Disorders in the Secondary School (1 0) Cr 1 *Prereq Teaching license concurrent enrollment in 512* Application of the basic principles of educational intervention approaches to secondary school youth who are identified as behaviorally disordered

Sp Ed 515 Curriculum Based Assessment of Children and Youth with Learning and Behavioral Disorders (3 0) Cr 3 *Prereq Teaching license* Individual educational diagnostic procedures and techniques

Sp Ed 517 Seminar Research in Educational Interventions and Management of Children and Youth with Disabilities (2 0) Cr 2 *Prereq 512 or 531 or 541 515* Critical review of recent literature in education and psychobehavioral sciences as applied to education of students with mild to severe disabilities

Sp Ed 531 Methods for Teaching Multicategorical Classrooms (2-0) Cr 2 *Prereq 505 concurrent enrollment in 532 or 533* Remedial instructional models and materials for individualized instruction and behavior management for students with mild disabilities

Sp Ed 532 Multicategorical Strategies for Elementary Teaching (1 0) Cr 1 *Prereq Concurrent enrollment in 531* Application of teaching/learning strategies appropriate at the elementary level

Sp Ed 533 Multicategorical Strategies for Secondary Teaching (1 0) Cr 1 *Prereq Concurrent enrollment in 531* Application of teaching/learning strategies appropriate at the secondary level

Sp Ed 541 Teaching Strategies for Learning Disabilities (2-0) Cr 2 Alt F offered even numbered years *Prereq 504 concurrent enrollment in 542 or 543* Analysis instructional of techniques and materials for remedying specific learning disabilities

Sp Ed 542 Learning Disabilities Strategies for Elementary Teaching (1-0) Cr 1 Alt F offered even numbered years *Prereq Concurrent enrollment in 541* Application of instructional strategies and materials modification for elementary school students

Sp Ed 543 Learning Disabilities Strategies for Secondary Teaching (1 0) Cr 1 Alt F offered even numbered years *Prereq Concurrent enrollment in 541* Application of instructional strategies and materials modification for secondary school students

Sp Ed 553 Reading for Adolescents with Mild Disabilities (Same as C I 553) (3 0) Cr 3 S *Prereq Teaching license* Instructional strategies for enhancing the comprehension and retention of students with mild disabilities in conjunction with content area reading material

Sp Ed 555 Career Education and Transition for Youth with Learning and Behavior Disabilities (2 0) Cr 2 *Prereq Teaching license* Examination of the academic personal social employability and daily living skills needed for a satisfactory adult life Exploration of curricula programs and services to meet these needs

Sp Ed 560 Classroom Management (3-0) Cr 3 *Prereq Teaching license* Current classroom management techniques Emphasis on practical use of techniques with students in regular and special education classrooms

Sp Ed 564 Consultation/Collaboration Methods in Special Education (2-0) Cr 2 *Prereq Teaching license* Techniques for collaboratively solving classroom problems by professionals with diverse expertise and responsibilities

Sp Ed 565 Role of the Consultant (1 0) Cr 1 *Prereq 564* Explore role of the educational consultant in different settings (state department area education agency school district private) Examine roles in relationship to models (mental health collaborative organization)

Sp Ed 567 Principles of Corrective Mathematics for Secondary Teachers (Same as C I 567) See *Curriculum and Instruction*

Sp Ed 590 Special Topics Cr 1 to 5 *Prereq 15 credits in education permission of department head*

Sp Ed 591 Supervised Field Experience (0 2 to 12) Cr 1 to 6 FS SS *Prereq 15 graduate credits in special area admission to the graduate program in special education* Supervised on the-job field experience in special areas
A Learning Disabilities Elementary
B Learning Disabilities Secondary
C Behavioral Disorders—Mild Elementary
D Behavioral Disorders—Mild Secondary
E Behavioral Disorders—Moderate to Severe Elementary
F Behavioral Disorders—Moderate to Severe Secondary
G Multicategorical Elementary
H Multicategorical Secondary
I Multicategorical SCI Elementary
J Multicategorical SCI Secondary

Sp Ed 593 Workshop Cr 1 to 5 *Prereq 15 credits in education*

Sp Ed 599 Creative Component Cr 1 to 5 *Prereq 15 credits in education*

Courses for Graduate Students

Sp Ed 615 Seminar (0 2) Cr 1 *Prereq 15 credits in education* Selected topics in special education presentation discussion and analysis of published research and student or faculty research projects

Sp Ed 699 Research Cr arr *Prereq 15 credits in education*

Design Studies

(Interdepartmental Undergraduate Program)

Kate Schwennsen, Program Coordinator

The Design Studies program brings together courses that deal with the integrated study of the conceptualization production visible form uses and history of artifacts buildings and environments as well as the common qualities and connections among the design fields Students in any college may elect to take a minor in Design Studies

Minor
The undergraduate minor in Design Studies is constructed to facilitate design awareness among interested students and to provide a vehicle for interdisciplinary study within the College of Design

Students seeking a Design Studies minor complete fifteen credits including three credits of history selected from College of Design course offerings and twelve additional credits selected from College of

Design course offerings Courses from Architecture Art and Design Community and Regional Planning Landscape Architecture and Design Studies may be taken to meet the requirements of the minor

At least six of the fifteen credits must be taken at Iowa State University in courses numbered 300 or above At least nine of the fifteen credits must not be used to meet any other college or university requirements except the credit requirement for graduation

Students enrolled in the College of Design may not use courses in their major to satisfy this minor

Additional information is available in the Student Programs and Services Office 297 College of Design

Graduate Study

Courses open for nonmajor graduate credit 365 380 382 383 385 394 467 471 481 487 488 495 496 498

Courses Primarily for Undergraduate Students

Dsn S 110 Design Exchange Seminar I (0-2) Cr 1 F *Prereq Member of Design Exchange Learning Community* Orientation to the College of Design Introduction to the design disciplines and studio pedagogy

Dsn S 111 Design Exchange Seminar II (0 2) Cr 1 S *Prereq Member of the Design Exchange Learning Community* Development and clarification of career and academic plans

Dsn S 181 History of Design (Same as Art H 181) (3-0) Cr 3 FS Study of issues and artifacts their relation to the traditional and changing role of the creators and to western culture

Dsn S 221 History of Western Architecture I (Same as Arch 221) See *Architecture*

Dsn S 222 History of Western Architecture II (Same as Arch 222) See *Architecture*

Dsn S 270 Forces Shaping Our Metropolitan Environment (Same as C R P 270) See *Community and Regional Planning*

Dsn S 273 Landscape Architectural History prehistory to 1800 (Same as L A 273) See *Landscape Architecture*

Dsn S 274 The Social and Behavioral Landscape (Same as L A 274) See *Landscape Architecture*

Dsn S 280 History of Art I (Same as Art H 280) See *Art History*

Dsn S 281 History of Art II (Same as Art H 281) See *Art History*

Dsn S 291 World Cities and Globalization (Same as C R P 291) See *Community and Regional Planning*

Dsn S 292 Dimensions of Art and Design (Same as Art 292) See *Art and Design*

Dsn S 293 Environmental Planning (Same as C R P 293) See *Community and Regional Planning*

Dsn S 301 Study Abroad Preparation Seminar (0 1) Cr 1 each time taken up to a maximum of 4 credits FS SS *Prereq Permission of instructor* Cultural introduction to host country introduction to faculty sponsor and program of study the particulars of traveling and living abroad and financial and logistical preparations Guest lectures Required of all students planning to participate in a College of Design study abroad program for 9 or more credits

Dsn S 320 Urban Form (Same as C R P 320) See *Community and Regional Planning*

Dsn S 351 Solar Home Design (Same as Arch 351) See *Architecture*

Dsn S 365 Technology and the City (Same as C R P 365) See *Community and Regional Planning* Nonmajor graduate credit

Dsn S 371 Landscape Architectural History 1800 to Present (Same as L A 371) See *Landscape Architecture*

Dsn S 380 North American Indian Art (Dual listed with 580 same as Art H 380) See *Art History* Nonmajor graduate credit

Dsn S 382 Art and Architecture of Asia (Dual listed with 582 same as Art H 382) See *Art History* Nonmajor graduate credit

Dsn S 383 Greek and Roman Art (Dual listed with 583 same as Art H 383) See *Art History* Nonmajor graduate credit

Dsn S 385 Renaissance Art (Dual-listed with 585 same as Art H 385) See *Art History* Nonmajor graduate credit

Dsn S 394 Women in Art (Dual listed with 594 same as Art H 394) See *Art History* Nonmajor graduate credit

Dsn S 415 Housing (Dual listed with 515 same as C R P 415) See *Community and Regional Planning*

Dsn S 417 Urban Revitalization (Dual listed with 517 same as C R P 417) See *Community and Regional Planning*

Dsn S 425 Growth Management (Dual listed with 515 same as C R P 415) See *Community and Regional Planning*

Dsn S 429 Planning in Developing Countries (Dual listed with 519 same as C R P 429) See *Community and Regional Planning*

Dsn S 442 Site Analysis and Development Design (Dual listed with 542 same as C R P 442) See *Community and Regional Planning*

Dsn S 446 Interdisciplinary Design Studio (Dual listed with 546) (0 12 to 0-18) Cr 4 to 6 FS *Prereq Junior classification in a curriculum in the College of Design and permission of instructor* Advanced interdisciplinary design projects

Dsn S 463 Housing Environments for Elderly and Disabled Persons (Same as HD FS 463) See *Human Development and Family Studies*

Dsn S 467 Preservation, Restoration and Rehabilitation (Same as Arch 467) See *Architecture* Nonmajor graduate credit

Dsn S 471 Design for All People (Same as Arch 471) See *Architecture* Nonmajor graduate credit

Dsn S 478 Topical Studies in Landscape Architecture (Dual listed with 578 same as L A 478) See *Landscape Architecture*

Dsn S 481 Art and Architecture of India (Dual listed with 581 same as Art H 481) See *Art History* Nonmajor graduate credit

Dsn S 484 Sustainable Communities (Dual listed with 584 same as C R P 484) See *Community and Regional Planning*

Dsn S 487 Nineteenth Century Art (Dual listed with 587 same as Art H 487) See *Art History* Nonmajor graduate credit

Dsn S 488 Modernism and Modern Art 1880 1945 (Dual-listed with 588 same as Art H 488) See *Art History* Nonmajor graduate credit

Dsn S 491 Environmental Law (Dual listed with 591 same as C R P 491) See *Community and Regional Planning*

Dsn S 495 Art and Theory Since 1945 (Dual-listed with 595 same as Art H 495) See *Art History* Nonmajor graduate credit

Dsn S 496 History of Photography (Dual listed with 596 same as Art H 496) See *Art History* Nonmajor graduate credit

Dsn S 498 Selected Topics in Art History (Dual listed with 598 same as Art H 498) See *Art History* Nonmajor graduate credit

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Dsn S 515 Housing (Dual listed with 415 same as C R P 515) See *Community and Regional Planning*

Dsn S 517 Urban Revitalization (Dual listed with 417 same as C R P 517 See *Community and Regional Planning*

Dsn S 525 Growth Management (Dual listed with 425 same as C R P 525) See *Community and Regional Planning*

Dsn S 528 Topical Studies in History Theory and Criticism of Architecture (Same as Arch 528) See *Architecture*

Dsn S 529 Planning in Developing Countries (Dual listed with 429 same as C R P 529) See *Community and Regional Planning*

Dsn S 542 Site Analysis and Development Design (Dual-listed with 442 same as C R P 542) See *Community and Regional Planning*

Dsn S 546 Interdisciplinary Design Studio (Dual-listed with 446) (0 15) Cr 4 to 6 each time taken maximum of 12 FS SS *Prereq Admission to a graduate program in the College of Design and permission of instructor* Advanced interdisciplinary design projects

Dsn S 558 Appropriate Technologies for Architecture (Same as Arch 558) See *Architecture*

Dsn S 566 Housing for Specific Groups (Same as Arch 566) See *Architecture*

Dsn S 575 Contemporary Urban Design Theory (Same as Arch 575) See *Architecture*

Dsn S 577 Social Impact of the Built Environment (Same as Arch 577) See *Architecture*

Dsn S 578 Topical Studies in Landscape Architecture (Dual listed with 478 same as L A 578) See *Landscape Architecture*

Dsn S 580 North American Indian Art (Dual listed with 380 same as Art H 580) See *Art History*

Dsn S 581 Art and Architecture of India (Dual-listed with 481 same as Art H 581) See *Art History*

Dsn S 582 Art and Architecture of Asia (Dual listed with 382 same as Art H 582) See *Art History*

Dsn S 583 Greek and Roman Art (Dual listed with 383 same as Art H 583) See *Art History*

Dsn S 584 Sustainable Communities (Dual listed with 484 same as C R P 584) See *Community and Regional Planning*

Dsn S 585 Renaissance Art (Dual listed with 385 same as Art H 585) See *Art History*

Dsn S 587 Nineteenth Century Art (Dual listed with 487 same as Art H 587) See *Art History*

Dsn S 588 Modernism and Modern Art 1880-1945 (Dual listed with 488 same as Art H 588) See *Art History*

Dsn S 591 Environmental Law (Dual listed with 491 same as C R P 591) See *Community and Regional Planning*

Dsn S 594 Women in Art (Dual listed with 394 same as Art H 594) See *Art History*

Dsn S 595 Art and Theory Since 1945 (Dual listed with 495 same as Art H 595) See *Art History*

Dsn S 596 History of Photography (Dual listed with 496 same as Art H 596) See *Art History*

Dsn S 598 Selected Topics in Art History (Dual listed with 498 same as Art H 598) See *Art History*

Ecology and Evolutionary Biology

www eeb iastate edu

(Interdepartmental Graduate Major)

Supervisory Committee J J Obrycki Chair
D Adams H Asbjomsen G W Courtney
J H Dekker T C Harrington M S Kaiser
R D Maddux J D Nason

The ecology and evolutionary biology interdepartmental major is offered through a faculty housed in seven departments of the university Faculty from the departments of Agronomy Ecology Evolution and Organismal Biology Entomology Geological and Atmospheric Sciences Mathematics Natural Resource Ecology and Management Plant Pathology and Statistics cooperate to offer courses and research opportunities leading to the M S and Ph D degrees with a major in ecology and evolutionary biology

Applicants should have completed an undergraduate or master of science or arts degree in one of the biological physical or mathematical sciences or should have equivalent preparation Students with degrees in the physical or mathematical sciences should have taken undergraduate courses in both basic ecology and evolution

Students majoring in ecology and evolutionary biology may prepare themselves for careers focused on basic or applied ecology and evolutionary biology in a variety of settings including academia government industry and private organizations For example graduates often work in wetland restoration and management conservation of biodiversity and ecological systems natural resource and wildlife management environmental analysis and management forestry and agriculture Graduates have a broad understanding of ecology and evolutionary biology have had experiences designing and conducting research writing grant proposals and communicating effectively with scientific colleagues at meetings and by writing publications

The ecology and evolutionary biology major is designed for students interested in the study of mechanisms controlling the composition structure and functional processes of ecological systems and the mechanisms that regulate the pattern and rate of evolutionary change within and among species Cooperating departments offer courses in physiological population community ecosystem restoration and landscape ecology aquatic and wetland ecology forest ecology agroecology wildlife and resource management systematics phylogenetics and genetics and population evolution In addition interdisciplinary courses in ecology and evolution are offered including a special topics course a seminar and an extended field trip

Information on application procedures research interests of the faculty and specific requirements of the major can be obtained from the chair of the supervisory committee

Courses for Graduate Students

EEB 585 Extended Field Trip (0 6) Cr 2 each time taken FS *Prereq Graduate classification* Annual field trip to a region of North America to study the major terrestrial and aquatic ecosystem types of the region Report required

EEB 590 Special Topics Cr 1 to 3 each time taken *Prereq Graduate classification and permission of instructor*

EEB 698 Seminar (1-0) Cr 1 each time taken FS Reports and discussion of recent research and literature

EEB 699 Research

Courses Offered by the Organization for Tropical Studies

ISU graduate students can take courses through the widely recognized Organization for Tropical Studies (OTS) at field sites in Central and South America Students register for OTS courses and upon successful completion receive credit from Duke University which transfers as either OTS 510 or OTS 515 For further information about OTS courses see www ots duke edu or inquire at 201 Bessey

OTS 510 Tropical Biology An Ecological Approach Cr 8 This course is designed for students in the early stages of graduate study in biology or a related field with the goal of training graduate students in research methods by providing intensive field experience in diverse tropical ecosystems

OTS 515 Topics in Tropical Biology Cr 1-8 This course is designated for students enrolled in graduate course offerings through OTS(excluding OTS 510) Examples of graduate courses offered by OTS include Tropical Plant Systematics Tropical Ecology and Conservation and Tropical Agroecology

(For information regarding undergraduate courses offered by OTS see *Index Organization for Tropical Studies*)

Economics

www econ iastate edu

J Arne Hallam, Chair of Department

Distinguished Professors Allen Baumel Harl Huffman Johnson

University Professors Lapan Wisner

Professors Babcock Beghin Choi Deiter Duffy Edelman Edwards Fletcher Ginder Hallam Hayenga Hayes Hennessy Herriges Jensen Jolly Kliebenstein Kling Mattila Meyers Miranowski Moschini Orazem Otto Stone Tesfatsion Van de Wetering

Professors (Adjunct) Hansen

Professors (Collaborators) Boal

Distinguished Professors (Emeritus) Fox Fuller Ladd Luckett

Professors (Emeritus) J Adams R Adams Beneke Faden Gratto Howell Julius Kolmer Meyer Paulsen Prescott Scott Skadberg Starleaf Stephenson Stoneberg

Associate Professors Falk Gallagher Kreider Lawrence Lence Quirmbach Schroeter Volij Wang

Associate Professors (Adjunct) Alexander

Associate Professors (Emeritus) Doak Pounds

Assistant Professors Bhattacharya Bunzel Doyle Hueth Kilkenny Marcoul Singh Weninger Zhao

Assistant Professors (Adjunct) Langinier Luvaga Wohlgemuth

Undergraduate Study

The department offers work for the degree bachelor of science with a major in agricultural business and for the degree bachelor of science with a major in economics For further discussion of programs in agricultural business see the statement below under College of Agriculture For programs in economics see the statement below under *College of Liberal Arts and Sciences* Visit our web site at www econ iastate edu

Graduates of the Department of Economics have unique skills that distinguish them from other graduates They have the ability to think and reason clearly and can address complex issues using tools and decision making models of economics mathematics statistics as well as concepts from the biological physical and social sciences Graduates develop human relations skills that are essential in the work place and the community They are able to communicate economic and business concepts to other professionals collective organizations governments and the general public using a variety of means Graduates understand the interaction of technology human activity and the environment They are able to apply concepts associated with making optimal choices among economic alternatives Graduates are prepared for graduate work in law economics and business as well as the world of work having learned tools of critical analysis and skills essential to getting and keeping meaningful employment

College of Agriculture

For the undergraduate curriculum in agricultural business see *College of Agriculture Curricula*

The agricultural business curriculum prepares students for advanced studies and for careers in agricultural finance management in agricultural supply and marketing industries commodity merchandising and research business research and management farm and ranch operations commercial farm management and appraisal agricultural sales and marketing agricultural reporting and public relations agricultural extension international activities and government service A major in agricultural business with a minor in economics is not permitted however a double major in economics is permitted

College of Liberal Arts and Sciences

Candidates for the bachelor of science degree with a major in economics must fulfill requirements established by the College of Liberal Arts and Sciences (For details of undergraduate curricula in liberal arts and sciences see *College of Liberal Arts and Sciences Curriculum*)

The economics curriculum prepares students for advanced studies professional degrees such as law and business administration and for careers in finance business and economic research management sales and marketing insurance brokerage real estate labor relations international development and government service

Students majoring in economics are required to take either Math 165 and 166 or Math 150 and 160 within the mathematical and natural sciences group Students who plan to take postgraduate work in economics or who want a more quantitative program should definitely take Math 165 and 166 for the above sequence Additional requirements are Statistics 226 and 326 and Computer Science 103 Twenty eight credits in economics are required for the bachelor of science degree These 28 must include Econ 101 102 301 302 472 and 492 In addition one course is required from advanced undergraduate courses in the department Advanced courses are defined as having either 301 or 302 (or both) as a prerequisite Economics majors must maintain a C average in 101 102 301 and 302 with no grade lower than a C

An optional Business Economics track is available for majors who intend to enter the business world after graduation Requirements are the same as for the regular track except that students take Econ 431 (Managerial Economics) as their advanced course they may substitute Econ 353 (Money & Banking) or a financial economics course for Econ 302 substitute Engl 302 (Business Communications) for Engl 314 and must take six credits of business courses from an approved list Students taking the Business Economics track are strongly encouraged to also complete the College of Business minor (see the *Curriculum in Business* section)

Optimal progress for an economics major would be to complete the principles sequence 101 and 102 in the freshman year Math 150 and 160(or the Math 165 166 sequence) should also be completed in the freshman year followed by the intermediate theory sequence Econ 301 and 302 in the sophomore year Computer Science 103 and Statistics 226 and 326 are recommended in the sophomore year Required advanced courses and electives should be taken in the junior and senior years

A minor in economics is offered Courses to be included in the minimum of 15 hours are Econ 101 102 301 and 302

English Proficiency Requirement The major in economics requires a grade of C or better in each of the following English courses 104 105 (or 105H) and 314

The department participates in the interdepartmental programs in international studies and women s studies

Graduate Study

The department offers work toward the degrees master of science and doctor of philosophy with majors in economics and agricultural economics The department also offers minors to students with majors in other departments

Students do not need to have an undergraduate major in economics or agricultural economics in order to

qualify for graduate work in the department However students must have completed undergraduate coursework in macroeconomics microeconomics statistics and calculus Background in matrix algebra is preferred particularly for the Ph D

Candidates for the degree master of science (thesis option) are required to complete satisfactorily 30 credits of acceptable graduate work including preparation of a thesis

Candidates for the degree master of science (non thesis option) may fulfill requirements by satisfactorily completing 32 credits of coursework including preparation of a creative component

Programs of study for the doctorate are organized by each student in consultation with the major professor and the individual s committee Students may select fields of concentration from the following agricultural economics financial economics industrial organiza tion international economics human resources and macroeconomics environmental and resource economics

Each student must complete advanced courses in microeconomic and macroeconomic theory quantitative methods and econometrics and two fields from the list above Students must demonstrate competence in theory by passing qualifying examinations Examinations may be required in the two field areas Students must also participate in workshops

With the cooperation of the College of Law at Drake University a joint degree consisting of doctor of jurisprudence and master of science in agricultural economics or economics may be pursued concur rently Other cooperative programs of study may be arranged with the University of Iowa College of Law or other recognized institutions

The department cooperates in the interdepartmental programs in business administrative sciences and industrial relations the interdepartmental major in transportation and interdepartmental minors in gerontology and housing

Courses open for nonmajor graduate credit 301 302 308 320 321 322 332 335 344 355 376 385 401 402 415 430 431 432 437 451 452 455 460 466 470 472 480

Courses Primarily for Undergraduate Students

Econ 101 Principles of Microeconomics (3 0) Cr 3 FS SS Resource allocation opportunity cost comparative and absolute advantage Supply and demand Marginal analysis Theories of production and consumption pricing and the market system Perfect and imperfect competition and strategic behavior Factor markets Present discounted value

Econ 101H Principles of Microeconomics (3 0) Cr 3 F Resource allocation opportunity cost comparative and absolute advantage Supply and demand Marginal analysis Theories of production and consumption pricing and the market system Perfect and imperfect competition and strategic behavior Factor markets Present discounted value Open only to honors students

Econ 101L Laboratory in Principles of Microeconomics (0 2) Cr 1 F *Prereq Concurrent enrollment in the appropriate section of 101* Discussion of material typically covered in Econ 101 Application of economic principles to real world problems Economic principles and basic business management concepts applied to decision making in agribusiness operations Guest class visits by academic government and industry representatives Field trips to agribusiness firms

Econ 102 Principles of Macroeconomics (3 0) Cr 3 FS SS *Prereq 101 recommended* Measurement of macro variables and general macro identities Classical models of full employment Production and growth Savings and investment Employment and unemploy ment Money inflation and price levels Operation of the U S banking system Fiscal and monetary policy Elements of international finance

Econ 102H Principles of Macroeconomics (3 0) Cr 3 S *Prereq 101* Measurement of macro variables and general macro identities Classical models of full employment Production and growth Savings and investment Employment and unemployment Money inflation and price levels Operation of the U S banking system Fiscal and monetary policy Elements of international finance Open only to honors students

Econ 110 Orientation in Economics/Agricultural Business (1 0) Cr R F Orientation course for freshman and new transfer students in agricultural business and economics

Econ 235 Introduction to Agricultural Markets (3-0) Cr 3 FS *Prereq 101* Basic concepts and economics principles related to markets for agricultural inputs and products Overview of current marketing problems faced by farms and agribusinesses farm and retail price behavior structure of markets food marketing channels food quality and food safety and the role of agriculture in the general economy The implications of consumer preferences at the farm level Introduction to hedging futures and other risk management tools

Econ 292 Career Seminar (1 0) Cr 1 F *Prereq Classification in economics or agricultural business* Career opportunities in the various industries and government institutions with an emphasis on agribusiness Required training and skills needed to perform successfully in different types of careers Factors important in finding and obtaining employ ment either before or after graduation including personal resumes interviewing and letter writing Offered on a satisfactory fail grading basis only

Econ 298 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator sophomore classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Econ 301 Intermediate Microeconomics (3-0) Cr 3 or (3 1) Cr 4 FS SS *Prereq 101 Math 160 or 165* Theory of consumer and business behavior optimal consumption choices and demand theory of firm behavior costs production and supply competitive and imperfectly competitive markets theory of demand for and supply of factors of production general equilibrium analysis Nonmajor graduate credit

Econ 302 Intermediate Macroeconomics (3 0) Cr 3 FS *Prereq 101 102 Math 160 or 165* Theory of income employment interest rates and the price level fiscal and monetary policy budget and trade deficits money and capital inflows interest rates and inflation Nonmajor graduate credit

Econ 308 Agent Based Computational Economics (3 0) Cr 3 *Prereq 101* Computational study of economies as evolving systems of autonomous interacting agents Key ideas from game theory and complex adaptive systems theory for modeling the adaptation learning and co-evolution of economic agents in decentralized market economies Evolution of behavioral norms and interaction networks Building agent based computational laboratories for the experimental study of market protocols and agent learning processes Illustrative economic applications (e g financial markets labor markets agricultural markets electricity markets auction markets automated Internet markets collective usage of common pool resources) Nonmajor graduate credit

Econ 312 History of Economic Thought (3 0) Cr 3 S *Prereq 101* The logic and explanatory value of received economic doctrines since the middle of the eighteenth century The reflection of past economic doctrines in contemporary theory and policy Discussion of major works by Smith Ricardo Mill Marx Marshall Walras Wicksell and Keynes

Econ 320 Labor Economics (3 0) Cr 3 F *Prereq 101* Survey of contemporary labor market problems and public policy toward labor Economic analysis of topics such as labor supply and demand work incentives and compensation transfer programs education and training mobility minimum wages unions working conditions benefits discrimination unemployment wage differentials across regions and labor markets in other countries Nonmajor graduate credit

Econ 321 Economics of Discrimination (Same as W S 321) (3 0) Cr 3 F *Prereq 101* Economic theories of discrimination Analysis of the economic problems of women and minorities in such areas as earnings occupations and unemployment Public policy concerning discrimination Nonmajor graduate credit

Econ 322 Collective Bargaining (3-0) Cr 3 S *Prereq 320* Economic analysis and institutional aspects of unions and collective bargaining Organizing bargaining strategy and contract terms impact of unions on employment and wages Public policy toward unions strikes and negotiated benefits in both the private and public sectors Nonmajor graduate credit

Econ 330 Farm Business Management (2 2) Cr 3 FS *Prereq 101 Acct 284* Business and economic principles applied to decision making and problem solving in the management of a farm business Cash flow partial enterprise and whole farm budgeting Information systems for farm accounting analysis and control Obtaining and managing land capital and labor resources Alternatives for farm business organization and risk management

Econ 331 Entrepreneurship in Agriculture (3 0) Cr 3 *Prereq 101 330 Acct 284* Application of business and economic principles to help students learn how to start a new agricultural enterprise or improve an existing firm Emphasis on analyzing markets and competition and in developing agribusiness competitive strategies Students will develop a comprehensive business plan

Econ 332 Cooperatives (2-0) Cr 2 S *Prereq 101* Survey of cooperative activities with emphasis on agricultural cooperatives types of cooperatives methods of organization and operation principles legal and tax aspects cooperative finance economic possibilities and limitations of cooperation Nonmajor graduate credit

Econ 335 Agricultural Firms and Industry Organization (2 2) Cr 3 FS *Prereq 235 301 concurrent enrollment or credit in Stat 326* Theory of industry structure firm behavior market price determination and market performance in agricultural industries Specific topics include the theory of the firm determinants of firm boundaries neoclassical models of firm behavior perfectly competitive markets monopolistic and monopsonistic markets price discrimination oligopoly and oligopsony and strategic market behavior Nonmajor graduate credit

Econ 336 Agricultural Selling (3 0) Cr 3 F *Prereq 101* Principles of selling with application to agricultural and food related businesses Attitudes value systems and behavioral patterns that relate to agricultural sales Electronic marketing selling strategies preparing for sales calls making sales presentations handling objections and closing sales Analysis of the buying or purchasing process Evaluation of agri selling as a possible career choice

Econ 338 Topics in Agricultural Marketing Cr 1 to 3 each time taken *Prereq 101 235 recommended for sections B C and D* A given topic section can be taken only once A hands-on application of economic concepts and principles to agricultural commodity markets marketing methods risk management and related agribusiness decision

A Dairy marketing
B Livestock marketing
C Grain marketing
D Agricultural marketing alliances (e g cooperatives partnerships joint ventures)

Econ 344 Public Finance (3-0) Cr 3 S *Prereq 101* The economic role of governments in market economies Public goods externalities income distribution and income maintenance programs The effect of taxes on economic behavior descriptions of the structure of the principal U S taxes and current reform proposals Nonma,or graduate credit

Econ 353 Money, Banking and Financial Institutions (3 0) Cr 3 FS SS *Prereq 101 102* Theoretical and applied analysis of money banking and financial markets interest rates and portfolio choice the banking industry in transition the money supply process the Federal Reserve System and the conduct of monetary policy macro implications of monetary policy international finance

Econ 355 International Economics (4 0) Cr 4 F *Prereq 101 102* Explanations of causes of international trade and the impact of trade on welfare and employment patterns Analysis of government policies towards trade such as tariffs quotas and free trade areas Theory of balance of payments and exchange rate determination and the role of government policies 'Examination of alternative international monetary arrangements Credit for either 355 or 455 but not both may be applied to graduation Nonmajor graduate credit

Econ 370 Comparative Capitalism and Economic Transitions (3-0) Cr 3 F *Prereq 101 102* Comparative organization and performance of variants of market capitalism including alternative government interventions and patterns of economic growth and income distribution analysis of planning incentives and enterprise behavior in variants of socialism study of comparative economic transformations of socialist economies assessment of future capitalism and social market economies includes examination of the United States Europe Japan Russia and China

Econ 376 Rural Urban and Regional Economics (Same as C R P 376) (3 0) Cr 3 F *Prereq 101* Firm location with respect to regional resources transport scale economies externalities and policies Measures of local comparative advantage and specialization Spatial markets Population location considering jobs wages commuting and local amenities Business residential and farm land use and value Migration The product cycle and other theories of rural and urban development Market failures regulation firm recruiting local public goods and finance and development policies Nonmajor graduate credit

Econ 380 Environmental and Resource Economics (Same as Env S 380) (3 0) Cr 3 F *Prereq 101* Natural resource availability use conservation and government policy including energy issues Environmental quality and pollution control policies

Econ 385 Economic Development (3 0) Cr 3 S *Prereq 101 102* Current problems of developing countries theories of economic development agriculture and economic development measurement and prediction of economic performance of developing countries alternative policies and reforms required for satisfying basic needs of Third World countries interrelationships between industrialized countries and the developing countries including foreign aid Nonmajor graduate credit

Econ 397 Internship Cr 2 each time taken maximum of 4 FS *Prereq Permission of instructor and classification in agricultural business or economics* Students complete a research report based on their internship or approved work experience that examines chosen topics in management marketing or finance Offered on a satisfactory-fail grading basis only

Econ 398 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator junior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Econ 401 Topics in Microeconomics (3 0) Cr 3 F *Prereq 301 Stat 226* Advanced treatment of selected topics from one or more of the following areas household production models factor markets game theory and imperfect competition general equilibrium intertemporal choice asset markets income distribution externalities and public goods etc Nonmajor graduate credit

Econ 402 Topics in Macroeconomics (3 0) Cr 3 S *Prereq 301 302 Stat 226* Advanced treatment of selected topics from one or more of the following areas business cycle theory growth theory fiscal and monetary policy coordination issues open economy macroeconomics and financial economics Nonmajor graduate credit

Econ 415 Economics of Imperfect Competition Antitrust and Regulated Industries (Dual listed with 515) (3-0) Cr 3 S *Prereq 301 Math 151 or 160 or 165* The economic and strategic analysis of monopoly and oligopoly predatory pricing cartels and price fixing entry barriers and entry deterrence vertical integration technological change and bid rigging and other anticompetitive practices The economic foundations of antitrust policy and industry regulation Nonmajor graduate credit

Econ 430 Advanced Farm Business Management (3 2) Cr 4 F *Prereq 330* Effective use of strategic planning decision methods and computer assistance for solving farm problems Applications of economic and management theory to analyze farm business decisions using efficiency measures to assess current resource use and direct the farm business analysis planning and tax process Computers as aids in the decision process Nonmajor graduate credit

Econ 431 Managerial Economics (3 0) Cr 3 S *Prereq 301* Topics including application of microeconomic theory of the firm and markets organizational incentives and efficiency pricing market structure and strategies role of information and decision making under uncertainty business investment Credit for either 431 or 432 but not both may be applied to graduation Nonmajor graduate credit

Econ 432 Agribusiness Management (3 0) Cr 3 F *Prereq 335* An advanced topics course in agribusiness management Students explore a variety of topics such as determinants of the optimal organization of the firm managing in different market structures game theory approaches to strategizing tax management strategies incentive structures in a firm instruments in firm pricing strategies the economics of information network economics managerial decisions for internet oriented firms the economics of regulation and decision making under uncertainty Credit for either 431 or 432 but not both may be applied to graduation Nonmajor graduate credit

Econ 437 Applied Commodity Marketing and Risk Management (3 0) Cr 3 S *Prereq 235 301 Stat 226* Applied commodity price analysis The purpose and performance of commodity markets Distinguishing features of agricultural commodities Hedging arbitrage and speculation in commodity spot forward futures and options markets Valuation theory Nonmajor graduate credit

Econ 451 Agricultural Law (3 2) Cr 4 F *Prereq Senior classification* The legal framework impinging upon decision making by farm firms families and individuals real and personal property contracts secured transactions negotiable instruments debtor-creditor relations bankruptcy organization of farm firms intergeneration property transfers trusts insurance liabilities environmental law federal and state regulatory powers Nonmajor graduate credit

Econ 452 Legal Issues in Agriculture (2-0) Cr 2 *Prereq 101* Designed for off campus programs in agriculture Offered as demand warrants The legal framework impinging on decision making by individuals families and firms in agriculture ownership and transfer of real property commercial law including secured transactions sales and negotiable instruments bankruptcy income tax planning and management estate and business planning for the farm family civil liabilities water law environmental law government regulation of agriculture Nonmajor graduate credit

Econ 455 International Trade and Finance (4-0) Cr 4 S *Prereq 301* Rigorous treatment of theories of international trade and its impact on domestic and world welfare and the distribution of income Theoretical analysis of government policies towards trade such as quotas tariffs and free trade areas Theory of exchange rate and balance of payments determination and the role of government policy study of efficiency of the foreign exchange market Examination of alternative international monetary arrangements Credit for either 355 or 455 but not both may be applied toward graduation Nonmajor graduate credit

Econ 460 Agricultural, Food, and Trade Policy (Dual listed with 560) (3 0) Cr 3 S *Prereq 301 or 501* Description and analysis of economic problems of U S agriculture Explanation and economic analysis of government policies and programs to develop agriculture conserve agricultural resources address consumer food concerns stabilize farm prices and raise farm incomes The influence of macropolicy world economy and international trade on U S agriculture Nonmajor graduate credit

Econ 466 Agricultural Finance (3-0) Cr 3 S *Prereq 301 Stat 226 Fin 301 and Econ 353 (recommended)* Financial analysis of agricultural businesses liquidity capital structure and growth of agricultural firms risk and return capital budgeting methods analysis of land investments leasing and costs of credit financial intermediation and major financial institutions for agriculture credit scoring loan pricing and asset liability management techniques by financial intermediaries public policies affecting agricultural credit markets Nonmajor graduate credit

Econ 470 Public Choice (Same as Pol S 470) (3 0) Cr 3 Alt F offered 2003 *Prereq 101* Application of economics to political science in the study of nonmarket decision making Behavior of bureaucrats elected officials and voters Market failure collective action representative democracies direct democracies logrolling voter paradoxes game theory and terrorism Nonmajor graduate credit

Econ 472 Introductory Econometrics (4 0) Cr 4 FS *Prereq 301 302 or 353 Stat 326* Introduction to the models and methods used to estimate relationships and test hypotheses pertaining to economic variables Simple and multiple regression analysis stochastic regressors heteroskedasticity autocorrelation measurement error simultaneous equations Nonmajor graduate credit

Econ 480 Intermediate Environmental and Resource Economics (Dual listed with 580) (3 0) Cr 3 *Prereq 301* Theories of natural resource utilization and allocation Externalities public goods and environmental quality Planning natural resource use and environmental quality Methodologies for analyzing natural resource and environmental problems Nonmajor graduate credit

Econ 490 Independent Study Cr 1 to 5 each time taken *Prereq Junior or senior classification 14 credits in economics* Students in the College of Agriculture may use no more than 6 credits of Econ 490 toward the total of 128 credits required for graduation students in the College of Liberal Arts and Sciences may count no more than 9 credits of Econ 490 toward graduation Offered on a satisfactory fail grading basis only
H Honors

Econ 492 Graduating Senior Survey (1 0) Cr R FS *Prereq Graduating senior* Final preparations for graduation The final stages of job searching interviewing letter writing and resume preparation Outcomes assessment information from graduating seniors including opinion surveys instructor/advisor/course evaluations exit interviews student accomplishment surveys job placement surveys and comprehensive skills examinations Departmental recognition of graduating seniors Life as an alumnus expectations and obligations Convocation and commencement information Offered on a satisfactory fail grading basis only

Econ 493 Workshops Cr 1 to 3 each time taken No more than 6 credits may be applied towards graduation *Prereq Permission of instructor* Offered on a satisfactory fail grading basis only

Econ 496 Economics Travel Course Cr 1 to 3 each time taken maximum of 6 *Prereq Sophomore status permission of instructor* Tour and study of international agricultural and/or nonagricultural economies markets and institutions Locations and duration of tours will vary Limited enrollment

Econ 498 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator senior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Econ 500 Quantitative Methods in Economic Analysis I (4 0) Cr 4 F *Prereq 301 1 year of calculus Stat 401 and permission of Director of Graduate Studies* Economic applications of selected mathematical and statistical concepts linear models and matrix algebra differential calculus and optimization integral calculus and economic dynamics probability distributions estimation and hypothesis testing in the analysis of economic data

Econ 501 Microeconomics (4-0) Cr 4 F *Prereq 301 credit or enrollment in 500 or equivalent background in calculus and statistics* The theory of the consumer theory of the firm perfect and imperfect competition welfare economics and selected topics in general equilibrium and uncertainty This is a Master s level course

Econ 502 Macroeconomics (4-0) Cr 4 F *Prereq 302 credit or enrollment in 500 or equivalent background in calculus and statistics* Models of aggregate supply and demand theories of consumption and investment money supply and demand inflation rational expectations stabilization policy financial markets and international finance This is a Master s level course

Econ 515 Economics of Imperfect Competition Antitrust and Regulated Industries (Dual listed with 415) (3 0) Cr 3 *Prereq 301 Math 151 or 160 or 165* The economic and strategic analysis of monopoly and oligopoly predatory pricing cartels and price fixing entry barriers and entry deterrence vertical integration technological change bid rigging and other anticompetitive practices The economic foundations of antitrust policy and industry regulation

Econ 520 Labor Supply and Human Capital Formation (3-0) Cr 3 *Prereq 501 or 601* Labor supply decisions and empirical analysis for agricultural operators and other self-employed and wage earning households multiple job holding resource allocation in productive households human capital formation by households firms and public institutions which includes schooling on-the job training migration health research raising of children and implications for household income and welfare applications to problems in rural areas of developing and developed countries

Econ 521 Labor Markets (3-0) Cr 3 *Prereq 501 or 601* Analysis of labor demand and market determination of wages and employment analysis of distortions in labor markets due to non-competitive forces legislation and discrimination wage inequality compensation and work incentives compensating differentials microeconomic analysis of unemployment and job search

Econ 530 Advanced Farm Management (2 0) Cr 2 *Prereq 6 credits in economics* Offered off campus as demand warrants Management techniques of planning implementation and control as applied to farm businesses Quantitative tools as applied to agricultural decision making Accounting control concepts and decision theory as used to manage agricultural enterprises Designed for master of agriculture program only

Econ 532 Business Economics (3 0) Cr 3 *Prereq 101 and enrollment in MBA or BAS program not for economics majors* Applications of microeconomic theory and decision analysis Demand analysis production and cost analysis forecasting pricing market structures and strategy capital investment analysis decision making under uncertainty government and business

Econ 533 Economic and Business Decision Tools (Same as BusAd 533) (3 0) Cr 3 *Prereq 501 or 532* Team taught by faculty in the Department of Economics and the College of Business this course focuses on applied economic and business tools decision making The topics include Monte Carlo analysis with applications to option pricing and insurance mechanism design portfolio analysis using existing standard spreadsheet software and add-ons dynamic programming tools for inventory management and sequential decisions discrete choice modeling and statistical bootstrapping and financial performance evaluation using commercially available software

Econ 535 Agricultural Marketing (3 0) Cr 3 *Prereq 501 or 532 or 601* Analysis of agricultural marketing systems focusing on their structure pricing and coordination mechanisms (including futures markets) and performance Government market intervention and regulation methods

Econ 536 Applied Agricultural Marketing (2 0) Cr 2 *Prereq 6 credits in economics* Off campus Offered as demand warrants Market structure and performance in the food and agricultural sector Vertical coordination systems and pricing systems in agriculture Market information and price forecasting Alternative marketing methods and strategies for major Iowa agricultural commodities including the use of futures and options markets Designed for master of agriculture program only

Econ 537 Commodity Markets Analysis and Strategy (3-0) Cr 3 *Prereq 501 or 532 or 601 Econ 571 or Stat 326* Analysis of exchange-traded and over the-counter commodity markets and related contracts their functions performance and relations with spot markets Evaluation of hedging speculation and arbitrage strategies Valuation of derivatives Efficiency and the role of information in commodity markets Market regulation Price forecasting

Econ 544 Public Economics I (3 0) Cr 3 *Prereq 501 or 601* Public goods externalities Lindahl equilibrium voting social choice aggregation of preferences non-manipulation of voting schemes

Econ 545 Public Economics II (3 0) Cr 3 *Prereq 501 or 601* Optimal taxation excess burden partial and general equilibrium analysis of tax incidence social insurance effects of taxation on labor supply and savings economics of the health sector

Econ 553 Applied Research in Monetary and Macroeconomics (3-0) Cr 3 *Prereq 502 571* Application of economic theory to the analysis of contemporary issues in macroeconomics monetary economics and financial economics This is a Master s level course

Econ 555 Issues in International Economics (3-0) Cr 3 *Prereq 501 502* Theories of international trade and finance Emphasis on current policy issues in international economics This is a Master s level course

Econ 560 Agricultural Food and Trade Policy (Dual listed with 460) (3 0) Cr 3 S *Prereq 301 or 501* Description and analysis of economic problems of U S agriculture Explanation and economic analysis of government policies and programs to develop agriculture conserve agricultural resources address consumer food concerns stabilize farm prices and raise farm incomes The influence of macroeconomic policy world economy and international trade on U S agriculture

Econ 563 Issues in Government Policy Affecting Agriculture (2 0) Cr 2 *Prereq 101* Off campus Offered as demand warrants Government policy and the policy making process as it affects food agriculture and trade Description and analysis of government policies and programs designed to address production agriculture problems and consumer food concerns Evaluation of the interaction of agriculture and world trade as affected by U S and foreign government policies Designed for master of agriculture program only

Econ 571 Intermediate Econometrics (3 0) Cr 3 S *Prereq 500* Single and multiple equation regression models dummy explanatory variables serial correlation heteroskedasticity distributed lags qualitative dependent variables simultaneity Use of econometric models for tests of economic theories and forecasting

Econ 576 Spatial Economics (3 0) Cr 3 *Prereq 501* Analysis of location choice by firms employees and households emphasizing the role of spatial variations in agglomeration economies economies of scale distance transport endowments amenities and local government Models of land use urban form spatial competition central place theory and migration Techniques of discrete choice analysis statistical analysis of categorical data urban system modeling and interregional computable general equilibrium

Econ 580 Intermediate Environmental and Resource Economics (Dual listed with 480) (3 0) Cr 3 *Prereq 301* Theories of natural resource utilization and allocation Externalities public goods and environmental quality Planning natural resource use and environmental quality Methodologies for analyzing natural resource and environmental problems

Econ 581 Advanced Environmental Economics (3-0) Cr 3 *Prereq 501 or 601* Interrelationships of natural resource use and the environment Applied welfare and benefit-cost analyses Externalities and pollution abatement Nonmarket valuation of resources Property rights Legal and social constraints Policy approaches

Econ 583 Water Resources (Same as W Res 583) (3-0) Cr 3 *Prereq Graduate classification not for economics majors* Analysis of water resource management issues from economic legal political and sociological perspectives Topics include rational water allocation systems market failure investment pollution control strategies and resource management Administered by Economics in cooperation with Political Science and Sociology

Econ 585 Economic Growth and Development (3 0) Cr 3 *Prereq 501 and 502 or 601 and 602* Performance and problems of developing countries in relation to growth employment structural change and human development theories and paradigms of development theories and sources of long run economic growth fertility and population growth income distribution and poverty land reforms and agricultural development rural-urban migration labor markets corruption and development information problems banking and financial intermediation role of monetary and fiscal policies in development

Econ 586 Microfoundations of Economic Growth and Development (3 0) Cr 3 *Prereq 501 and 502 or 601 and 602* Models of household and firm/farm behavior in developing countries with missing markets Quantitative policy analysis Measures of comparative advantage distortions and protection Aggregation of distortions into trade restrictiveness indicies Political economy of protection Trade and environment interface in developing economies Coordination and piecemeal reforms of trades and environmental policies

Econ 590 Special Topics Cr 1 to 5 each time taken Offered on a satisfactory-fail grading basis only

Econ 599 Creative Component Cr 1 to 5 Offered on a satisfactory fail grading basis only

Courses for Graduate Students, major or minor

Econ 600 Quantitative Methods in Economic Analysis II (4 1) Cr 4 F *Prereq 500 and linear algebra* Unconstrained and equality- and inequality constrained optimization the Kuhn Tucker formulation abstract spaces dynamic programming dynamical systems

Econ 601 Microeconomic Analysis I (4 1) Cr 4 F *Prereq 301 previous or concurrent enrollment in 600 and permission of Director of Graduate Studies* Economic theory and methodology theory of consumer behavior theory of the competitive firm supply and factor demand duality relations in consumer and producer theory welfare change measures partial equilibrium analysis perfect competition monopoly choice under uncertainty the expected utility model risk aversion insurance portfolio and production decisions under risk

Econ 602 Macroeconomic Analysis (4 1) Cr 4 S *Prereq 301 302 previous or concurrent enrollment in 600 and permission of Director of Graduate Studies* Neoclassical aggregate growth models the overlapping generations model endogenous growth models equilibrium business cycle theories equilibrium job search and matching models of money fiscal and monetary policy income and wealth distribution

Econ 603 Microeconomic Analysis II (4 1) Cr 4 S *Prereq 601 602 and permission of Director of Graduate Studies* General equilibrium analysis efficiency and welfare market failures externalities and the theory of the second best introduction to game theory adverse selection signaling screening and moral hazard

Econ 604 Advanced Macroeconomic Analysis (4-1) Cr 4 F *Prereq 601 602 and permission of Director of Graduate Studies* Topics will be selected from new Keynesian approaches to business cycle theory endogenously generated business cycles models of credit and financial intermediation mechanism design and time inconsistency issues political economy models heterogeneous-agent models with strategic interaction path dependence network effects and lock-in economies as evolving self organizing systems

Econ 605 AdvancedTopics in Microeconomics (3 0) Cr 3 each time taken *Prereq 603 604* Selected topics in microeconomic theory of current significance to the profession

Econ 606 AdvancedTopics in Macroeconomics (3-0) Cr 3 each time taken *Prereq 603 604* Selected topics in macroeconomic theory of current signifi cance to the profession

Econ 615 Industrial Organization I (3 0) Cr 3 *Prereq 603* Theoretical analysis of traditional topics in industrial organization Review of game theory Monopoly and oligopoly theory price discrimination product differentiation research and development diffusion of innovation network externalities and asymmetric information

Econ 616 Industrial Organization II (3-0) Cr 3 *Prereq 615 671* Empirical methods in industrial organization Measurement of market power Discrete choice models of product differentiation Empirical studies of price dynamics entry collusion price discrimination technology adoption asymmetric information and auctions

Econ 618 GameTheory (3-0) Cr 3 *Prereq 501 and permission of instructor* Theoretical analysis and applications of strategic games extensive form games and cooperative games Nash equilibrium correlated equilibrium Bayesian games subgame perfect equilibrium the core evolutionary equilibrium repeated games with finite automata and common knowledge

Econ 640 AdvancedTopics in Agricultural Economics (3-0) Cr 3 each time taken *Prereq 603* Selected topics in agricultural economics of current significance to the profession

Econ 641 Agricultural Economics I (3 0) Cr 3 *Prereq 603* Advanced treatment of topics in agricultural economics with emphasis on optimization models Part 1 Applied duality in production and demand models Flexible representation of production and demand systems Production efficiency and nonparametric analysis Production models with risk Part 2 The role of contracts in the organization and coordination of agricultural production Distribution of asset ownership allocation of risk among parties and the structure of incentive systems Rationale for cooperative efforts and information sharing The role of information insurance and credit

Econ 642 Agricultural Economics II (3-0) Cr 3 *Prereq 603* Advanced treatment of topics and models in agricultural economics with emphasis on equilibrium analysis Part 1 Application of price theory to agricultural market analysis Vertical market relations product differentiation and quality in agri food markets Storage futures markets and commodity prices Part 2 Market failures and the scope for government intervention in agriculture Applied welfare analysis of agricultural and environ mental policies Issues and models in international trade of agricultural products

Econ 653 Financial Economics (3-0) Cr 3 *Prereq 603 672 Recommended 674 Stat 551* Review of decision-making under uncertainty PortfolioTheory Theoretical foundations of asset valuation models capital asset pricing model (CAPM) arbitrage pricing theory (APT) representative agent models pricing of derivative securities Complete and incomplete asset markets credit markets financial intermediaries the role of government in the financial sector Market frictions crashes bubbles Applications of asset valuation models with emphasis on their testable implications

Econ 654 AdvancedTopics in Financial Economics (3-0) Cr 3 each time taken *Prereq 653* Selected topics in financial economics of current significance to the profession

Econ 655 InternationalTrade (3 0) Cr 3 *Prereq 603* Theories of international trade welfare and distributional aspects of trade and commercial policies Optimal trade policies in the presence of domestic distortions strategic trade policy international trade and economic growth

Econ 657 International Finance (3-0) Cr 3 *Prereq 604* The intertemporal approach to current account determination non traded goods and the real exchange rate fiscal policy in the open economy monetary approach to balance of payments and exchange rate determination sticky price models of the open economy exchange-rate based stabilizations capital inflows financial and balance of payments crises international business cycles

Econ 671 Econometrics I (4 1) Cr 4 F *Prereq 501 and Stat 447 or 542* Overview of statistical theory underlying econometric methods Specification estimation and testing of single and multiple equation models of economic processes large sample properties of estimators and large sample inference dynamic models and instrumental variables

Econ 672 Econometrics II (4-1) Cr 4 S *Prereq 671* Identification estimation and evaluation of systems of simultaneous equations qualitative choice and limited dependent variable models Introduction to time series methods and applications including alternative variance specifications

Econ 673 Microeconometrics (3-0) Cr 3 *Prereq 672 601* Econometric treatment of models arising in microeconometric applications Methods are primarily concerned with the analysis of cross section data Topics may include systems of demand equations in panel data settings random utility models of discrete choices production possibilities frontier estimation and discrete/continuous models of participation and consumption

Econ 674 Macroeconometrics (3 0) Cr 3 *Prereq 672 602* Time series econometric techniques and their application to macroeconomics and financial markets Techniques may include GARCH and ARCH M models unit root tests nonlinear adjustment models structural VARs and cointegration tests

Econ 675 AdvancedTopics in Econometrics (3 0) Cr 3 each time taken *Prereq 672 or Stat 543* Advanced treatment of issues important in econometrics Topics chosen from asymptotic theory nonlinear estimation Bayesian and robust econometrics econometric time series limited dependent variables and censored regression models nonparametric and semiparametric methods bootstrapping and Monte Carlo techniques etc

Econ 680 Advanced Resource Economics (3 0) Cr 3 *Prereq 603* Dynamic allocation of scarce exhaustible and renewable natural resources including minerals and energy soil water forests and fish Social versus private decisions Market and nonmarket considerations Technological change Regulation Dynamics and uncertainty

Econ 690 AdvancedTopics Cr 1 to 5 each time taken Offered on a satisfactory fail grading basis only

Econ 693 Workshops Cr 1 to 3 each time taken *Prereq 6 graduate credits in chosen field* Offered on a satisfactory fail grading basis only

Econ 699 Research forThesis or Dissertation Offered on a satisfactory fail grading basis only

Educational Leadership and Policy Studies

(www educ iastate edu/elps/homepage htm)

John H Schuh Chair of Department

University Professors Robinson

Professors Blake Ebbers Evans Gmelch Huba Littrell Moore Schuh Shelley Van Ast

Professors (Collaborators) Barak Claar Gardner Pierce

Distinguished Professors (Emeritus) Ahmann Fanslow Warren

University Professor (Emeritus) Manatt

Professors (Emeritus) Beavers Boyles Bryan Engel Hopper Jones Kizer Lagomarcino Lawrence McCandless Netusil Pellegreno

Associate Professors Hackmann Hamrick Licklider Poston

Associate Professors (Adjunct) Stow Tesfagiorgis

Associate Professor (Emeritus) Thielen

Assistant Professors Alsbury Bartlett Kilgore Mullen

Assistant Professors (Adjunct) Andersen Arthur Gruenewald Hill Jackson McGuire Norton Udin

Clinicians Scharff Smith Walker

Departmental Mission, Vision and Goals Statements

Mission

The mission of the Department of Educational Leadership and Policy Studies is to advance the quality and effectiveness of educational institutions and individuals engaged in education The department is guided by the missions of Iowa State University and the College of Education and embodies the concepts of the land grant tradition of teaching research and service The department is dedicated to enhancing the intellectual cultural social and ethical potential of students and faculty for the benefit of Iowa the nation and the world Specifically the Department of Educational Leadership and Policy Studies

- Provides graduate degree and career preparation programs coursework and other learning opportuni ties for students and practitioners
- Conducts and disseminates basic and applied research for the advancement of educational theory and practice
- Provides professional service for institutions individuals and organizations at all levels of education

Vision

Research All Educational Leadership and Policy Studies faculty create and disseminate knowledge and

promote educational inquiry that enhances educational practices at local state national and international levels

Teaching All Educational Leadership and Policy Studies faculty engage in teaching that is consonant with the principles of adult learning and effective teaching that help students develop critical thinking and professionally relevant skills and that provides a foundation for the application of knowledge to practice

Service All Educational Leadership and Policy Studies faculty using their professional expertise work with educators educational institutions and other consituent groups to solve problems

Advising All Educational Leadership and Policy Studies faculty foster students professional and personal growth by guiding and inspiring them to formulate and complete relevant programs of study and to conduct high quality research

Curricula/Program The Educational Leadership and Policy Studies faculty develop and implement futuristic curricula and programs to ensure that students learn to think critically and perform their professional roles in an exemplary fashion

General Goals

The general goals of the department and hence of each of its program areas and affiliated programs are to

- Conduct high quality graduate education programs both on and off-campus for students seeking graduate degrees in a major in education and/or seeking professional licensure as school service personnel
- Establish appropriate conditions opportunities and resources with which both faculty and graduate students may engage in scholarly activities
- Assist the educational enterprise of Iowa in development by utilizing when appropriate the talents and expertise of the faculty and graduate student body in such activities as workshops conferences and consultation in small groups both on and off-campus

Graduate Study

Degrees. The Department of Educational Leadership and Policy Studies – ELPS – offers work for the degrees master of science master of education certificate of advanced studies and doctor of philosophy with a major in education ELPS also offers minor work to students majoring in other fields of study At the master s level students may specialize in counselor education educational administration higher education organizational learning and human resource development and research and evaluation Interested students should consult the specific program area for master s degree information related to that program

Students may complete the Ph D with a major in education and a specialization in educational leadership with emphasis in either educational administration or higher education Specific information about the requirements of the Ph D degree is available from the departmental office or on the web (www educ iastate edu/elps/elpsdoc htm)

The following information refers only to the Ph D program

Prerequisites Prerequisite to major graduate work in educational leadership is completion of an under graduate degree with coursework appropriate to the planned specialization and evidence that the student ranks above average in scholastic achievement and promise of professional competence

Learning Opportunities Doctoral students in Educational Leadership and Policy Studies will complete seminars laboratory experiences field experiences independent research and a capstone experience course In addition to the common experiences noted above students will each select an intellectual content area that will prepare them to work in the setting of their choice

Careers Graduates of the Doctoral Program are prepared to serve as leaders in various educational settings including school administration community colleges public and private colleges and universities and public and private agencies

Outcomes Graduates of the Ph D Program regardless of the emphasis chosen possess skills and knowledge related to six core domains leadership educational research communication educational evaluation educational foundations and educational technology By the time of graduation students will demonstrate the necessary skills and knowledge to

- Work effectively with individuals and groups
- Engage in ethical decision making and management of resources to accomplish goals
- Engage in scholarly inquiry
- Express ideas clearly both orally and in writing
- Articulate their values beliefs and philosophy of life
- Relate sensitively to individuals from diverse backgrounds
- Use the principles of program evaluation and assessment intelligently
- Have a clear understanding of the foundations of education grounding their work in theory and philosophy
- Use technology effectively in learning and organizational processes
- Articulate the concepts theories and practices related to the educational content area emphasized in their studies

Other Related Programs Other graduate programs related to education (including General Graduate Studies) may be more suited to the interests of potential students on the basis of previous education and experiences as well as future plans and needs Potential students should refer to programs in the Departments of Agricultural Education and Studies Curriculum and Instruction Family and Consumer Sciences Education and Studies Health and Human Performance Industrial Technology and General Graduate Studies or to graduate level course offerings within the other departments to determine if these offerings may be more closely matched with their career interests

Counselor Education (Co Ed)

John M Littrell Program Coordinator

Degrees Counselor Education offers work for the master of science and master of education degrees with a specialization in counselor education and with the option of thesis or creative component Courses are designed for cohort groups

Emphasis The Counselor Education Program focuses on preparing educational leaders who work as counselors and/or consultants with clients in schools communities and/or businesses The program prepares students for one of the following settings elementary schools secondary schools or communities

Prerequisites Prerequisite to major graduate work in educational leadership is completion of an under graduate degree with coursework appropriate to the planned specialization and evidence that the student ranks above average in scholastic achievement and promise of professional competence

Learning Opportunities To become counselors who are educational leaders Counselor Education master s students learn the art and science of counseling individuals facilitating groups and enhancing schools and communities Opportunities are provided to engage students in an experiential curriculum participate in relevant practical experiences in schools and communities explore research related to their specializations and present portfolios that summarize their cumulative learning

Careers Graduates of the Master s Degree Program in Counselor Education are prepared for leadership roles as elementary or secondary school counselors and/or counselor consultants to individual clients school districts home schoolers parochial and private schools educational agencies businesses and communities

Outcomes Graduates of the Master s Degree Program in Counselor Education will possess skills and knowledge for leadership as well as skills as K 12 school counselors and counselor consultants By the time of graduation students will demonstrate the necessary skills and knowledge to

- Identify themselves as educational leaders who inspire their clients with vision risk-taking and energy
- Possess the awareness knowledge sensitivity and skills to function as high level
  - counselors
  - group facilitators
  - consultants
  - change agents
- Add value to the organizations with which they work
- Be skilled in at least one area of specialization
- Belong to relevant professional organizations
- Adhere to ethical codes of the counseling profession
- Be competent in the administration of ASCAs (American School Counselor Assoc) National Standards for School Counselors in three core areas personal/social academic and career development
- Be skilled as talent developers

Courses for Graduate Students

Co Ed 501 Foundations of Counseling (3-0) Cr 3 F *Prereq 8 credits in undergraduate education sociology or psychology* Counseling theories that facilitate change in individuals professional roles and functions professional organizations and associations professional history and trends ethical standards and legal issues professional preparation standards and professional credentials

Co Ed 505 Art of Helping (3 0) Cr 3 F *Prereq Credit or enrollment in 501* Building skills in listening responding and developing counseling relationships

Co Ed 510 Counseling Individuals I (3-0) Cr 3 S *Prereq 501 and 505* Provides an understanding of counseling process with focus on counseling theories applicable to schools ethics career development and social and cultural issues

Co Ed 515 Counseling Individuals II (3 0) Cr 3 S *Prereq 501 and 505* Provides an understanding of counseling process with focus on assessment and evaluation developmental and learning theory relevant research and factors considered in application

Co Ed 520 Counseling Specialization (3-0) Cr 3 F *Prereq 510 and 515* Provides an in-depth opportunity to explore topics to develop an area of specialization

Co Ed 530 Facilitating Groups I (3 0) Cr 3 F *Prereq 520* Provides an understanding of the group counseling process with focus on group theories ethics for group leaders planning implementing and facilitating groups dynamics and leader interventions at various group stages accent on career development participation in group laboratory activities

Co Ed 535 Facilitating Groups II (3 0) Cr 3 F *Prereq 520* Provides an understanding of the group counseling process with focus on issues and trends in a multicultural and diverse society school counseling skills classroom management learning theory and assessment and evaluation of change

Co Ed 541 Educational Consulting I (3-0) Cr 3 S *Prereq 530 and 535* Historical philosophical societal cultural economic and political dimensions of schools and their relationships to communities general principles of community intervention prevention consultation and outreach evaluation of programs and systems school counseling skills classroom management and working with exceptional children

Co Ed 545 Educational Consulting II (3-0) Cr 3 S *Prereq 530 and 535* Understanding of the consulting process with focus on consulting theories and systems perspective the role of the counselor as a consultant in a variety of settings relationships between consultants and other professionals in these settings organization businesses fiscal and legal dimensions of the institutions and settings in which consultants practice

Co Ed 550 Management of School Counseling Programs (3-0) Cr 3 F *Prereq 505* Design implementation and evaluation of a comprehensive developmental school program coordination with resource persons specialists businesses and agencies outside the school to promote program objectives promotion of the program within the total school community integration of guidance curriculum in the total school curriculum data gathering methods for program planning and evaluation time management referral procedures

Co Ed 590 Special Topics Cr 1 to 2 *Prereq 9 graduate hours in counselor education*

Co Ed 591 Internship Cr 1-6 F *Prereq 541 and 545* Actively engaged within the school setting counseling students consulting with teachers and parents and coordinating activities that enhance student development and growth both in the cognitive and affective domains
A Elementary Internship
B Secondary Internship
C Community Counseling Internship

Co Ed 593 Workshop in Counseling and Guidance Cr 1 to 3 SS *Prereq 9 hours in counselor education* Workshops are designed to give practicing counselors an in depth exposure to a counseling issue or a counseling model with concurrent opportunity for application of the model Offered when demand warrants
B Counseling with Exceptional Children
D Substance Abuse Counseling
F Working with Parents and Families
G Advanced Brief Counseling
H Crisis Intervention
M Play Therapy
N Counseling Children and Adolescents at Risk

Co Ed 599 Creative Component Cr 1 to 2 *Prereq 9 credits in counselor education*

Co Ed 601 Advanced Counseling Theories and Methods (3 0) Cr 3 FS *Prereq 591A or 591B or 591C* Comparative study of counseling theories supervised experience facilitating and processing groups practice in skill training labs with master s students

Co Ed 602 Advanced Group Theories and Methods (3 0) Cr 3 *Prereq 591A or 591B or 591C and permission of instructor* Critical analysis of group theories Supervised experience facilitating and processing groups of master s students

Co Ed 603 Supervision of Counselors (3 0) Cr 3 *Prereq 601* Theories of supervision are examined in depth Advanced counseling students provide clinical supervision of students enrolled in 591A 591B and/or 591C

Co Ed 604 Group Counseling Practicum Cr 1 FS SS *Prereq 591A 591B or 591C and permission of instructor* Supervised experience facilitating and processing groups
A Skill Training Lab
B Counseling Group

Co Ed 605 Research in Counseling (3 0) Cr 3 *Prereq 602* A student prepares relevant research proposals and reviews of literature

Co Ed 606 Supervision of Counseling Cr 2 FS *Prereq Minimum of 3 practicum credits and permission of instructor* Advanced counseling students provide clinical supervision for students enrolled in 591A 591B or 591C

Co Ed 615 Seminar Cr 1 to 2 *Prereq 9 hours in counselor education* Seminars are designed to meet various needs of advanced master s students and practicing counselors Offered when demand warrants
C Current Issues and Trends in Counseling
D Consultation
F Group Intervention Strategies

Co Ed 625 Advanced Internship (3 6) Cr 3 to 6 FS *Prereq 604* A student intern performs all activities regularly performed by employed staff members in a counseling setting

Co Ed 690 Advanced Special Topics Cr arr *Prereq 9 credits in counselor education*

Co Ed 699 Research Cr arr *Prereq 9 credits in counselor education*

Educational Administration (EdAdm)

Donald G Hackmann Program Coordinator

Degrees and Certificates Several programs are offered (1) master of science degree with thesis or creative component in elementary or secondary school administration (2) master of education practitioner (3) advanced study leading to principal s license (4) certificate of advanced studies providing post master s training for superintendency licensure and (5) doctor of philosophy with major in education and specialization in educational leadership Courses are scheduled with consideration for cohort-collegial teams or groups

Emphasis The Educational Administration Program places dual emphasis on preparation of professional educational administrators and on the academic/ scholarly aspects of educational leadership and management

Prerequisites Prerequisite to major graduate work in educational leadership is completion of an under graduate degree with coursework appropriate to the planned specialization and evidence that the student ranks above average in scholastic achievement and promise of professional competence

Learning Opportunities Students will complete courses laboratory experiences field experiences and independent research so that they can effectively serve in leadership roles

Careers Graduates of Master s Degree and Certificate of Advanced Study Programs in Educational Administration are prepared for leadership roles in Pre K 12 school districts and education agencies typically as building level principals assistant principals curriculum directors and central office administrators Doctoral graduates are prepared for PreK 12 leadership roles and academic or leadership positions in higher education

Outcomes Graduates of the Certificate of Advanced Studies Program will possess administrative and leadership skills necessary for the superintendency and central office administration By the time of graduation students will demonstrate the necessary skills and knowledge to
•Serve as visionary leaders with effective skills in curricular and instructional leadership
•Work effectively with individuals and groups both within the district and community to create and sustain a positive learning culture
•Engage in ethical decision making and effective management of human material and financial resources to accomplish district goals
•Express ideas clearly to various publics both orally and in writing
•Articulate their values beliefs and philosophies of education
•Relate sensitively to individuals from diverse backgrounds
•Access and utilize research information and technology to assist with organizational improvement
•Translate educational administration concepts and theories into sound management and leadership practices

Graduates of the Master s Program with a specialization in educational administration and the Principal Licensure Program possess administrative and leadership skills necessary for PreK 12 building level leadership roles By the time of graduation students will demonstrate the necessary skills and knowledge to

•Serve as visionary building level leaders with effective skills in curricular and instructional leadership
•Work effectively with individuals and groups to create and sustain a positive school culture
•Engage in ethical decision making and effective management of human material and financial resources to accomplish school goals
•Express ideas clearly to various publics both orally and in writing
•Articulate their values beliefs and philosophies of education
•Relate sensitively to individuals from diverse backgrounds
•Access and utilize research information and technology to assist with school improvement
•Translate educational administration concepts and theories into sound management and leadership practices

Graduates of the Ph D Program with a specialization in educational administration will possess skills and knowledge related to the six core domains leadership educational research communication educational evaluation educational foundations and educational technology By the time of graduation students will demonstrate the necessary skills and knowledge for those outcomes as listed under the ELPS Ph D program outcomes

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

EdAdm 541 Principles of Educational Administration (3 0) Cr 3 FSS *Prereq Teacher licensure and permission of instructor* Purposes of education in a democratic society Basic principles of school administration and educational organization planning Analysis of the nature and function of units of education at local intermediate and state levels exploration of substantive elements such as leadership change process strategic and operational planning and current issues in education

EdAdm 551 Supervision of Instruction (3 0) Cr 3 FSS *Prereq 541* Evaluating and improving the performance of teachers and administrators of K 12 public and independent schools intermediate educational units and community colleges This offering meets the requirement for initial evaluator training necessary for licensure in Iowa

EdAdm 552 The Principalship (3 0) Cr 3 S SS *Prereq 541* Essential tasks of building level leadership in contemporary school settings are explored including strategic goal setting mission and vision development curriculum and organizational structure theory and practice of scheduling effective staff development programs school climate and culture effective student support programs such as counseling attendance and discipline and home/ parental involvement and relationships

EdAdm 553 Administrative Theory in Education (3 0) Cr 3 S SS *Prereq 541* Current thinking in administration and organization and theoretical approaches to administration analysis of functions and processes of administration as they apply to education

EdAdm 554 Community and Interagency Partnerships (3 0) Cr 3 FSS *Prereq 541* Concept and development of community/school partnerships with family and juvenile service agencies to enhance pupil learning and resiliency via increasing family stability and mental and physical health Practices which promote interagency collaboration with the school legal and administrative issues will be explored

EdAdm 556 Cultural Analysis of Administrative Problems (3 0) Cr 3 FSS *Prereq 541* Practical and theoretical perspectives on school administrative problems from critical pedagogical studies and research Deals with school related issues such as cultural literacy forms of authority and control and other historical problems of schools in dealing with minorities and culturally different groups and persons

EdAdm 558 Developmental Needs of Diverse Learners (3 0) Cr 3 FSS *Prereq 541* Learner needs are examined from dominant psycho/social perspectives with stress upon developmental phases of normal growth along with common problems encountered in schools Other issues examined are racism gender bias and socio-economic problems which impact learner responsiveness to school curricula routines regulations and legal requirements

EdAdm 559 Design and Delivery of School Curricula (3 0) Cr 3 FSS *Prereq 541* Generic administrative approaches to the design and delivery of elementary and secondary school curricula including quality control validation concepts of balance planning and alignment development of curriculum guides mapping and student assessment strategies employing national standards and benchmarks

EdAdm 563 Leadership for Staff Development (3-0) Cr 3 S SS *Prereq 541* For educators who will serve as consultants and directors of staff development programs Course content will include needs assessment delivery of staff development programs and evaluation Adult learning theory will be the focus of facilitation skills problem solving skills and conflict resolution strategies The relationship between supervision and staff development will also be explored

EdAdm 575 Fundamentals of Education Law (3-0) Cr 3 S SS *Prereq 541* Constitutional statutory and judicial provisions as a basis for the legal operation of public schools The law is examined as it affects the local school district boards of education administrators teachers and students at the elementary and secondary school levels

EdAdm 590 SpecialTopics Cr 1 to 4 *Prereq 9 credits in education*

EdAdm 591 Supervised Field Experience Cr R or 1 to 8 *Prereq 541 and admission to program and instructor s approval* Supervised on the job field experience in special areas
A Elementary Principal (Cr 1-8)
B Secondary Principal (Cr 1-8)
C Superintendency/Central Office (Cr 1 8)

EdAdm 593 Workshops Cr 1 to 4 *Prereq 9 credits in education*

EdAdm 599 Thesis Research or Creative Component Development Cr 1 to 3 *Prereq 9 credits in educational administration*

Courses for Graduate Students

EdAdm 601 Planning Systems, Operations and School Environments (3-0) Cr 3 FSS *Prereq 541* Planning and management theories assumptions strategies and tactics within belief systems development of vision and mission positions strategic goals objectives and operational tactics to attain them with emphasis on facility renovation and school construction projects

EdAdm 602 Human Resource Development and Negotiations (3-0) Cr 3 S SS *Prereq 541* Development and practice of collective negotiations within human resource development concepts and strategies with emphasis on creating and implementing win-win approaches that enhance system productivity and performance Specific contract language and concepts which enhance system effectiveness will be highlighted

EdAdm 603 Personnel Evaluation and System Assessment Practices (3 0) Cr 3 *Prereq 541* Theory strategies and systems for supervising programs and personnel in school districts and independent schools Focuses on the principal cabinet level administrator e g director headmaster or assistant superintendent for instruction

EdAdm 604 Theories of Leadership (3-0) Cr 3 FSS *Prereq 541* Specific leadership theories and models will be studied with an emphasis on organization building and constructivist strategies for teachers developing and assessing internal and external support groups for schools and organizational capacity building

EdAdm 605 Current Practices of the Superintendency (3-0) Cr 3 S SS *Prereq 541* Reviews the historical development of the American superintendency in public education problems and pitfalls and politics and tensions separating executive actions from board policy formulation executive challenges among contemporary educational problems of resource acquisition and allocation collaborative relationships union/system issues system changes and capacity building models

EdAdm 606 The Administration ofTechnology Systems (3 0) Cr 3 FSS *Prereq 541* The design acquisition and operations of technology in educational administration accounting personnel record keeping and health system interfaces compensation practices staff development and instruction record keeping maintenance and groups

EdAdm 607 Advanced Education Law *(3 0) Cr 3 S SS Prereq 575* Emerging issues of school case law and litigation as it pertains to school/student safety student/teacher relationships administrative authority/oversight taxation and abatement home schooling issues censorship of books and curricula student clubs and religious practices

EdAdm 608 Administrative Problems (3 0) Cr 3 FSS *Prereq 541* A case study approach to the resolution of problems in educational administration Emphasis on decision making conflict resolution and communication using actual situations

EdAdm 609 Instructional Management (3 0) Cr 3 FSS *Prereq 541* Theories and practices of instructional management including curriculum audits classroom observations and analytical models assessing teacher interactions with students Strategies of improving assessment of teacher interactions with students Strategies of improving pupil resiliency and achievement will be highlighted Mapping of curriculum configurations in classrooms will be applied to the use of national/international standards

EdAdm 611 Superintendent/Board Relations (3 0) Cr 3 FSS *Prereq 541* An historical analysis of the development of governance systems in American public education and contemporary issues and problems confronting effective school district governance

EdAdm 612 School Finance and Business Management (3 0) Cr 3 S SS *Prereq 541* Contemporary business and risk management practices including financial management and banking investment of funds cash flow projections accounting practices and school budget development concepts and usage The functions and duties of school business personnel will be related to specific business and fiduciary tasks

EdAdm 615 Seminar Cr 1 to 3 In-depth study of *administrative topics of contemporary interest and* importance
A Client Focus
B Research
C Quality Improvement
D Special Services
E Assessment
F Leadership

EdAdm 690 Advanced SpecialTopics Cr 1 to 3 *Prereq 9 credits in educational administration*

EdAdm 691 Internship (3 0) Cr 3 *Prereq 541 admission to program and instructor s approval* Supervised on the job field experience in special areas

EdAdm 699 Dissertation Research Cr arr *Prereq 9 credits in education*

Educational Leadership and Policy Studies (EL PS)

Barbara L Licklider Program Coordinator

Courses for Graduate Students

EL PS 615 Thematic Seminars Cr 1 FS SS *Prereq Admission to educational leadership doctoral program*
A Communication and Team Building
B Governance Politics and Policies
C Law Equity Equality
D Ethics Justice and Caring
E Problem Solving and Planning
F Critical and Creative Thinking

EL PS 616 Capstone Experience Cr 3 FS *Prereq 6 credits of 615* This experience is designed to explore a topic addressed in one of the thematic seminars The product of the capstone experience is a written paper of sufficient quality to be submitted to a scholarly journal for review

Higher Education (Hg Ed)

Nancy J Evans Program Coordinator

Degrees. Higher Education offers work for the master of science degree with thesis and master of education degree (non thesis) and a specialization in higher education as well as postgraduate professional development A community college leadership certificate program and a community college teaching and learning certificate program are also offered

The Master's Program in Higher Education

Emphasis The Higher Education Program provides graduate instruction and leadership development in community college education student affairs practice institutional research post secondary curriculum and higher education administration

Prerequisites Prerequisite to major graduate work in educational leadership is completion of an undergraduate degree with coursework appropriate to the planned specialization and evidence that the student ranks above average in scholastic achievement and promise of professional competence

Learning Opportunities Master s students in Higher Education will complete courses practical experiences and independent research or a culminating experience that will enable them to serve as leaders in various educational settings

Careers Master s students in Higher Education are prepared for entry level positions in student affairs administration general institutional administration teaching positions in community colleges and support positions in post secondary settings

Outcomes Graduates of the Master s Program in Higher Education with a specialization in student affairs will demonstrate leadership in student affairs settings By the time of graduation students will possess the necessary skills and knowledge to

- Demonstrate effective oral communication
- Effectively communicate in writing
- Work effectively with a diverse student population
- Employ interventions designed to facilitate the development and learning of college students
- Create design and implement programs and interventions
- Effectively advise students individually and in groups
- Organize and administrate student services in post-secondary settings
- Conduct basic assessment evaluation and research

Graduates of the Master s Program in Higher Education with a specialization in community college teaching and learning will possess teaching and learning leadership skills By the time of graduation students will possess the necessary skills and knowledge to
•Facilitate college student learning
•Employ pedagogical techniques
•Demonstrate a clear understanding of the foundations of education grounding their work in theory and philosophy
•Use technology effectively in learning and organizational processes
•Articulate the concepts theories and practices related to the content of higher education as emphasized in their course work
•Develop curriculum
•Assess student learning
•Understand the philosophy organization functions and current issues of community colleges

Graduates of the Master s Program in Higher Education with a specialization in community college administration will demonstrate leadership in community college settings By the time of graduation students will possess the necessary skills and knowledge to
•Create positive environments for community college students
•Perform administrative functions in community college settings
•Assist community college students with the academic and personal issues they face
•Develop effective teaching and learning strategies
•Work effectively with diverse student populations
•Shape community college curricula

The Ph D Program in Higher Education

Emphasis The Ph D in education with a specialization in educational leadership includes an emphasis on higher education This program is designed to prepare leaders for post secondary settings and is concerned with advanced study and independent research on various topics related to post-secondary settings See departmental overview of the Ph D degree in educational leadership

Prerequisites Prerequisite to major graduate work in educational leadership is completion of an under graduate degree with coursework appropriate to the planned specialization and evidence that the student ranks above average in scholastic achievement and promise of professional competence In addition students are expected to have completed a master s degree and 3 5 years of professional work experience in higher education

Learning Opportunities Doctoral students will complete courses laboratory experiences field experiences independent research a capstone experience and a dissertation so that they can serve as leaders in various post secondary educational settings such as colleges and universities private and state agencies and other organizations concerned with post secondary education

Careers Typical careers available to graduates include leadership positions in post secondary institutions agencies and other organizations concerned with post secondary education Special experiences are available to those who are interested in a career as a faculty member in post secondary settings

Outcomes Graduates of the doctoral program with an emphasis in higher education will possess knowledge and skills related to six core domains leadership educational research communication educational evaluation educational foundations and educational technology By the time of graduation students will demonstrate the necessary skills and knowledge for these outcomes as listed under ELPS Ph D program outcomes

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Hg Ed 420 Introduction to Vocational Technical Teaching at Community Colleges (3-0) Cr 3 F Examines the competencies for successful teaching in vocational technical programs a focus on lesson planning motivating students teaching methods time management and evaluation

Hg Ed 421 Vocational Technical Teaching Methods at Community Colleges (Dual listed with 521) (3-0) Cr 3 S *Prereq 420* Develops competencies necessary to identify develop implement and evaluate collaborative learning learning to learn and other classroom and lab/clinic teaching techniques

Hg Ed 422 Vocational Technical Curriculum at Community Colleges (Dual listed with 522) (3-0) Cr 3 F *Prereq 421* With a focus on alignment and accountability develops competencies necessary to identify develop implement and evaluate outcome-based vocational technical courses and programs in community colleges

Hg Ed 423 Vocational Technical Assessment at Community Colleges (Dual listed with 523) (3 0) Cr 3 S *Prereq 422* With a focus on classroom assessment develops competencies necessary to identify develop empower and evaluate teaching and learning success

Hg Ed 504 Higher Education in the United States (3 0) Cr 3 S *Prereq Graduate classification* Historical development of higher education diversity functions and philosophies of colleges and universities federal and state roles review of general liberal technical graduate and professional education

Hg Ed 521 Vocational Technical Teaching Methods at Community Colleges (Dual-listed with 421) (3 0) Cr 3 S *Prereq 420* Develops competencies necessary to identify develop implement and evaluate collaborative learning learning to learn and other classroom and lab/clinic teaching techniques

Hg Ed 522 Vocational Technical Curriculum at Community Colleges (Dual-listed with 422) (3 0) Cr 3 F *Prereq 521* With a focus on alignment and accountability develops competencies necessary to identify develop implement and evaluate outcome based vocational technical courses and programs in community colleges

Hg Ed 523 Vocational Technical Assessment at Community College (Dual listed with 423) (3 0) Cr 3 S *Prereq 522* With a focus on classroom assessment develops competencies necessary to identify develop empower and evaluate teaching and learning success

Hg Ed 550 Teaching Learning and Leadership (3 0) Cr 3 F *Prereq Teacher licensure* Current issues and practices in community college teaching and learning and the roles and responsibilities of teachers as leaders

Hg Ed 561 College Teaching (3-0) Cr 3 *Prereq 6 graduate credits* This course will review educational theories methods and strategies for the improvement of college instruction It seeks to assist potential college instructors in developing knowledge of protocol assessment and the scholarship and art of teaching This course will emphasize the unique challenge of college teaching in a changing student population environment

Hg Ed 562 Curriculum Development in Colleges (3 0) Cr 3 *Prereq Graduate classification* Modes of curriculum design development and change in colleges Development of curricular leadership and evaluation strategies

Hg Ed 568 Global Education Policy Analysis (3 0) Cr 3 *Prereq 504* Assessment of global education policy issues in education Analysis of policies implementation strategies and policy outcomes

Hg Ed 570 Current Topics in Student Affairs Cr 1 to 3 *Prereq Graduate classification* Current issues and new directions in student affairs practice Topics developed to the specific needs of student affairs professionals Primarily for off-campus
D Residential Life
G Student Affairs Institute
H Student Diversity

Hg Ed 574 Student Affairs Practice in Higher Education (3 0) Cr 3 F *Prereq Graduate classification admission to Higher Education Program* An introduction to the field of student affairs practice with a consideration of student activities counseling services financial aid admissions student conduct academic advising and residential programs includes community college programs

Hg Ed 575 Organization and Administration of Student Affairs (3 0) Cr 3 S *Prereq Admission to Higher Education Program 574* Organization structures role and function of student affairs staff policies and decision making for student affairs practice

Hg Ed 576 Student Development in Higher Education (3 0) Cr 3 F *Prereq Admission to Higher Education Program* Theories of student development and their applications in student affairs programs services and activities are reviewed Emphasis is placed on psychosocial cognitive developmental and learning theories

Hg Ed 577 Campus Environments and Cultures (3 0) Cr 3 F *Prereq Admission to Higher Education Program* Study of the impact of the college environment on students Ability to use environmental theory to create positive learning situations for students

Hg Ed 578 Students in American Higher Education (3-0) Cr 3 F *Prereq Admission to Higher Education Program* Study of the relationship between college students and characteristics from 1950 to the present Traditional assumptions about the impact of higher education on students will be reviewed and challenged Campus issues and concerns relative to commuters and residential life will be discussed Participants will analyze institutional responses to students through college missions organizational development structure core curriculum and retention

Hg Ed 579 Counseling and Group Dynamics in Post secondary Settings (3 0) Cr 3 F *Prereq 574 576* Development of effective basic counseling skills Understanding of group dynamics Ability to work effectively in groups

Hg Ed 580 Current Topics in Community Colleges (1 3) Cr 1 to 3 *Prereq Graduate classification* Current issues and new directions in community college education Topics developed to the specific needs of colleges For off campus
A Student Needs
B General and Liberal Education
C Counseling and Advising
D Adult and Continuing Education
E Development and Remedial Education
F Student Services
G Faculty and Staff Evaluation
H Organization and Administration
I Learning and Teaching
J Human Relations

Hg Ed 582 The Comprehensive Community College (3-0) Cr 3 *Prereq Graduate classification* The community college as a unique social and educational institution its history philosophy functions programs faculty and student characteris tics organization and finance trends and issues Reviews current research and exemplary community college practices internationally nationally and in Iowa

Hg Ed 590 SpecialTopics Cr 1 to 4 *Prereq 9 credits in education* Independent study on specific topics arranged with an instructor
A Student Services
B Community Colleges
C Current Issues
D International Higher Education
E Federal and State Affairs
F Law in Higher Education
G Institutional Research

Hg Ed 591 Supervised Field Experience Cr 1 to 4 S *Prereq 9 credits graduate work* Supervised on the job field experience

Hg Ed 593 Workshops Cr 1 to 5 *Prereq 15 credits in education*

Hg Ed 597 Program Assessment and Evaluation (Same as ResEv 597) (3 0) Cr 3 S *Prereq ResEv 550* Evaluation models and professional standards Techniques of evaluating educational programs Emphasis on both theory and practical applications

Hg Ed 598 Capstone Seminar (3-0) Cr 3 S *Prereq Completion of 30 credits in EL PS* This course is designed to integrate the learning experiences of students completing the Master s Degree Program in higher education Such issues as ethics continuing professional development career planning and leadership will be explored

Hg Ed 599 Creative Component Cr arr *Prereq 9 credits in education*

Courses for Graduate Students

Hg Ed 615 Seminars in Higher Education Cr 1 to 4
A Student Services
B Community Colleges
C Current Issues
D International Higher Education
E Federal and State Affairs
F Law in Higher Education
G Institutional Research
H Research Designs in Higher Education

Hg Ed 664 College Organization and Administration (3 0) Cr 3 S *Prereq 504* Administrative organization and behavior communications leadership finance strategic planning and institu tional governance

Hg Ed 665 Financing Higher Education (3 0) Cr 3 F *Prereq 504* Lectures discussions and individual investigation relating to financial administration in colleges and universities Budgeting auxiliary enterprises administration of financial planning fund raising examination of theories on expenditures Designed for persons aspiring to serve as college administrators

Hg Ed 666 Academic Issues and Cultures (3 0) Cr 3 S *Prereq 504* This course will examine institutional culture and issues in higher education focusing on the roles and responsibilities of faculty and academic administrators

Hg Ed 676 Student DevelopmentTheory II (3 0) Cr 3 S *Prereq 576* This course will examine life span approaches to student development racial ethic and sexual identity development and spiritual develop ment The emphasis is on application of these theories in student affairs practice

Hg Ed 690 Advanced SpecialTopics Cr 1 to 4 *Prereq 9 credits in education*

Hg Ed 699 Research Cr arr *Prereq 9 credits in education*

Organizational Learning and Human Resource Development (OLHRD)

Deborah W Kilgore Program Coordinator

Degrees Work for the master of education degree (M Ed) with a specialization in organizational learning and human resource development is offered Courses are scheduled with consideration of the full time work schedules of the majority of our students

Emphasis The OLHRD Program focuses primarily on three components of positive organizational development learning performance and change Students learn how to design carry out monitor and evaluate organizational learning and human resource development efforts to improve the learning potential of individuals and organizations

Prerequisites Prerequisites to major graduate work in educational leadership are completion of an undergraduate degree with coursework appropriate to the planned specialization and evidence that the student ranks above average in scholastic achieve ment and promise of professional competence

Learning Opportunities Master s students in OLHRD will engage in learning experiences via courses practical experiences and independent reserach or a culminating experience that will enable them to serve as leaders in various OLHRD settings

Careers The Organizational Learning and Human Resource Development (OLHRD) master s degree prepares graduates for continuing education and human resource development leadership roles in public and private organizations

Outcomes Master s degree graduates with a specialization in organizational learning and human resource development will be knowledgeable about the mutual and complex relationships between learning performance and change By the time of graduation students will demonstrate the necessary skills and knowledge to
•Promote individual and organizational growth by thoughtfully enacting theories of individual and organizational learning and development strategic planning and performance and change management
•Facilitate selection and deployment of appropriate OLHRD interventions at all levels of an organization
•Continually monitor and evaluate OLHRD efforts in light of new challenges
•Relate sensitively and evaluate OLHRD efforts in light of new challenges
•Express ideas clearly to various audiences both orally and in writing
•Articulate their values beliefs and philosophies of organizational learning and human resource development
•Access and use research information and technology to assist with OLHRD efforts
•Negotiate collaborate with and respond to the diverse interests of the many stakeholders in organizations
•Act ethically honestly and with regard for fairness

Admissions for this program are suspended at this time

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

OLHRD 540 Foundations of Organizational Learning and Human Resource Development (3 0) Cr 3 A study of the modern practice of organizational learning and human resource development from a perspective of its history philosophy application and literature

OLHRD 541 Adult Learning (3 0) Cr 3 *Prereq OLHRD 540* Examining how adults acquire and use knowledge skills and attitudes within organizational settings studying individual differences in learning as well as the principles and elements of the learning organization

OLHRD 542 Program Development in Human Resource Development (3 0) Cr 3 *Prereq OLHRD 540* Applying program development principles models and strategies to human resource develop ment and performance improvement interventions

OLHRD 543 Strategically Integrated Human Resource Development (3 0) Cr 3 *Prereq OLHRD 540 541* Examining the evolution and philosophy of human resource development organizational transformation techniques performance partnerships and changes in human resource development practice applying tools and techniques to improve organizational performance

OLHRD 544 Performance Improvement and ChangeThrough Learning Interventions (3 0) Cr 3 *Prereq OLHRD 541 542* Examining the characteris tics and elements of the performance improvement and change process with special attention to the roles and responsibilities of employees managers and organizations when improving individual and organizational learning

OLHRD 545 Learning Acquisition Transfer and Evaluation (3-0) Cr 3 *Prereq OLHRD 541 542 544* Critical examination of learning acquisition transfer and evaluation barriers partnerships strategies and activities and the roles and responsibilities of human resource development professionals managers employees and organizations in the application and evaluation of learning on the job

OLHRD 546 Human Resource Development Consulting (3-0) Cr 3 *Prereq OLHRD 543 544* Understanding the roles responsibilities characteris tics objectives competencies and skills of human resource development consultants applying the consulting process to solve performance and organizational problems in real and hypothetical settings

OLHRD 547 Practicum/Internship Cr 3 FS Practicum or internship designed to provide work exposure in organizational learning and human resource development

OLHRD 598 Capstone Seminar Cr 3 FS SS *Prereq 21 credits in organizational learning and human resource development* Integrating the learning experiences of students completing the Master s Degree Program in organizational learning and HRD

OLHRD 599 Creative Component Cr 3 *Prereq 21 credits in organizational learning and human resource development*

Research and Evaluation (ResEv)

John H Schuh Program Coordinator

Degree Research and Evaluation offers work for the master of science degree with thesis with a specialization in research and evaluation

Emphasis Research and Evaluation students receive a broad foundation in the areas of quantitative and qualitative research methodology data anlaysis assessment and evaluation Students select one area for in depth study

Prerequisites Prerequisites to major graduate work in educational leadership are completion of an undergraduate degree with coursework appropriate to the planned specialization and evidence that the student ranks above average in scholastic achieve ment and promise of professional competence

Learning Opportunities Students in Research and Evaluation will complete courses laboratory experiences field experiences independent research and a thesis

Careers Graduates are prepared for professional roles in institutional research assessment of student learning and program evaluation in post secondary settings school districts and not for profit organiza tions

Outcomes Graduates of the Master s Program with a specialization in research and evaluation will be prepared for leadership roles for careers in assess ment and evaluation By the time of graduation students will demonstrate the necessary skills and knowledge to

•Articulate current issues and principles in research program evaluation and assessment
•Implement various conceptual approaches to research program evaluation and assessment
•Effectively use the principles and skills of research data analysis
•Interpret data and prepare accurate and useful reports

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

ResEv 550 Educational Research (3 0) Cr 3 FS SS *Prereq Graduate classification* Understanding the nature of quantitative and qualitative research reviewing the literature developing research problems and questions research designs data collection and analysis issues evaluating research studies

ResEv 552 Basic Educational Statistics (3 0) Cr 3 F *Prereq 550* Statistical concepts and procedures for analyzing educational data descriptive statistics correlation t tests and chi square with computer applications

ResEv 553 Intermediate Educational Statistics (2 1) Cr 2 *Prereq 552* A continuation of statistical concepts and procedures for analyzing educational data inferential techniques including simple and multiple regression multiple ANOVA etc with educational computer applications

ResEv 554 Intermediate Research Methods (3 0) Cr 3 SS *Prereq 550 580 Stat 401 or ResEv 552* Intermediate quantitative and qualitative research methodology in preparation for carrying out thesis and dissertation research problem formulation design data collection and analysis interpreting and summarizing research findings

ResEv 560 Assessing Student Learning (3 0) Cr 3 *Prereq 550 or basic statistical skills* The purpose and techniques of formal and informal classroom assessment rubrics performance assessment portfolios paper and pencil tests communicating assessment findings emphasis on both theory and practical applications

Resev 580 Qualitative Research Methodology (3-0) Cr 3 *Prereq 550* Qualitative research procedures in education particularly historical philosophical biographical ethnographic and case study use of sources principles of qualitative research methods of data collection and analysis field techniques and writing of research results

ResEv 590 Special Topics Cr 1 to 3 each time taken FS SS *Prereq Graduate standing* Guided reading and in research and evaluation study on special topic

ResEv 593 Workshop Cr 1 to 3 each time taken FS SS *Prereq Graduate standing* Intensive concentrated exposure to a special educational research or evaluation problem

ResEv 597 Program Evaluation (Same as Hg Ed 597) (3 0) Cr 3 S *Prereq 550* Evaluation models and professional standards techniques of evaluating educational programs emphasis on both theory and practical applications

Courses for Graduate Students

ResEv 615 Current Topics in Research and Evaluation (1 0) Cr 1 may be taken 3 times FS

ResEv 680 Critical Issues in Interpretive Methodology (3 0) Cr 3 S *Prereq 580* An intensive reading and discussion course focusing on contemporary methodological theory for interpretive inquiry examines how interpretive field work is conducted how narrative and ethnographic data are theorized and analyzed and how interpretive texts are written

ResEv 690 Advanced Special Topics Cr 1 to 3 each time taken FS SS *Prereq Graduate standing* Guided reading and/or study on special topics of an advanced nature

ResEv 699 Research Cr arr FS SS *Prereq Graduate standing*

Electrical Engineering

(Administered by the Department of Electrical and Computer Engineering)

Subrahmanyam Venkata, Chair of Department

Professors J Bowler Dalal Geiger Horton Jiles Kamal Kothari Lamont Melsa Rover Sheble Somani Venkata Vittal Weber Woods

Professors (Collaborators) Hassoun Khammash L Udpa S Udpa

Distinguished Professors (Emeritus) Brown Fouad Lord Nilsson Pohm

University Professors (Emeritus) Jones

Professors (Emeritus) Anderson Brearley Brockman Comstock Fanslow Hale Hsieh Koerber Kopplin Potter Read Smay Stewart Swift Townsend Triska

Associate Professors Ajjarapu Aluru Bartlett Berleant Chang Chen Cruz Neira Davidson Davis Dickerson Jacobson Kleitsch Kruempel Kumar McCalley Russell Tuttle Tyagi

Associate Professors (Adjunct) N Bowler

Associate Professors (Emeritus) Bond Carlson Coady McMechan Mericle Pavlat Scott Stephenson

Assistant Professors Chu Daniels Dogandzic Elia Govindarasu Guan Ma Patterson Salapaka Song Tirthapura Wang Zhang

Assistant Professors (Adjunct) Amin Bode Mina

Assistant Professors (Collaborators) Barton Chandramouli Lee

Undergraduate Study

For undergraduate curriculum in electrical engineering leading to the degree bachelor of science see *College of Engineering Curricula* This curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology

The Department of Electrical and Computer Engineering at Iowa State University provides undergraduate students with the opportunity to learn electrical and computer engineering fundamentals to study applications of the most recent advances in state of the art technologies and to prepare for the practice of engineering The student faculty interaction necessary to realize this opportunity occurs within an environment that is motivated by the principle that excellence in undergraduate education is enhanced by an integrated commitment to successful long term research and outreach programs

The electrical engineering curriculum offers a number of specialization areas at the undergraduate level including computer networking security computer architecture and digital systems control systems electromagnetics microelectronics VLSI power systems and communications and signal processing An attractive feature of the curriculum is that seniors may choose among course sequences each of which focuses on one of these areas therefore graduated students have substantial depth in specific areas to complement the breadth obtained in the required curriculum

The mission of the electrical engineering program at Iowa State University is to enable the graduated student to make significant and substantive contributions to solving electrical engineering problems throughout the student s professional career The following objectives are identified as critical to the accomplishment of this mission

A Objective I Impart and enhance knowledge in the domain of electrical engineering The graduated student should understand

1 engineering and basic science fundamentals including mathematics probability statistics physical sciences and information technology

2 the design and manufacturing processes

3 the fundamentals of business including entrepreneurship engineering economy and cost/revenue streams

B Objective II Expand and hone engineering abilities

1 identify and solve engineering problems

2 analyze and design electrical computer and multidisciplinary systems

3 design and conduct experiments and analyze resulting data

4 use modern engineering hardware and software tools such as computers and instrumentation

C Objective III Instill and nurture social awareness abilities and understanding The graduated student should

1 desire to engage in lifelong learning and should expect and embrace change

2 be able to function effectively as a member of a multidisciplinary team to communicate effectively and to think critically and creatively both independently and with others

3 apply standards of professional conduct in view of the value of science and technology in a global/societal context

As a complement to the instructional activity the ECPE Department provides opportunities for each student to have experience with broadening activities Through the Cooperative Education and Internship Program students have the opportunity to gain practical industry experience See *College of Engineering Cooperative Programs* Through the Undergraduate Research Program students have the opportunity to participate in advanced research activities and through international exchange programs students learn about engineering practices in other parts of the world Well-qualified juniors and seniors in electrical engineering who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both B S and M S degrees See *Graduate Study* for more information

Students are required to prepare and to maintain a portfolio of their technical and non technical skills This portfolio is evaluated for student preparation during the student s curriculum planning process Results of the evaluation are used to advise students of core strengths and weaknesses Prerequisite material exams may be given at key points in the curriculum These exams are to assist student evaluation of progress made during the academic experience as the materials covered in several courses are the foundation of more advanced courses These outcome assessments are also used to assess and to improve the quality of the curriculum

Courses for students who are not in the electrical engineering program 441 442 448 Credit in these courses may not be counted toward a degree in either electrical engineering or computer engineering

Credit for only one of the following courses may be counted towards graduation E E 201 441 and 442

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with major in electrical engineering and minor work to students with other majors Minor work for electrical engineering majors is usually selected from a wide range of courses outside electrical engineering

The degree master of science with thesis is recommended for students who intend to continue toward the doctor of philosophy degree or to undertake a career in research and development The nonthesis master of science degree requires a creative component

The normal prerequisite to major graduate work in electrical engineering is the completion of undergraduate work substantially equivalent to that required of electrical engineering students at this university Because of the diversification in the electrical

engineering graduate program however it is possible for a student to qualify for graduate study in certain areas of electrical engineering even though the student s undergraduate or prior graduate training has been in a discipline other than electrical engineering Supporting work if required will depend on the student s background and area of research interest Prospective students from a discipline other than electrical engineering are required to submit with the application for admission a statement of the proposed area of graduate study

The department requires submission of GRE aptitude test scores by applicants from other countries All students whose first language is not English and who have no U S degree must submit TOEFL examination scores Ph D students must pass a department *qualifying examination*

In cooperation with the College of Liberal Arts and Science the College of Engineering offers a graduate minor in Complex Adaptive Systems It is open only to students who have met the basic program require ments and are not on temporary enrollment The CAS minor consists of one common core course at least two CAS specific techniques courses and at least two supporting courses Both technique and supporting courses must be selected from lists approved by the advisory committee A *student s minor program in* CAS must include at least nine credits that are beyond the total used to meet curriculum requirements An interdisciplinary faculty committee supervises the minor Interested students may contact the electrical and computer engineering department to obtain more specific guidelines and requirements

The Department of Electrical and Computer Engineering is a participating department in the interdepartmental M S and Ph D degree programs in bioinformatics and computational biology *Students* interested in these programs may earn their degrees while working under an adviser in electrical and computer engineering

The Department of Electrical and Computer Engineering is also a participating department in the interdepartmental master of science in information assurance program Students interested in studying Information Assurance topics may earn a degree in computer engineering or in information assurance (See bulletin section on *information assurance*)

The Department of Electrical and Computer Engineering offers a graduate certificate in electric power systems engineering Completion of the certificate requires at least nine credits including 553 554 and one course selected from 555 556 and 653

Well qualified juniors or seniors in Electrical Engineering who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both B S and M S degrees Under concurrent enrollment students are eligible for assistantships and simultaneously take undergraduate and graduate courses Details are available in the Student Services Office and on the department s web site

Courses open for nonmajor graduate credit all 300 and 400 level courses except 322 396 397 398 463 466 490 491 492 494 and 498

Courses Primarily for Undergraduate Students

E E 166 Professional Programs Orientation (Same as Cpr E 166) (1 0) Cr R FS Overview of the nature and scope of electrical engineering and computer engineering professions Portfolio construction Departmental rules advising center operations degree requirements program of study planning career options and student organizations

E E 185 Introduction to Electrial Engineering and Problem-Solving (2 2) Cr 3 FS *Prereq Math 140 and credit or enrollment in Math 141 or 142* Introduction to Electrical Engineering C and MATLAB programming Project based examples from electrical engineering Group skills needed to work effectively in teams Group problem solving Individual interactive skills for small and large groups Electrical/computer based projects Solving engineering problems and presenting solutions through technical reports and oral presentations

E E 201 Electric Circuits (3 2) Cr 4 FS *Prereq Credit or registration in Math 267 and Phys 222* Emphasis on mathematical tools Circuit elements and analysis methods including power and energy relationships Network theorems DC sinusoidal steady state and transient analysis Operational amplifiers AC power PSPICE Laboratory instrumentation and experimentation

E E 203 Electronic Devices and Circuits (Same as Cpr E 203) (3 3) Cr 4 FS *Prereq 201 Math 267 Phys 222 and credit or enrollment in Cpr E 210* With emphasis on mathematical tools Operational amplifier models and applications DC large-signal and small-signal frequencey-independent and frequency dependent models and characteristics for diodes bipolar junction transistors and field-effect transistors SPICE simulation applied to electronic circuit analysis and design IC technology for MOS and bipolar analysis and design Characteristics of IC logic families Laboratory design projects

E E 224 Signals and Systems I (4-0) Cr 4 FS *Prereq 201 Math 267 Phys 222* Examples of continuous and discrete time signals and systems elementary signal manipulations the exponential sinusoidal and singularity signals basic system properties properties of LTI systems convolution sums and integrals continuous and discrete time periodic signals Fourier Series representation properties of Fourier Series filtering and FS continuous time Fourier Transform properties of FT Discrete Time Fourier Transform properties for DTFT FT and DTFT of periodic signals duality Use of Matlab

E E 264 Introduction to Space Systems and Science (3 0) Cr 3 *Prereq Phys 221* Space environment Launch vehicles Orbital mechanics Spacecraft systems including communications power guidance commands and data processing Science from space including astronomy geology earth observing and planetary exploration

E E 298 Cooperative Education Cr R FS SS *Prereq Permission of department* First professional work period in the cooperative education program Students must register for this course before commencing work

E E 303 Energy Systems and Power Electronics (3 0) Cr 3 FS *Prereq Math 267 Phys 222 Credit or registration in 224 and 203* Structure of competitive electric energy systems Electricity markets and e-commerce Computerized control and data acquisition for energy networks System operation and economic optimization Mutual inductance transformers Synchronous generators Balanced three phase circuit analysis and power calculations Network calculations and associated numerical algorithms Two port circuits Voltage regulation Resonance and power factor correction DC and induction motors Power electronic circuit applications to power supplies and motor drives Electronic loads and power quality Nonmajor graduate credit

E E 311 Electromagnetic Fields and Waves (4-0) Cr 4 FS *Prereq 201 Math 267 Phys 222 credit or registration in Math 265* Fundamentals and applications of electric and magnetic fields and materials Uniform plane electromagnetic waves reflection and transmission at planar interfaces Poynting vector propagation in lossless and lossy media dispersion Transmission lines under transient and sinusoidal steady state conditions Smith chart Guided waves Introductory radiation and antenna concepts Reduction to electrostatics and magnetostatics potentials capacitance and inductance energy force torque Nonmajor graduate credit

E E 322 Probabilistic Methods for Electrical Engineers (Same as Stat 322) (3-0) Cr 3 FS *Prereq 224* Introduction to probability with applications to electrical engineering Sets and events probability reliability of systems Discrete and continuous random variables associated probability modes extensions to multivariate random vectors Expectation moments correlation functions of random variables Random processes

E E 324 Signals and Systems II (3-0) Cr 3 FS *Prereq 224* Frequency response of LTI systems frequency selective filters first and second order LTI systems amplitude modulation and demodulation sampling and reconstruction the sampling theorem and aliasing impulse-train sampling pulse amplitude modulation the Laplace and z Transform their properties and their use in analysis of LTI systems Transfer functions block diagrams linear feedback systems stability Use of Matlab Nonmajor graduate credit

E E 332 Semiconductor Materials and Devices (Same as Mat E 332) (3 0) Cr 3 S *Prereq Mat E 231 or E E 203 and credit or registration in E E 311 or Phys 222* Introduction to semiconductor material and device physics Quantum mechanics and band theory of semiconductors Charge carrier distributions generation/recombination transport properties Physical and electrical properties and fabrication of semiconductor devices such as MOSFETs bipolar transistors laser diodes and LED s Nonmajor *graduate credit*

E E 334 Integrated Circuit Design (Same as Cpr E 334) (3 3) Cr 4 FS *Prereq 203* Overview of integrated circuit technology Advanced MOSFET models bipolar junction transistors Small signal analysis IC amplifier configurations biasing and frequency response MOS digital design Introduction to CAD tools Laboratory design projects Nonmajor graduate credit

E E 396 Summer Internship Cr R SS *Prereq Permission of department* Summer professional work period Students must register for this course before commencing work

E E 397 Engineering Internship Cr R FS *Prereq Permission of department* One semester maximum per academic year professional work period Students must register for this course before commencing work

E E 398 Cooperative Education Cr R FS SS *Prereq 298 permission of department* Second professional work period in the cooperative education program Students must register for this course before commencing work

E E 408 Interdisciplinary Problem Solving (Same as I E 408 I Tec 408) (3 0) Cr 3 FS *Prereq Junior or senior standing* Use the Theory of Constraints as a way of approaching problem solving win win negotiation project planning and effective delegation in the context of engineering/business systems Team projects aimed at improving design outcomes Nonmajor graduate credit

E E 409 Interdisciplinary Systems Effectiveness (Same as I E 409 I Tec 409) (3 0) Cr 3 FS *Prereq Junior or senior standing* Focus on functions that determine the effectiveness of an entire organization Generic Theory of Constraints solutions to production distribution project management are compared to traditional solutions Strategy for improvements discovered using simulations and group projects Nonmajor graduate credit

E E 414 Microwave Engineering (Dual listed with 514) (3-3) Cr 4 F *Prereq 334 311* Principles analyses and instrumentation used in the microwave portion of the electromagnetic spectrum Wave theory in relation to circuit parameters S parameters couplers discontinuities and microwave device equivalent circuits RF amplifier design microwave sources optimum noise figure and maximum power designs Microwave filters and oscillators Nonmajor graduate credit

E E 417 Electromagnetic Radiation, Antennas and Propagation (Dual listed with 517) (3-3) Cr 4 S *Prereq 311* Fundamental antenna concepts Radiation from wire-and aperture type sources Radio

transmission formulas Wave and antenna polarization Antenna arrays Modern antenna topics Practical antenna design Antenna noise Radiowave propagation in the presence of the earth and its atmosphere Antenna measurements and computer aided analysis Nonmajor graduate credit

E E 421 Communication Systems I (3 0) Cr 3 *Prereq 324 credit or registration in 322* Frequency domain analysis Spectral filtering Linear modulation signals receivers transmitters Angle modulation systems Pulse code modulation and line codes Frequency division multiplex Calculation of signal to-noise ratios System comparisons Nonmajor graduate credit

E E 422 Communication Systems II (3 0) Cr 3 *Prereq 421 and enrollment in 423* Pulse modulation systems Noise analysis Quantization and pulse-code modulation Time division multiplex Information theory coding Data transmission spectral shaping transmission impairments error rates Comparison and evaluation of modulation schemes for data transmission Nonmajor graduate credit

E E 423 Communication Systems Laboratory (0 3) Cr 1 *Prereq 421 enrollment in 422* Construction and evaluation of modulators demodulators modems and other components for analog and digital communications Design and evaluate baseband communications Noise measurement Design and construction of a communication circuit Nonmajor graduate credit

E E 424 Introduction to Digital Signal Processing (3 3) Cr 4 *Prereq 324* Discrete time linear systems Z transforms Sampling Discrete Fourier transform Linear and circular convolution using the DFT Fast Fourier algorithms Design of IIR and FIR filters Realization of discrete time systems and computational complexity Quantization effects in digital signal processing Simulation and real time laboratory experiments illustrating DSP principles and applications Nonmajor graduate credit

E E 432 Microelectronics Fabrication Techniques (Dual-listed with 532 same as Mat E 432) (2-4) Cr 4 Semester varies *Prereq E E 332 or Mat E 332* Techniques used in modern integrated circuit fabrication including diffusion oxidation ion implantation lithography evaporation sputtering chemical vapor deposition and etching Process integration Process evaluation and final device testing Extensive laboratory exercises utilizing fabrication methods to build electronic devices Use of computer simulation tools for predicting processing outcomes Recent advances in processing CMOS ICs and micro-electro mechanical systems (MEMS) Nonmajor graduate credit

E E 434 Analog and Digital VLSI Design (Same as Cpr E 434) (3 3) Cr 4 F *Prereq 334* Semiconductor processes and fabrication device models physical layout simulation synthesis and fabrication Design and use of analog and digital building blocks Behavioral level descriptions of digital circuits and synthesis using standard cells Nonmajor graduate credit

E E 435 Analog VLSI Circuit Design (Same as Cpr E 435) (3 3) Cr 4 S *Prereq 434* Basic analog integrated circuit and system design including design space exploration performance enhancement strategies operational amplifiers references integrated filters and data converters Nonmajor graduate credit

E E 438 Optoelectronic Devices and Applications (Dual listed with 538) (3 0) Cr 3 *Prereq 332 and 311* Transmission and reflection of electromagnetic plane waves Propagation in dielectric and fiber optic waveguides Laser operating principles and applications Laser design Photodetectors Solar cells Optical modulation and switching Non communication applications of optoelectronic devices Nonmajor graduate credit

E E 441 Introduction to Circuits, Instruments and Electronics (3 2) Cr 4 FS SS *Prereq Phys 222 Math 266 or 267* Circuit analysis using network theorems and Laplace transform techniques Transient and sinusoidal steady-state circuit behavior Diode circuits Transistor amplifiers Operational amplifiers Other selected topics Nonmajor graduate credit

E E 442 Introduction to Circuits and Instruments (3 3) Cr 2 Half semester course FS *Prereq Phys 222 Math 267* Basic circuit analysis using network theorems with time domain and Laplace transform techniques for resistive resistive inductive resistive capacitive and resistive inductive-capacitive circuits Transient circuit behavior Basic operational amplifiers and applications Familiarization with common E E instrumentation and demonstration of basic principles Nonmajor graduate credit

E E 448 Introduction to AC Circuits and Motors (3 2) Cr 2 Half semester course FS *Prereq 303 or 441 or 442* Magnetic circuits Power transformers AC steady state and three phase circuit analysis Basic principles of operation and control of induction and single phase motors Nonmajor graduate credit

E E 452 Electrical Machines and Power Electronic Drives (2 3) Cr 3 S *Prereq 303 credit or registration in E E 324* Basic concepts of electromagnetic energy conversion DC motors and three phase induction motors Basic introduction to power electronics Adjustable speed drives used for control of DC induction and AC motors Experiments with DC motors AC motors and adjustable speed drives Nonmajor graduate credit

E E 455 Introduction to Energy Distribution Systems (3-0) Cr 3 F *Prereq 303 credit or registration in E E 324* Overhead and underground distribution system descriptions and characteristics load descriptions and characteristics overhead line and underground cable models distribution transformers power flow and fault analysis overcurrent protection power factor correction system planning and automation and economics in a deregulated environment Nonmajor graduate credit

E E 456 Power System Analysis I (3 0) Cr 3 F *Prereq 303 credit or registration in E E 324* Power transmission lines and transformers network analysis power system representation load flow Power system operation including the new utility environment Nonmajor graduate credit

E E 457 Power System Analysis II (3-0) Cr 3 S *Prereq 303 credit or registration in E E 324* Power system protection symmetrical components faults stability Nonmajor graduate credit

E E 463 Design of Electrical Systems (1 10) Cr 5 SS *Prereq 322 and completion of 24 credits in the E E core professional program Engl 314 Distance education students only* Team project design experience Emphasis on defining and planning to achieve project objectives to meet a client need with due consideration to professional and technical considerations of engineering design Oral poster and written presentations

E E 465 Digital Integrated Circuit Design (Same as Cpr E 465) (3 3) Cr 4 S *Prereq 334* Digital design of integrated circuits employing very large scale integration (VLSI) methodologies High level hardware design languages logic synthesis and silicon compilers datapath architectures and systems on a chip (SOC) considerations VLSI chip hardware design project Nonmajor graduate credit

E E 466 Multidisciplinary Engineering Design (Same as Cpr E 466 I E 466 M E 466 Mat E 466) (1-4) Cr 3 F S *Prereq Student must be within two semesters of graduation and receive permission of instructor* Application of team design concepts to projects of a multidisciplinary nature Concurrent treatment of design manufacturing and life cycle considerations Application of design tools such as CAD CAM and FEM Design methodologies project scheduling cost estimating quality control manufacturing processes Development of a prototype and appropriate documentation in the form of written reports oral presentations and computer models and engineering drawings

E E 475 Automatic Control Systems (3 0) Cr 3 F *Prereq 324* Design of linear continuous and discrete control systems using root locus and frequency response methods Analysis using modern system simulation languages Lead and lag compensation Rate and state variable feedback Design projects Nonmajor graduate credit

E E 476 Control System Simulation (2 3) Cr 3 S *Prereq 475* Computer aided techniques for feedback control system design simulation and implementation Nonmajor graduate credit

E E 490 Independent Study Cr arr *Prereq Senior classification in electrical engineering* Investigation of an approved topic commensurate with the student s prerequisites
H Honors

E E 491 Senior Design Project I and Professionalism (Same as Cpr E 491) (2 3) Cr 3 FS *Prereq 322 or Cpr E 308 completion of 24 credits in the E E core professional program or 29 credits in the Cpr E core professional program Engl 314* Preparing for entry to the workplace Selected professional topics Use of technical writing skills in developing project plan and design report project poster First of two semester team-oriented project design and implementation experience

E E 492 Senior Design Project II (Same as Cpr E 492) (1 3) Cr 2 FS *Prereq 491 or Cpr E 491* Second semester of a team design project experience Emphasis on achieving project objectives as defined in Cpr E 491 or E E 491 Implementation of Project Design Technical writing of final project report oral presentation of project achievements

E E 494 Portfolio Assessment (Same as Cpr E 494) (1 0) Cr R *Prereq Credit or enrollment in 491* Portfolio update and evaluation Interviewing skills with portfolios

E E 498 Cooperative Education Cr R FS SS *Prereq 398 permission of department* Third and subsequent professional work periods in the cooperative education programs Students must register for this course before commencing work

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

E E 501 Analog and Mixed Signal VLSI Circuit Design Techniques (Same as Cpr E 501) (3 3) Cr 4 F *Prereq 434* Design techniques for analog and mixed signal VLSI circuits Amplifiers operational amplifiers transconductance amplifiers finite gain amplifiers and current amplifiers Linear building blocks differential amplifiers current mirrors references cascoding and buffering Performance characterization of linear integrated circuits offset noise sensitivity and stability Layout considerations simulation yield and modeling for high performance linear integrated circuits

E E 502 Complex Adaptive Systems Seminar (Same as CAS 502 Com S 502) (1-0) Cr 1 Core techniques in artificial life Complex analysis methods such as evolutionary computation neural nets agent based simulations and large-scale simulations

E E 503 Complex Adaptive Systems Concepts and Techniques (Same as CAS 503 Com S 503) (3 0) Cr 3 Complex adaptive systems approach to the study of evolutionary computation neural computation cellular computation computational models of immune systems complexity theory computational economics

E E 505 CMOS and BiCMOS Data Conversion Circuits (Same as Cpr E 505) (3 3) Cr 4 Alt S offered 2004 *Prereq 434 or 501* Theory design and applications of data conversion circuits (A/D and D/A converters) including architecture characterization quantization effects conversion algorithms spectral performance element matching design for yield and practical comparators implementation issues

E E 507 VLSI Communication Circuits (Same as Cpr E 507) (3 0) Cr 3 Alt S offered 2005 *Prereq 434 or 501* Phase locked loops frequency synthesizers clock and data recovery circuits theory and

implementation of adaptive filters low noise amplifiers mixers power amplifiers transmitter and receiver architectures

E E 508 Filter Design and Applications (3-3) Cr 4 *Prereq 501 or 434* Filter design concepts Approximation and synthesis Transformations Continuous time and discrete time filters Discrete active and integrated synthesis techniques

E E 510 Topics in Electromagnetics Cr 1 to 3 each time elected

E E 511 Modern Optical Communications (3-0) Cr 3 S *Prereq 311* Propagation in optical media Optical fibers Optical sources and detectors Fiber optic communications systems

E E 512 Advanced Electromagnetic Field Theory I (3 0) Cr 3 F *Prereq 311* Static electric and magnetic fields Solutions of static field problems Maxwell s equations Circuit concepts and impedance elements Propagation and reflection of plane waves in isotropic media Guided electromagnetic waves Characteristics of common waveguides and transmission lines Propagation in anisotropic media

E E 513 Advanced Electromagnetic Field Theory II (3 0) Cr 3 S *Prereq 512* Special theorems and concepts Plane wave functions Cylindrical wave functions Spherical wave functions Perturbational and variational techniques

E E 514 Microwave Engineering (Dual listed with 414) (3 3) Cr 4 F *Prereq 334 311* Principles analyses and instrumentation used in the microwave portion of the electromagnetic spectrum Wave theory in relation to circuit parameters S parameters couplers discontinuities and microwave device equivalent circuits RF amplifier design microwave sources optimum noise figure and maximum power designs Microwave filters and oscillators

E E 517 Electromagnetic Radiation Antennas and Propagation (Dual listed with 417) (3 3) Cr 4 S *Prereq 311* Fundamental antenna concepts Radiation from wire and aperture type sources Radio transmission formulas Wave and antenna polarization Antenna arrays Modern antenna topics Practical antenna design Antenna noise Radiowave propagation in the presence of the earth and its atmosphere Antenna measurements and computer aided analysis

E E 519 Magnetism and Magnetic Materials (Same as M S E 519) (3-0) Cr 3 Alt F offered 2003 *Prereq 311 or Mat E 211 or 271 or 272 or Phys 364* Magnetic fields flux density and magnetization Magnetic materials magnetic measurements Magnetic properties of materials Domains domain walls domain processes magnetization curves and hysteresis Types of magnetic order magnetic phases and critical phenomena Magnetic moments of electrons theory of electron magnetism Technological application soft magnetic materials for electromagnets hard magnetic materials permanent magnets magnetic recording technology magnetic measurements of properties for materials evaluation

E E 520 Selected Topics in Communications and Signal Processing (3 0) Cr 3 each time elected Space time processing multiuser communications multimedia communications wavelet signal digital image and video communications wavelet signal processing speech processing multirate communications and signal processing signal processing applications

E E 521 Advanced Communications (3 0) Cr 3 F *Prereq 422 Math 317 Math 365* Topics in advanced digital communication systems emphasizing wireless and multiuser communications Receiver performance on AWGN channels bandlimited channels channel equalization fading multipath channels spread spectrum signals and multiuser detectors

E E 523 Random Processes for Communications and Signal Processing (3 0) Cr 3 *Prereq 322* Vector random variables Covariance matrix properties Discrete time random sequences Classification of random processes Linear transformations Cyclostationary processes in communications and two-dimensional random fields Stochastic differential and difference equations Optimal filtering power spectral density and linear modeling

E E 524 Digital Signal Processing (3 0) Cr 3 F *Prereq 322 424* Signal modeling Introduction to filter banks and Multirate signal processing Spectral estimation (classical and high resolution) Optimal and adaptive filtering Introduction to adaptive arrays Design of IIR and FIR digital filters Time-frequency distributions Computer algorithms and applications of digital signal processing techniques

E E 527 Detection and Estimation Theory (3-0) Cr 3 *Prereq 422* Classical statistical decision theory decision criteria binary and composite hypothesis tests Error probability and Chernoff bound Statistical estimation theory and performance measures Maximum likelihood estimation and sufficiency Cramer Rao bound Bayesian estimation optimum demodulation signal design Applications

E E 528 Digital Image Processing (3 0) Cr 3 S *Prereq 524* Image fundamentals Image transforms—Fourier cosine Karhunen Loeve and nonlinear transforms Stochastic models Enhancement—histogram equalization smoothing sharpening Restoration—Wiener filter least squares filter maximum entropy Coding error free predictive transform Edge detection image compression Reconstruction Radon transform back projection deconvolution

E E 530 Selected Topics in Electronics Microelectronics and Photonics (3 0) Cr 3 each time elected *Prereq 332*

E E 531 Semiconductor Device Design and Analysis (3 0) Cr 3 *Prereq 332* Semiconductor properties and measurement techniques Silicon bipolar MOS and III V device fabrication principles Theory and technology of photolithography diffusion oxidation plasma processing ion implantation epitaxial growth chemical vapor deposition molecular beam epitaxy sputtering and metallization Use of SUPREM for fabrication process flow modeling

E E 532 Microelectronics Fabrication Techniques (Dual listed with 432) (2-4) Cr 4 *Prereq 332 or 531* Techniques used in modern integrated circuit fabrication including diffusion oxidation ion implantation lithography evaporation sputtering chemical vapor deposition and etching Process integration Process evaluation and final device testing Extensive laboratory exercises utilizing fabrication methods to build electronic devices Use of computer simulation tools for predicting processing outcomes Recent advances in processing CMOS ICs and micro electro mechanical systems (MEMS)

E E 535 Physics of Semiconductors (3 0) Cr 3 *Prereq 311 and 332* Basic elements of quantum theory Fermi statistics motion of electrons in periodic structures crystal structure energy bands equilibrium carrier concentration and doping excess carriers and recombination carrier transport at low and high fields phonons optical properties amorphous semiconductors heterostructures and surface effects

E E 536 Physics of Semiconductor Devices (3 0) Cr 3 *Prereq 535* P n junctions band bending theory tunneling phenomena Schottky barriers heterojunctions bipolar transistors field-effect transistors negative resistance devices and optoelectronic devices

E E 538 Optoelectronic Devices and Applications (Dual listed with 438) (3 0) Cr 3 *Prereq 311 or 332* Transmission and reflection of electromagnetic plane waves Propagation id dielectric and fiber optic waveguides Laser operating principles and applications Laser design Photodetectors Solar cells Optical modulation and switching Non communication applications of optoelectronic devices

E E 539 Electronic Properties of Materials (Same as M S E 539) (3-0) Cr 3 *Prereq 332 or Mat E 331 or Phys 322* Review of quantum mechanics band theory of solids LCAO model metallic conduction lattice vibrations semiconductor semiconductor devices dielectrics polarization mechanisms dielectric relaxations ,crystal anisotropy ferroelectricity piezoelectricity conducting oxides magnetism

E E 545 Artificial Neural Networks (3 0) Cr 3 F *Prereq 324* Introduction to the fundamentals of artificial neural networks (ANNs) Theory and practical implementation of networks ANNs for pattern recognition function approximation prediction Activation functions neural net architectures supervised and unsupervised learning Various neural network methods and architectures

E E 547 Pattern Recognition (3 0) Cr 3 F *Prereq 524* Mathematical formulation of pattern recognition problems and decision functions statistical approach Bayes classifier probability density function estimation clustering algorithms (supervised and unsupervised) learning algorithms and neural networks fuzzy recognition systems feature selection methods syntactic approach to pattern recognition

E E 553 Steady State Analysis (3 0) Cr 3 F *Prereq 456 457* Power flow economic dispatch unit commitment automatic generation control sparse matrix techniques interconnected operation voltage control

E E 554 Power System Dynamics (3 0) Cr 3 S *Prereq 456 457 475* Dynamic performance of power systems with emphasis on stability Modeling of system components and control equipment Analysis of the dynamic behavior of the system in response to small and large disturbances

E E 555 Advanced Energy Distribution Systems (3-0) Cr 3 *Prereq 455* Transient models of distribution components automated system planning and distribution automation surge protection reliability power quality power electronics and intelligent systems applications

E E 556 Power Electronic Systems (3 0) Cr 3 *Prereq 452* Converter topologies AC/DC DC/DC DC/AC AC/AC Converter applications to do motor drives power supplies AC motor drives power system utility applications (var compensators) and power quality

E E 565 Systems Engineering and Analysis (Same as Aer E 565 I E 565) (3 0) Cr 3 F *Prereq Graduate classification in engineering* Introduction to organized multidisciplinary approach to designing and developing systems Concepts principles and practice of systems engineering as applied to large integrated systems Life-cycle costing scheduling risk management functional analysis conceptual and detail design test evaluation and systems engineering planning and organization

E E 566 Avionics Systems Engineering (Same as Aer E 566) (3-0) Cr 3 S *Prereq 565* Avionics functions Applications of systems engineering principles to avionics Top down design of avionics systems Automated design tools

E E 570 Systems Engineering Analysis and Design (3 0) Cr 3 *Prereq 475 577* Selected topics in abstract algebra linear algebra real analysis functional analysis and optimization methods in electrical engineering

E E 573 Random Signal Analysis and Kalman Filtering (Same as Aer E 573 Math 573 M E 573) (3 0) Cr 3 S *Prereq 324 or Aer E 331 or M E 370 or 411 or Math 341 or 395* Elementary notions of probability Random processes Autocorrelation and spectral functions Estimation of spectrum from finite data Response of linear systems to random inputs Discrete and continuous Kalman filter theory and applications Smoothing and prediction Linearization of nonlinear dynamics

E E 574 Optimal Control (Same as Aer E 574 Math 574 M E 574) (3 0) *Cr 3* S *Prereq 577* The optimal control problem Variational approach Pontryagins principle Hamilton Jacobi equation Dynamic programming Time-optimal minimum fuel minimum energy control systems The regulator problem Structures and properties of optimal controls

E E 575 Introduction to Robust Control (Same as Math 575 Aer E 575 M E 575) (3 0) Cr 3 *Prereq 577* Introduction to modern robust control Model and signal uncertainty in control systems Uncertainty description Stability and performance robustness to uncertainty Solutions to the H2 H_∞ and l1 control problems Tools for robustness analysis and synthesis

E E 576 Digital Feedback Control Systems (Same as Aer E 576 Math 576 M E 576) (3 0) Cr 3 F *Prereq 475 or Aer E 432 or M E 411 or 414 or Math 415 and Math 267* Sampled data discrete data and the z transform Design of digital control systems using transform methods root locus frequency response and direct design methods Design using state space methods Controllability observability pole placement state estimators Digital filters in control systems Microcomputer implementation of digital filters Finite wordlength effects Linear quadratic optimal control in digital control systems Simulation of digital control systems

E E 577 Modern Control Systems I (Same as Aer E 577 Math 577 M E 577) (3 0) Cr 3 F *Prereq 324 or Aer E 331 or M E 414 or Math 415 and Math 307* State variable and input-output descriptions of linear continuous time and discrete time systems Solution of linear dynamical equations Controllability and observability of linear dynamical systems Canonical descriptions of linear equations Irreducible realizations of rational transfer function matrices Canonical form dynamical equations State feedback State estimators Decoupling by state feedback Design of feedback systems Stability of linear dynamical systems

E E 578 Modern Control Systems II (Same as Aer E 578 Math 578 M E 578) (3 0) Cr 3 S *Prereq 577* Well posedness of nonlinear control systems Approximate analysis methods Poincaré perturbation method and describing function method Lyapunov stability theory Absolute stability of feedback systems Input-output stability Large scale systems

E E 590 Special Topics Cr 1 to 6 each time elected Formulation and solution of theoretical or practical problems in electrical engineering
A Electromagnetic Theory
B Control Systems
C Communication Systems
D Circuit Theory
E Computer Engineering
F Electric Power
G Electrical Materials
H Electronic Devices and Circuits

E E 591 Seminar in Electronics, Microelectronics and Photonics Cr 1 to 3 each time elected

E E 592 Seminar in Nondestructive Evaluation Cr 1 each time taken *Prereq Graduate student status* Offered on a satisfactory fail grading basis only

E E 594 Seminar in Electric Power Cr 1 to 3 each time elected

E E 596 Seminar in Control Systems Cr 1 to 3 each time elected

E E 597 Seminar in Communications and Signal Processing Cr 1 to 3 each time elected

E E 599 Creative Component Cr var

Courses for Graduate Students

E E 628 Computer Vision (3 0) Cr 3 F *Prereq 528* Image understanding/computer vision techniques Image to-image and high level image to representation transformations are used to provide explicit meaningful descriptions of objects in images at various levels of abstraction Image algebra Segmentation techniques boundary region texture Geometrical descriptions Euler numbers connectiv ity Relational descriptors scene labeling string grammars similarity measures Color image processing

E E 653 Advanced Topics in Electric Power System Engineering (3 0) Cr 3 each time elected *Prereq Permission of instructor* Advanced topics of current interest in electric power system engineering

E E 674 Advanced Topics in Systems Engineering (3 0) Cr 3 each time elected *Prereq Permission of instructor* Advanced topics of current interest in the areas of control theory circuit theory stochastic processes digital signal processing and image processing

E E 697 Engineering Internship (Same as Cpr E 697) Cr R *Prereq Permission of department chair graduate classification* One semester and one summer maximum per academic year professional work period Offered on a satisfactory fail grading basis only

E E 699 Research Cr var

Engineering

Loren W Zachary, Assistant Dean for Undergraduate Programs

Professors (Emeritus) Mashaw Sanders

Associate Professors Dowling

Most of the courses with the designator of Engr are broad based engineering courses applicable to all engineering disciplines Several of these courses are part of the basic program which is required for engineering students Course related questions should be directed to the department or unit with responsibility for that course The following is a list of those responsibilities

Engr 101 Engineering Undergraduate Programs

Engr 160 Materials Science and Engineering

Engr 170 Agricultural and Biosystems Engineering

Courses Primarily for Undergraduate Students

Engr 101 Engineering Orientation (1 0) Cr R FS Introduction to the College of Engineering and the engineering profession Considerations in choosing an engineering curriculum Information concerning university and college policies procedures and resources Opportunities to interact with departments

Engr 104 LEAD Program Orientation (1 0) Cr 1 F Orientation for LEAD Living/Learning Community participants Applications of problem solving engineering design teamwork study and time management techniques and skills Engineering professional development Offered on a satisfactory fail grading basis only

Engr 105 LEAD Program Seminar (1 0) Cr 1 S Seminar for LEAD Program participants in the residential learning community Industrial tours and orientation to engineering profession Offered on a satisfactory fail grading basis only

Engr 160 Engineering Problems with Computer Applications Laboratory (2-2) Cr 3 FS SS *Prereq Satisfactory scores on mathematics placement examinations credit or enrollment in Math 142 165* Solving engineering problems and presenting solutions through technical reports Significant figures Use of SI units Graphing and curve fitting Flowchart ing Introduction to material balance mechanics electrical circuits statistics and engineering economics Use of spreadsheet programs to solve and present engineering problems Solution of engineering problems using computer programming languages (The honors section includes application of programming to mobile robotics)
H Honors F

Engr 170 Engineering Graphics and Introductory Design (2 2) Cr 3 FS *Prereq Satisfactory scores on mathematics placement examinations credit or enrollment in Math 142* Integration of fundamental graphics computer modeling and engineering design Applications of multiview drawings and dimensioning Techniques for visualizing analyzing and communicat ing 3 D geometries Application of the design process including written and oral reports Freehand and computer methods

Engr 193 Academic Excellence Workshop (0-3) Cr 1 FS *Prereq Engineering classification and concurrent enrollment in appropriate course* Collaborative learning community workshops for LEAD participants Offered on a satisfactory fail grading basis only
A Chemistry 155 (Fall only)
B Chemistry 165 (Spring only)
C Chemistry 167
D Mathematics 165
E Mathematics 166
F Physics 221
G Physics 222

Engr 312 Engineering Connections (2 2) Cr 3 S Hands-on in class experiments connecting engineer ing concepts with K 6 mathematics and science curricula Engineering use of simple machines pressure force and equilbrium utilizing levers gears and truss structures For elementary education majors only

Engr 322 Engineering Mechanics for Teachers (1 0) Cr 1 S SS *Prereq Teaching license concurrent enrollment in C I 522* Exploration of material properties equilbrium deflections and natural occurence of mathematical functions using design of simple truss structures Applications in 8 12 classroom settings

Engr 396 Summer Internship Cr R SS *Prereq Permission of Engineering Undergraduate Programs advisor* Summer professional work period

Engineering Mechanics

(Administered by the Department of Aerospace Engineering)

Thomas J Rudolphi, Chair of Department

Distinguished Professors R B Thompson

Professors Chimenti Holger Inger McDaniel Pierson Rajagopalan Rothmayer Rudolphi Schmerr Tannehill Tsai Zachary

Professors (Adjunct) Hsu

Distinguished Professors (Emeritus) D Thompson Young

Professors (Emeritus) Akers Greer Iversen Jenison McConnell Munson Rizzo Rogge Rohach Weiss Wilson

Associate Professors Dayal Hilliard Hindman Lu Mann Mitra Sarkar Sherman Sturges

Associate Professors (Adjunct) Biner Cox Roberts

Associate Professors (Collaborators) Flatau

Associate Professors (Emeritus) Hermann Seversike Trulin Vogel

Assistant Professors Bastawros Chavez Haan Jacobson

Assistant Professors (Adjunct) Byrd Gray Kellogg Legg Wolter

Undergraduate Study

The courses in mechanics are intermediate between those in physics and mathematics and the profes sional and design courses of the several engineering curricula In the work of this department the student is expected to acquire an understanding of the principles underlying the technique of analysis and a knowledge of those properties of materials which influence the manner and extent of their use for engineering purposes Physical properties of engineering materials are studied in the classroom and are evaluated in the laboratory General laws such as those of Newton are given mathematical expression and are made suitable for use in the solution of specific problems in machine and structural design and in the flow and measurement of fluids

Graduate Study

The department offers work for the degrees master of science master of engineering and doctor of

philosophy with major in engineering mechanics and minor work to students taking major work in other departments

The master of science degree requires a thesis and a minimum of 8 research credits It has strong research emphasis and is recommended for students who anticipate entering a doctoral program later At least 30 credits of acceptable graduate work are required for the degree

The master of engineering degree does not require either research credits or a thesis However at least two credits of acceptable creative component and at least 26 credits of acceptable graduate coursework are required A minimum of 30 credits of acceptable graduate work is required for the degree The program is intended to give students additional instruction at the graduate level to better qualify them for advanced professional engineering work By careful selection of electives and perhaps additional courses during the senior undergraduate year students should be able to qualify for the master of engineering degree with an additional year of full time study after receiving their baccalaureate degree in one of the several engineer ing curricula

Credits for creative component will be obtained by registering for E M 599 A written report and an oral presentation will be given to the student s graduate committee

The normal prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in engineering at this university However because of the diversity of interests in graduate work in engineering mechanics it is possible for a student to qualify for graduate study even though undergraduate or prior graduate training has been in a discipline other than engineering—e g physics or mathematics

Courses open for nonmajor graduate credit All 300 and 400 level courses except 490

Courses Primarily for Undergraduate Students

E M 274 Statics of Engineering (3-0) Cr 3 FS SS *Prereq Credit or enrollment in Math 166 credit or enrollment in Phys 111 or 221* Vector and scalar treatment of coplanar and noncoplanar force systems Resultants equilibrium friction centroids second moments of areas principal second moments of area radius of gyration internal forces shear and bending moment diagrams
H Honors FS

E M 324 Mechanics of Materials (3 0) Cr 3 FS SS *Prereq 274* Plane stress plane strain stress-strain relationships and elements of material behavior Application of stress and deformation analysis to members subject to centric torsional flexural and combined loadings Elementary considerations of theories of failure buckling Nonmajor graduate credit

E M 327 Mechanics of Materials Laboratory (0 3) Cr 1 FS SS *Prereq Credit or enrollment in 324* Experimental determination of mechanical properties of selected engineering materials Experimental verification of assumptions made in 324 Use of strain measuring devices Preparation of reports Students who are not present for the first laboratory meeting of their own sections may qualify for continuation in the course only by attending the first laboratory meeting of some other section of the course Nonmajor graduate credit

E M 345 Dynamics (3 0) Cr 3 FS SS *Prereq 274 credit or enrollment in Math 266 or 267* Particle and rigid body kinematics Newton s laws of motion kinetics of plane motion rigid body problems using work-energy linear and angular impulse momentum principles vibrations Nonmajor graduate credit

E M 350 Introduction to Nondestructive Evaluation Engineering (3 0) Cr 3 S *Prereq 324 Math 266 Phys 222* Introduction to the fundamentals of ultrasonic eddy current and x ray testing The generation transmission scattering and reception of ultrasonic waves and x rays in an NDE inspection Safety issues The connection between NDE fracture mechanics and reliability Probability of detection and its impact on failure The use of NDE in design Nonmajor graduate credit

E M 362 Principles of NondestructiveTesting (Same as Mat E 362) See *Materials Engineering* Nonmajor graduate credit

E M 362L NondestructiveTesting Laboratory (Same as Mat E 362L) See *Materials Engineering* Nonmajor graduate credit

E M 378 Mechanics of Fluids (2-2) Cr 3 FS SS *Prereq 274* Properties of fluids Fluid statics Kinematics and kinetics of fluid flow Mass momentum and energy conservation laws dimensional analysis flow in pipes and channels Selected laboratory experiments Nonmajor graduate credit

E M 417 Experimental Mechanics (2 2) Cr 3 F *Prereq 324* The use of strain gages and brittle coating with applications to practical engineering problems Strain gage based transducers recording and output devices Selected laboratory experiments Nonmajor graduate credit

E M 424 Intermediate Mechanics of Materials (3 0) Cr 3 FS *Prereq 324* Stresses strains deflections and angular twist of symmetrical and unsymmetrical members subjected to combined loading Analysis of contact stress problems and shrink fit problems Dynamic load effects fatigue and fracture mechanics introduction Stress analysis of connections Nonmajor graduate credit

E M 425 Introduction to the Finite Element Method (3-0) Cr 3 S *Prereq 324 Math 266 or Math 267* Introduction of finite element analysis through applications to one dimensional steady state problems such as elastic deformation heat and fluid flow consolidation beam bending and mass transport Transient heat conduction and wave propagation Two-dimensional triangular and quadrilateral elements Plane problems of torsion thermal and potential flow stress analysis Simple computer programs for one and two-dimensional problems Nonmajor graduate credit

E M 444 Mechanical Vibrations (2-2) Cr 3 F *Prereq 324 345* Elementary vibration analysis single and multiple degrees of freedom energy methods free and forced vibrations viscous damping transmissibil ity matrix methods modal analysis Selected laboratory experiments Numerical methods of solution Nonmajor graduate credit

E M 451 Engineering Acoustics (Same as M E 451) (2 2) Cr 3 S *Prereq Phys 221 and Math 266 or 267* Sound sources and propagation Noise standards and effects of noise on people Principles of noise and vibration control used in architectural and engineering design Characteristics of basic noise measurement equipment Experience in use of noise measuring equipment sound power measurements techniques for performing noise surveys evaluation of various noise abatement techniques applied to common noise sources Selected laboratory experiments Nonmajor graduate credit

E M 490 Independent Study Cr arr *Prereq Permission of instructor*
H Honors

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

E M 510 Continuum Mechanics (3 0) Cr 3 F *Prereq Math 385* Presentation of the basic equations of engineering mechanics conservation of mass conservation of momentum conservation of energy principles of selection of constitutive equations constitutive relations for classical elastic materials and classical fluids simple rheological models for *viscoelastic materials introduction* to Cartesian tensors

E M 514 Advanced Mechanics of Materials (Same as Aer E 514) (3 0) Cr 3 F *Prereq 324* Theory of stress and strain stress strain relationships Limitations of flexure and torsion formulas unsymmetrical bending curved beams cross shear shear center Torsion of thin-walled noncircular sections Theories of failure membrane stresses in shells thick walled cylinders

E M 516 Mechanics of Deformable Solids (3 0) Cr 3 S *Prereq E M 510* Fundamental mechanics of *linear elasticity formulation and solution of simple* elastostatic boundary value problems Kinematics of small deformations constitutive equations for isotropic and anisotropic media Field equations for elastic solids plane strain/plane stress and some classic canonical solutions Constitutive models of inelastic/plastic solids and selected problems of elastoplasticiy contact mechanics fracture mechanics and defects in crystalline solids

E M 517 Experimental Mechanics (Same as Aer E 517) (3 1) Cr 4 Alt S offered 2005 *Prereq E M 510 or 514 or 516* Fundamental concepts for force displacement stress and strain measurements Strain gages full field deformation measurements with laser interferometry and digital image process ing Advanced experimental concepts at the micro and nano scale regimes

E M 518 Waves in Elastic Solids with Applications to Ultrasonic Nondestructive Evaluation (3 0) Cr 3 F *Prereq Math 385* Propagation of bulk waves surface waves and guided waves in isotropic and anisotropic elastic media Transmission and reflection of waves at plane and curved interfaces Radiation of sources with application to ultrasonic transducer beam modeling Elastic wave scattering from cracks and inclusions Reciprocity principles and their use in the development of an ultrasonic measurement model Characterization and measurement of material attenuation

E M 525 Finite Element Analysis (Same as Aer E 525) (3 0) Cr 3 S *Prereq 425 Math 385* Variational and weighted residual approach to finite element equations Emphasis on two- and three dimensional problems in solid mechanics Isoparametric element formulation higher order elements numerical integration imposition of constraints and penalty convergence and other more advanced topics Use of two- and three-dimensional computer programs Dynamic and vibrational problems eigenvalues and time integration Introduction to geometric and *material nonlinearities*

E M 526 Boundary Element Methods in Engineer ing (3 0) Cr 3 Alt F offered 2003 *Prereq 514 or 516* Introductory boundary element methods through plane problems Singular integrals Cauchy principal values integral representations and boundary integrals in one dimension Direct and indirect formulations Plane potential and elastostatic problems Higher order elements numerical integration Regularizations Body forces and infinite *regions Specialized fundamental solutions half plane* and axisymmetric problems Diffusion and wave problems Coupling with finite elements

E M 544 Mechanical Vibrations (2-2) Cr 3 Alt S offered 2004 *Prereq 324 345* Elements of lumped parameter linear systems kinematics of vibrations equations of motion for free and forced vibrations energy methods resonance damping multiple degrees of freedom mechanical impedance isolation and absorption of vibrations with impulsive and arbitrary excitation of linear systems primary and residual shock spectra Vibration of continuous systems

E M 548 Advanced Engineering Dynamics (3-0) Cr 3 Alt S ofered 2005 *Prereq 345 Math 266 or 267* Dynamics of particles and rigid bodies Generalized coordinates Lagrangian equations of motion Equations of motion in terms of Eulerian angles motion of a gyroscope

E M 550 Fundamentals of Nondestructive Evaluation (Same as M S E 550) (3 2) Cr 4 S *Prereq 324 Math 385* Basic physics of ultrasonic radiographic and electromagnetic NDE measure ments Principles and uses of other quantitative techniques in nondestructive evaluation Signal

processing and evaluation methods Laboratory experiments in ultrasonics eddy current and x ray radiography methods of NDE

E M 551 Signal Processing in Mechanics (Same as M E 551) See *Mechanical Engineering*

E M 552 Advanced Acoustics (3 0) Cr 3 Alt F offered 2003 *Prereq 451* Theoretical acoustics wave propagation in fluids acoustic radiation diffraction and scattering and architectural acoustics Applications of basic acoustic theory in noise control and acoustic radiation Introduction to selected numerical methods in acoustics

E M 564 Fracture and Fatigue (Same as M S E 564 and M E 564) (3-0) Cr 3 F *Prereq 324 and either Mat E 211 or 272* Materials and mechanics approach to fracture and fatigue Fracture mechanics brittle and ductile fracture fracture and fatigue characteristics Fracture and fatigue tests thermal fracture mechanics and materials designed to avoid fracture or fatigue

E M 569 Mechanics of Composite and Combined Materials (Same as M S E 569 and Aer E 569) (3-0) Cr 3 Alt S offered 2005 *Prereq 324* Mechanics of fiber reinforced materials Macromechanical behavior of lamina and laminates Strength and interlaminar stresses of laminates Failure criteria Micromechanics of lamina Stress analysis of laminates Thermal moisture and residual stresses

E M 570 Wind Engineering (Same as Aer E 570) (3 0) Cr 3 F *Prereq 378 345* Atmospheric circulations atmospheric boundary layer wind bluff body aerodynamics aeroelastic phenomena wind tunnel and full scale testing wind load code and standards effect of tornado and thunderstorm winds design applications

E M 590 Special Topics Cr 1 to 4 each time taken *Prereq Permission of instructor*
G Random Vibrations
H Mechanics of Thin Films and Adhesives
I Mechanics of Cellular and Porous Media
J Other

E M 599 Creative Component Cr arr

Courses for Graduate Students

E M 690 Special Topics Credit 1 to 6 each time taken *Prereq Permission of instructor*
N Advanced Experimental Methods
O Advanced Wave Propagation
P Advanced Materials
Q Advanced Computational Methods
R Reliability and Failure
S Other

E M 697 Engineering Internship Cr R *Prereq Permission of DOGE (Director of Graduate Education) graduate classification* One semester and one summer maximum per academic year professional work period Offered on a satisfactory fail grading basis only

E M 699 Research

English

www engl iastate edu/

Charles J Kostelnick Chair of Department

Distinguished Professors Bowers Swander

University Professors Burnett Nakadate

Professors Carlson Chapelle Daly Dearin Douglas Dow Ewald Freed Graham Hickok Kostelnick Mendelson Owen Poague Russell Silet Vann Winsor Zimmerman

Distinguished Professors (Emeritus) Feinberg

Professors (Emeritus) Abraham Anderson Hsieh Bataille Blyler Bruner David Geha Haggard Herrnstadt McCarthy Nostwich Potter Underhill Zbaracki

Associate Professors Allen Catron Consigny Davis Haas J Hagge Herndl Kienzler Kupfer Larson Marquart Niday W Payne Pett Post Price Herndl Roberts Schwarte Slagell St Germain Tremmel Yager

Associate Professors (Emeritus) Galyon Gwiasda Matthies Ross Speer Whitaker

Assistant Professors Amaya Berg Cortes Duffelmeyer Goodwin Hegelheimer Honeycutt LaWare Levis Michie Winkiel

Assistant Professors (Adjunct) Betcher R Payne Vallier

Assistant Professors (Emeritus) Kaufmann McCully

Instructors (Adjunct) Anderson Barratt Bassis Brown Douglas L Hagge Langenberg Mahoney Morgan Myers Noland Regenold Schmidt Shivvers

Lecturers Benner Demaray DeWall Gilchrist McGough Messenger Minkler Schabel Tremmel Thornburg

Undergraduate Study

The department offers a wide variety of courses for students seeking a degree in English or Technical Communication as well as for students wishing to broaden their general education Offerings include classes in introductory college writing literature film creative writing rhetoric and professional communica tion technical communication English education linguistics and teaching English as a second language/ applied linguistics

The discipline of English helps to develop students understanding of how language functions in literature mass media and both personal and professional writing Students not pursuing an English or Technical Communication major may select English courses to fill electives to pursue a minor or to complement their training in other majors

Graduates majoring in English will possess a broad based knowledge and understanding of the discipline They will also understand their particular disciplinary specialization whether it be literary studies rhetorical studies teacher education creative writing or teaching English as a second language/applied linguistics Graduates in Technical Communication will learn how to communicate scientific and technical information through coursework both in English and in scientific and technical fields Graduates in either major will be able to write well-organized well reasoned essays that demonstrate their ability to read and think critically

Introductory writing courses in the department are designed to improve the skills in communication and reading comprehension necessary for successful university work

Through the Intensive English and Orientation Program the department offers special courses in English for both undergraduate and graduate students who are native speakers of other languages (See bulletin entries under *English Courses for Native Speakers of Other Languages and English Require ment for International Students*)

Careers for English Majors
Students who graduate with a major in English often enter fields that require special communication skills such as publishing public service research business and technical writing or human resources An undergraduate major in English can be a solid basis for the professional study of law medicine theology or business management Students in English Education can qualify to teach English in middle or high school (See *Index Teacher Licensure*) English majors may also pursue graduate studies in a number of communication related fields

Careers for Technical Communication Majors
Students who graduate with a major in Technical Communication will be prepared for careers in scientific and technical writing and editing They will typically seek positions in companies or nonprofit organizations in communication based units of local state and federal government in the documentation units of software developers or publishers or in such areas as web design and communication consulting Technical Communication majors may also pursue graduate study in rhetoric and professional communication or other communication related fields

English Major Requirements
English majors choose one of three programs of study Literary Studies Rhetorical Studies or English Education Students interested in creative writing typically choose Literary Studies as a program of study English majors are required to have in addition to first year composition at least 39 credits in English those in English Education must have 48 credits in English in addition to required teaching related courses taken in other departments English majors transferring from other institutions must take at least 18 of their credits in English while in residence at Iowa State

To graduate with a major in the English Department a student must earn at least a C (not a C) in English 104 and 105 as well as in each of the courses taken to fulfill the program of study Earning at least a C in first year composition and in one advanced writing course also meets the departmental English proficiency requirement

Finally all English majors must take at least one pre 1800 literature course and one pre-1900 literature course

Distributed Requirements
All English majors no matter what their program of study must take nine courses for a total of 27 credits from a list of distributed requirements

Engl 199	Introduction to the Study of English	R
Engl 220	Descriptive English Grammar	3
Engl 260	Introduction to Literary Study	3
Engl 310	Rhetorical Analysis	3
Engl 302 309 313 316	Advanced Writing	3
Engl 340 349	Women s or Multicultural Literature	3
Engl 360 364	American Literature	6
Engl 373 378	British Literature	6
		27

These distributed requirements may not overlap with any Advanced Study requirements

Advanced Study Requirements
Each program of study has its own requirements for advanced work

Literary Studies

Engl 339	Literary Theory	3
Engl	English Elective	3
Engl 440 463	Literature Seminars	6
		12

Rhetorical Studies

Engl 350	Rhetoric and the History of Ideas	3
Engl 300+	Rhetoric and Professional Communication	3
Engl 418	Argumentative Writing	3
Engl 400+	Rhetoric and Professional Communication	3
		12

English Education

Engl 219	Intro to Linguistics	3
Engl 300+	English Literature Elective	3
Engl 339	Literary Theory	3
Engl 392	Practice & Theory of Teaching Writing in the Secondary Schools	3
Engl 394	Teaching the Reading of Young Adult Literature	3
Engl 420	History of the English Language	3
Engl 494	Prac & Theory of Teaching Literature in the Secondary Schools	3
		21

There are a number of other course requirements outside of English for English Education majors These requirements may overlap with General Education requirements for the college

C I 201	Instructional Media	3

C I 204	Social Foundations of American Education	3
C I 280A	Pre-Student-Teaching Experience	4
C I 406	Multicultural Gender Fair Education	3
C I 415	Senior Seminar	R
C I 426	Principles of Secondary Education	3
Engl 417	Student Teaching	16
Cl St 353	World Literature	3
Psych 230	Developmental Psychology	3
Psych 333	Educational Psychology	3
Hist or Pol S	American History or Government	3
Sp Cm 212 or Thtre 358		3
Health Dance Safety or Exercise & Sport Science		1

Technical Communication Major Requirements
Technical Communication majors must take 43-45 *credits within the major* as well as 15 18 credits in a declared minor or concentration in a technical field Majors develop advanced skills in multiple aspects of technical communication and apply their knowledge of technical communication to a specifc discipline

Theory and History

Engl 310	Rhetorical Analysis	3
Engl 350	Rhetoric and the History of Ideas	3
Engl 411	Technology Rhetoric and Professional Communication OR	
Engl 412	Rhetoric in Organizational Culture	3

Linguistics and Literature

Engl 219	Introduction to Linguistics	3
Engl 220	Descriptive English Grammar	3
200 or 300 level literature course		3

Principles Practices and Technologies

Engl 213	Computers in the Study of English	3
Engl 314	Technical Communication	3
Engl 416	Visual Aspects of Business and Technical Communication	3

12 additional credits at least 9 at 400 level from Engl 309 Engl 313 Engl 410 Engl 413 Engl 414 Engl 415 Engl 418

Communication Elective		3
Engl 487	Internship	1 3

Declared Minor or Concentrated Study in a Technical Field 15-18

Declared minor in a scientific or technical field or where no official minor exists a concentrated study in a scientific or technical field approved by the English department

Minors and Second Majors
English majors are encouraged to seek a minor or a second major to complement their English studies To find out the requirements for particular majors or minors consult the section in this bulletin relating to the department offering the major or minor Students in English Education are particularly encouraged to acquire secondary certification in another teaching area Consult ISU s certification officer in the College of Education for a list of Iowa Secondary Certification requirements in various subject areas

Degree Choices
English majors may earn a bachelor of arts or a bachelor of science degree Technical Communication majors may earn a bachelor of science degree only For *English majors the B S degree requires an extra* 12 credits beyond the general education require ments these credits must be taken in linguistics natural science mathematics social science or selected courses in Exercise and Sport Science

English Minor Requirements
The department offers a minor in English which students may earn by completing at least 18 credits in English courses beyond the 100 level A student earning an English minor must take 9 of the 18 credits *at the 300-level or above and must earn a grade of C* (not C) or higher in each course taken in the minor No specific courses need be taken students may design their minor programs around their own interests

Technical Communication Minor Requirements
The department offers a minor in Technical Communication which students may earn by completing 18 credits in Technical Communication courses 6 from Theory and History and 12 from Principles Practices and Technologies Half of the 18 credits must be 300-level or above and students must earn a grade of C (not C) or higher in each course taken in the minor Although students may design their minor programs around their own interests they are encouraged to work with a departmental adviser in Technical Communication

Departmental Awards and Scholarships
Each spring the English department offers many scholarships and awards for both undergraduate and graduate students Some undergraduate awards are for returning English and Technical Communication majors only others are for returning students of any major demonstrating excellence in some aspect of English or Technical Communication A list of current awards and application forms are available in the English Advising Office 306 Ross Hall for undergraduate students and in the Graduate English Office 403 Ross for graduate students during late February Award winners are announced each year on May 1 or shortly before

Other Programs Associated with English
The English Department participates in interdepart mental programs in African American Studies American Indian Studies Classical Studies Latina/o Studies Linguistics Speech Communication Theatre and Women s Studies (See the *Index for requirements for these interdepartmental programs*)

Graduate Study

The master of arts degree programs in English and TESL/Applied Linguistics offer various possibilities for the advanced study of writing language and literature Students are admitted to one of three areas of specialization for the M A in English creative writing literature and rhetoric composition and professional communication These areas of specialization are designed to prepare students for teaching at the secondary two year college or beginning college and university levels for further graduate study in language and literature for creative writing or for technical writing business communication editing and associated professional writing Students can be admitted to one of the optional specializations for the M A in TESL/Applied Linguistics Computer Assisted Language Learning (CALL) Language Assessment English for Specific Purposes (ESP) Literacy and Literature in ESL

The master s degree requires 30 semester credits including a thesis or project (2 3 credits) The literature specialization of the M A in English and the M A in TESL/Applied Linguistics have language requirements that may be met through a number of options including previous foreign language study graduate linguistics courses or satisfactory performance on a test-out exam A student whose native language is other than English is considered to have met the language requirement after satisfying the Graduate College English requirement

The Ph D in rhetoric and professional communication (RPC) focuses on the theory of rhetoric and the practice of written communication in professional communities such as business industry and government The degree qualifies graduates for academic positions in rhetoric and in business and technical communication as well as for work in the private sector as professional writing specialists editors and communications production managers Prospective students must first secure admission to the graduate studies program through the Department of English Candidates are required to complete 72 hours of graduate credit and a dissertation and to pass a portfolio assessment a preliminary examina tion consisting of a comprehensive examination and a *special field examination and an oral defense of the* dissertation

The department offers graduate students an opportunity to gain professional experience through professional writing internships selected departmental research activities the Intensive English and Orientation Program the First Year Composition Program and the Interpersonal and Rhetorical Communication Program Teaching and research assistantships are available for qualified students Teaching assistants are responsible for teaching with faculty supervision classes in first year composition in public speaking in English as a second language and in business and technical communication Research assistants are assigned to individual faculty members engaged in projects in writing language or literature One or more Pearl Hogrefe Fellowships in Creative Writing covering stipend and tuition are awarded each year to outstanding graduate students Several Freda Huncke Graduate Teaching Fellowships are available to first year Ph D students Miller Fellowships are also available to highly qualified Ph D students

With prior written approval from the College of Education students may take English courses to meet part of the requirements for certification to teach English in two-year and community colleges Selected courses may also be used to meet requirements for ESL endorsement (K 12) for teachers

A graduate minor in English at the M A level requires 9 credits of English 6 of which must be in 500 or 600 level courses A graduate minor in English at the Ph D level requires 12 credits of English 9 of which must be in 500 or 600 level courses

Courses open for nonmajor graduate credit 302 309 313 314 315 316 335 340 345 346 347 348 349 357 358 394 410 411 412 413 414 415 416 418 420 422 425 440 441 450 451 452 453 460 461 463 489

Courses Primarily for Undergraduate Students

Engl 10 Intensive English and Orientation Program (20 5) Cr 0 FS SS *Prereq Recommenda tion of the English Department* Full time study of English for speakers of other languages Brochure available from the IEOP Office 337 Ross Hall Offered on a satisfactory fail grading basis only

Engl 101 English for Native Speakers of Other Languages FS *Prereq Recommendation of English Department placement in various sections is determined by examination* (See *English Requirement for International Students in Index*) For undergradu ates Completion of English 101 requirement prepares students for English 104 For graduates Completion of English 101 satisfies the English requirement of the Graduate College Engl 101 courses are limited to students who are nonnative speakers of English Credit from 101 does not count toward graduation
B Academic English I—Cr 3 Available P/NP to graduate students at their department s option
C Academic English II—Undergraduates Cr 3
D Academic English II—Graduates Cr 3 Available P/NP to graduate students at their department s option
L Strategies for Listening Cr 2 Available P/NP to graduate students at their department s option
R Strategies for Reading Cr Var 1 2 Available P/NP to graduate students at their department s option

Engl 104 First-Year Composition I (3 0) Cr 3 FS SS Introduction to college level writing strategies with emphasis on critical reading and thinking skills Six to eight major writing assignments with readings from a variety of sources

Engl 105 First Year Composition II (3-0) Cr 3 FS SS *Prereq 104 or exemption from 104 credit for or concurrent enrollment in Lib 160* Development of college level writing strategies with emphasis on arguing a position analyzing texts and using primary and secondary sources Five to seven major writing assignments

Engl 105H First-Year Composition, Honors *(3-0)* Cr 3 F *Prereq Exemption from 104 and admission to Freshman Honors Program credit for or concurrent enrollment in Lib 160* A rhetorical approach to topics in language literature and culture Reading and writing assignments may be organized around a course theme or focus Writing intensive

Engl 180 Communication Skills for International Teaching Assistants (Same as U St 180) Cr 1 to 3 FS Placement based upon SPEAK/TEACH test results Persons whose native language is English cannot take 180 for credit No more than one section of 180 may be taken per semester up to two sections total Credit does not apply toward graduation Offered on a satisfactory fail grading basis only
A Speaking Skills Cr 3 Emphasis on pronunciation improvement and greater fluency in spoken English for teaching purposes
B Intermediate Spoken English Cr 3
C Advanced Spoken English Cr 3 For students who have completed 180A or 180B but have not reached the passing level on the SPEAK/TEACH test
D Presentation Skills Cr 3 Developing explanations leading discussions and handling questions in a teaching environment
E Supervised Independent Study Cr 1 Seminar with individual observation and consultation

Engl 199 Introduction to the Study of English (2-0) Cr R FS 8 weeks General introduction to the discipline discussion of the various fields in English consideration of career opportunities Offered on a satisfactory fail grading basis only

Engl 201 Introduction to Literature (3 0) Cr 3 FS *Prereq Credit in or exemption from 104* Study of selected examples of drama poetry short fiction and the novel drawn from both British and American literature Emphasis on becoming an active reader Recommended for non majors

Engl 205 Popular Culture Analysis (Same as Sp Cm 205) (3 0) Cr 3 FS *Prereq Credit in or exeption from 104* Analysis of how information and entertainment forms persuade and manipulate audiences Study of several forms that may include newspapers speeches television film advertising fiction and magazines Special attention to verbal and visual devices

Engl 207 Introduction to Creative Writing (3 0) Cr 3 FS *Prereq Credit in or exemption from 104* Course introduces students to the fundamentals of writing fiction poetry and creative nonfiction Extensive readings in all three genres Students learn creative processes through writing exercises workshops and conferences

Engl 213 Computers in the Study of English (3 0) Cr 3 FS *Prereq 105* Introduction to the role that computers play in English studies Use of discipline specific databases applications and online resources Theoretical and practical understanding of online environments and information management procedures Work with computer applications for writing editing imaging and World Wide Web site development Study of the impact of cybercultural practices on the discipline of English

Engl 219 Introduction to Linguistics (Same as Ling 219) (3 0) Cr 3 FS *Prereq Sophomore classification* Introduction to linguistic concepts and principles of linguistic analysis with English as the primary source of data Sound and writing systems sentence structure vocabulary and meaning Issues in the study of usage regional and social dialects language acquisition and language change

Engl 220 Descriptive English Grammar (Same as Ling 220) (3 0) Cr 3 FS *Prereq 105* Overview of grammatical structures and functions Parts of speech phrase clause and sentence structure sentence types and sentence analysis rhetorical grammar and sentence style terminology Not a remedial English composition or ESL course

Engl 230 Readings in British Literature and Culture (3-0) Cr 3 F *Prereq Credit in or exemption from 104* Selected literary texts read in the context of important trends and ideas

Engl 231 Readings in American Literature and Culture (3 0) Cr 3 S *Prereq Credit in or exemption from 104* Selected literary texts read in the context of important trends and ideas

Engl 237 Survey of Film History (3 0) Cr 3 F *Prereq Credit in or exemption from 104* A survey of the history of film both U S and international from the beginnings in the late nineteenth century to the present

Engl 240 Introduction to American Indian Literature (Same as Am In 240) (3 0) Cr 3 F *Prereq Credit in or exemption from 104* Appreciation of oral and written forms of American Indian literatures Tropes and techniques in oral visual and written texts Focus on the role of American Indians in interdisciplinary approaches to modern social and environmental issues as expressed in literary works

Engl 260 Introduction to Literary Study (3 0) Cr 3 FS *Prereq Credit in or exemption from 104* Basic principles of literary study Emphasis on writing of interpretive and critical essays Particular attention to poetry Designed for English majors

Engl 301 Cultural Studies (3 0) Cr 3 each time taken maximum of 6 F *Prereq 105* Literature and related arts and cultural phenomena with focus on a specific group subgroup identity cluster or phenomenon Selected texts artifacts and cultural experiences

Engl 302 Business Communication (3 0) Cr 3 FS SS *Prereq 105 junior classification* Theory principles and processes of effective written communication typically encountered in business and the professions Extensive writing practice in standard letter and memo forms short proposals policy and procedure descriptions job descriptions application letters résumés autobiographical précis performance reviews and evaluations and letters of recommendation H Honors Nonmajor graduate credit

Engl 303 Free Lance Writing for Popular Magazines (3 0) Cr 3 S *Prereq 105 not open to freshmen* Practical workshop in writing nonfiction articles for popular magazines Emphasis on writing market research preparation of manuscripts methods of submission Major goal of the course is production of marketable material

Engl 304 Creative Writing—Fiction (3-0) Cr 3 FS *Prereq 105 not open to freshmen* Progresses from practice in basic techniques of fiction writing to fully developed short stories Emphasis on writing analytical reading workshop criticism and individual conferences

Engl 305 Creative Writing—Nonfiction (3-0) Cr 3 FS *Prereq 105 not open to freshmen* Workshop in writing imaginative essays both critical and personal Analytical reading development of literary techniques Individual and small group conferences

Engl 306 Creative Writing—Poetry (3 0) Cr 3 FS *Prereq 105 not open to freshmen* Progresses from traditional to contemporary forms Emphasis on writing analytical reading workshop criticism and individual conferences

Engl 307 Writing Young Adult Fiction (3 0) Cr 3 S *Prereq 105 not open to freshmen* Workshop in writing and reading short stories that explore coming of age themes Emphasis on coming of age literature as well as the craft and technique of short fiction Individual and group story conferences

Engl 309 Report and Proposal Writing (3 0) Cr 3 FS *Prereq 105 junior classification* Introduction to the theory and practice of preparing and analyzing reports and proposals intended for businesses governmental agencies and private and corporate foundations Individual assignments and group projects include text documents and oral presentations Nonmajor graduate credit

Engl 310 Rhetorical Analysis (3 0) Cr 3 FS *Prereq 105* Fundamental principles of rhetorical criticism Focus on selected theories for analyzing cultural texts including essays speeches film technical and scientific documents and web sites Emphasis on identifying artifacts formulating research questions and designing methodology

Engl 313 Writing for the World Wide Web (3 0) Cr 3 FS *Prereq 105* Rhetorical principles of hypertextual writing and publishing Group and individual projects using HyperText Markup Language to construct interactive sites for the World Wide Web Special emphasis on business and technical applications Nonmajor graduate credit

Engl 314 Technical Communication (3-0) Cr 3 FS SS *Prereq 105 junior classification* Theories principles and processes of effective written communication in the technical disciplines Attention to the major strategies for composing technical discourse techniques of analyzing audiences and writing situations and for organizing data and information H Honors Nonmajor graduate credit

Engl 315 Creative Writing—Screenplays (3 0) Cr 3 F *Prereq 105 not open to freshmen* Stresses master scene technique of writing fully developed screen plays Emphasis on TV and movie techniques writing workshop criticism analytical reading and viewing and individual conferences Nonmajor graduate credit

Engl 316 Creative Writing—Playwriting (Same as Thtre 316) (3 0) Cr 3 S *Prereq 105 not open to freshmen* Progresses from production of scenes to fully developed one act plays Emphasis on action staging writing analytical reading workshop criticism and individual conferences Nonmajor graduate credit

Engl 330 Science Fiction (3 0) Cr 3 FS *Prereq 105* Development of science fiction from its origins in nineteenth century fiction to the present Emphasis on reading protocols developed through Golden Age New Wave and post 1970s fiction

Engl 335 Film (3 0) Cr 3 each time taken maximum of 6 FS *Prereq 105* Principles of film art and the traditional vocabulary of literature as applied to film Influence of film on modes of thought and behavior Nonmajor graduate credit

Engl 339 Literary Theory and Criticism (3 0) Cr 3 FS *Prereq 260 and 3 additional credits in literature* Study of selected texts of literary criticism with attention to the purposes and practices of criticism

Engl 340 Survey of Women s Literature (Same as W S 340) (3 0) Cr 3 F *Prereq 105* Historical and thematic survey of literature by and about women May include autobiographies journals letters poetry fiction and drama Nonmajor graduate credit

Engl 344 U S Latino/a Literature (3 0) Cr 3 S *Prereq 105* An introduction to the literature of Mexican Americans Puerto Ricans Cuban Americans and other Latino/a sub groups Special emphasis on themes such as ethnic relations and comparisons with Euroamerican literary traditions

Engl 345 Women and Literature Selected Topics (Same as W S 345) (3 0) Cr 3 each time taken maximum of 6 S *Prereq 105* Literature by women and/or dealing with the images of women e g study of individual authors or related schools of authors exploration of specific themes or genres in women s literature analysis of recurrent images of women in literature Nonmajor graduate credit

Engl 346 American Indian Literature (Same as Am In 346) (3 0) Cr 3 S *Prereq 105* Survey of literature by Native Americans from pre Columbian tales and songs to contemporary novels and poetry Nonmajor graduate credit

Engl 347 Survey of African American Literature (Same as Af Am 347) (3 0) Cr 3 F *Prereq 105* Literature by African Americans from the beginnings to the 1960s Nonmajor graduate credit

Engl 348 Contemporary African American Literature (Same as Af Am 348) (3-0) Cr 3 S *Prereq 105* Intensive reading in literature by African Americans from 1960 to the present Nonmajor graduate credit

Engl 349 Selected Topics in Multicultural Literatures of the United States (3 0) Cr 3 each time taken maximum of 6 S *Prereq 105* Literature by writers from U S multicultural groups May include literature of several groups or focus upon one of the following Asian Americans African Americans Latino/a Americans American Indians Nonmajor graduate credit

Engl 350 Rhetoric and the History of Ideas (Same as CI St 350 Sp Cm 350) (3-0) Cr 3 S *Prereq 105* An exploration of the relationship between rhetoric and society in contemporary and historical contexts Sample topics rhetorical theory in relation to politics gender race ethics education science

Engl 353 World Literature Western Foundations through Renaissance (Same as CI St 353) (3-0) Cr 3 FS *Prereq 105* Representative works from the drama epics poetry and prose of the Ancient World through the late sixteenth century May include Homer Aeschylus Sappho Catullus Dante Marie de France Boccaccio Christine de Pizan Cervantes and others

Engl 354 World Literature Seventeenth Century to the Present (3 0) Cr 3 F *Prereq 105* Representative works primarily from European traditions of drama fiction poetry and nonfiction

Engl 356 Literary Study of the Bible (3 0) Cr 3 Alt S offered 2004 *Prereq 105* Selected readings from Judaic and Christian sacred literature including narrative poetry wisdom literature and apocalyptic literature

Engl 357 Folklore (3 0) Cr 3 Alt F offered 2003 *Prereq 105* Types functions contexts and purposes of folklore Emphasis on traditional narratives and verbal folklore Nonmajor graduate credit

Engl 358 Myth Fairytale, and Legend (3 0) Cr 3 S *Prereq 105* Study of traditional fairytales myths and legends from diverse cultures Nonmajor graduate credit

Engl 360 American Literature Beginnings to 1830 (3 0) Cr 3 FS *Prereq 105 sophomore classification* American literature from its beginnings through the colonial period to early romanticism literary works in their social and cultural contexts

Engl 362 American Literature 1830 to 1914 (3 0) Cr 3 FS *Prereq 105 sophomore classification* Romanticism realism and naturalism in American literature literary works in their social and cultural contexts

Engl 364 American Literature 1914- present (3-0) Cr 3 FS *Prereq 105 sophomore classification* American literature since World War I literary works in their social and cultural contexts

Engl 366 Studies in Drama (3 0) Cr 3 Alt S offered 2004 *Prereq 105* Dramatic literature in its historical and cultural contexts Particular plays and national dramas studied will vary

Engl 370 Shakespeare (3 0) Cr 3 FS *Prereq 105* Reading and analysis of selected plays Development of Shakespeare s dramatic art in its social and intellectual context

Engl 373 British Literature The Middle Ages (3-0) Cr 3 F *Prereq 105 sophomore classification* Medieval literature (Beowulf through the fifteenth century) considered in social and intellectual contexts

Engl 374 British Literature The Renaissance (3 0) Cr 3 F *Prereq 105 sophomore classification* Literature from 1500 to 1660 considered in social and intellectual contexts

Engl 375 British Literature The Restoration and 18th Century (3 0) Cr 3 S *Prereq 105 sophomore classification* Literature from 1660 to 1800 considered in social and intellectual contexts

Engl 376 British Literature Romantic and Victorian (3 0) Cr 3 S *Prereq 105 sophomore classification* Literature from the late eighteenth century to about 1900 considered in social and intellectual contexts

Engl 378 British Literature Modern and Contemporary (3 0) Cr 3 S *Prereq 105 sophomore classification* British literature since about 1900 considered in social and intellectual contexts

Engl 384 Twentieth Century and Contemporary Fiction (3-0) Cr 3 F *Prereq 105* Works by writers from various countries including the United States or Great Britain

Engl 389 Postcolonial Literatures (3-0) Cr 3 Alt S offered 2004 *Prereq 105* History theory and practice of postcolonial literature written in English Selected reading from one or more postcolonial literatures

Engl 392 Practice and Theory of Teaching Writing in the Secondary Schools (3 0) Cr 3 FS *Prereq 219 or 220* Introduction to teaching secondary language arts Current theories and practices in the teaching of writing to secondary school students Theories of rhetoric approaches to teaching lesson design and planning Evaluating writing Professional portfolio preparation (Taken concurrently with C I 280 Cr 2)

Engl 393 The History of Children s Literature (3-0) Cr 3 F *Prereq 105* Origin and development of English and American children s literature through the early twentieth century Special emphasis on nature structure and enduring themes of fantasy literature

Engl 394 Teaching the Reading of Young Adult Literature (3 0) Cr 3 FS *Prereq 105* Critical study and evaluation of the genre examination of modes and themes found in the literature strategies of effective reading study of the relationship of the genre to children s literature and adult literature discussion techniques for teachers and parents Evaluation of literature for use in school programs Restricted to students seeking teacher certification Nonmajor graduate credit

Engl 395 Study Abroad Cr var SS *Prereq Permission of instructor* Supervised study of an appropriate area of the discipline in a foreign country Special fees apply
A Literature
B Creative Writing
C Linguistics
D Rhetoric and Professional Communication
E Teacher Education

Engl 404 Creative Writing Workshop—Fiction (3 0) Cr 3 each time taken maximum of 6 FS *Prereq 304* Individual projects in short fiction on a workshop and conference basis Readings in short fiction Discussion of elements of narrative such as plot point of view characterization theme setting

Engl 405 Creative Writing Workshop—Nonfiction (3-0) Cr 3 each time taken maximum of 6 FS *Prereq 305* Individual projects in memoir immersion journalism character studies and/or the personal essay on a workshop and conference basis Readings in creative nonfiction

Engl 406 Creative Writing Workshop—Poetry (3-0) Cr 3 each time taken maximum of 6 FS *Prereq 306* Individual projects in poetry on a workshop and conference basis Readings in poetry Discussion of poetic elements such as image sound internal structure rhythm tone figurative language

Engl 410 Multimedia Design in Professional Communication (3 0) Cr 3 Alt S offered 2004 *Prereq 302 309 313 or 314 junior classification* Rhetorical principles of information based multimedia design Practical understanding of computer applications used in multimedia development Focus on theoretical and practical elements of producing multimedia training programs in both education and industry Work with interactive hypertext digital audio and non-linear video editing Nonmajor graduate credit

Engl 411 Technology, Rhetoric and Professional Communication (3 0) Cr 3 S *Prereq 310 302 309 313 or 314 junior classification* Study of the implication of technologies especially computer technology for the writing and reading of business technical and academic texts Focus on selected technology related topics Nonmajor graduate credit

Engl 412 Rhetoric in Organizational Culture (3 0) Cr 3 F *Prereq 310 302 309 or 314 junior classification* Explores how discourse both reflects and constructs institutions and organizations as well as individuals within these organizations the academy the community and selected workplace settings Examines how discourse in diverse organizations shares certain contextual textual and intertextual strategies through readings and written assignments Nonmajor graduate credit

Engl 413 Composing Documentation and Instructional Materials (3 0) Cr 3 F *Prereq 313 302 309 or 314 junior classification* Rhetorical approach to the analysis creation testing and production of instruction sheets policy and procedure manuals computer documentation and other types of instructions Coverage of both print and online instructional materials Safety ethical and liability issues Nonmajor graduate credit

Engl 414 Production Processes for Technical Documents (3 0) Cr 3 Alt S offered 2005 *Prereq 302 309 313 or 314 junior classification* Review of the principles of desktop publishing as practiced in the field of technical communication Focus on theories of print document design and project management as well as digital prepress techniques needed to produce documents using outside print bureaus Practice with current desktop publishing software Nonmajor graduate credit

Engl 415 Business and Technical Editing (3-0) Cr 3 F *Prereq 302 309 or 314 junior classification* Editing journal articles research reports technical manuals newsletters and proposals Attention to editorial levels and styles project management editor author relationships and electronic editing Nonmajor graduate credit

Engl 416 Visual Aspects of Business and Technical Communication (3 0) Cr 3 S *Prereq 302 309 or 314 junior classification* Rhetoric of visual elements in business and technical communication Issues in the design of text charts graphs diagrams schematics illustrations and other visual displays Nonmajor graduate credit

Engl 417 Student Teaching (Same as C I 417) See *Curriculum and Instruction*

Engl 418 Argumentative Writing (3 0) Cr 3 S *Prereq 310 junior classification* Advanced seminar in principles theory and analysis of argumentation Extensive practice in argumentative writing Nonmajor graduate credit

Engl 419 Grammatical Analysis (Dual listed with 516 same as Ling 419) (3 0) Cr 3 F *Prereq 219 junior classification* Theories and methods for analysis of English syntax with emphasis on recent syntactic theory

Engl 420 History of the English Language (Same as Ling 420) (3 0) Cr 3 FS *Prereq 219 220* Comparison of English to other languages by family background and by type Analysis of representative Old Middle Early Modern and present-day English texts including both literary works and non-literary documents Nonmajor graduate credit

Engl 422 Women Men , and the English Language (Same as Ling 422 W S 422) (3-0) Cr 3 S *Prereq 219* The ways men and women differ in using language in varied settings and the ways in which language both creates and reflects gender divisions Nonmajor graduate credit

Engl 423 Introduction to Old English Language and Literature (Dual listed with 523) (3 0) Cr 3 Alt F offered 2003 *Prereq Junior classification 373 or 420 recommended* Introductory study of Old English language and literature in prose and poetry including extracts from *Beowulf* Some attention to Anglo-Saxon culture

Engl 425 Second Language Learning and Teaching (Same as Ling 425) (3 0) Cr 3 Alt S offered 2004 *Prereq 219 junior classification* The process of second language learning and principles and techniques of teaching second languages Learning and teaching in specific situations and for particular purposes Current applications of technology in teaching and assessment Nonmajor graduate credit

Engl 440 Seminar in British Literature (3-0) Cr 3 each time taken F *Prereq Completion of or concurrent enrollment in 339* Selected authors

movements eras or genres in British literature Readings in criticism Nonmajor graduate credit

Engl 441 Seminar in American Literature (3-0) Cr 3 each time taken S *Prereq Completion of or concurrent enrollment in 339* Selected authors movements eras or genres in American literature Readings in criticism Nonmajor graduate credit

Engl 450 Seminar in Drama (3 0) Cr 3 each time taken Alt S offered 2004 *Prereq Completion of or concurrent enrollment in 339* Selected authors movements eras or national literatures Readings in criticism Nonmajor graduate credit

Engl 451 Seminar in Poetry (3 0) Cr 3 each time taken Alt F offered 2003 *Prereq Completion of or concurrent enrollment in 339* Selected authors movements eras or national literatures Readings in criticism Nonmajor graduate credit

Engl 452 Seminar in Prose (3 0) Cr 3 each time taken Alt S offered 2005 *Prereq Completion of or concurrent enrollment in 339* Selected authors movements eras or national literatures May include the novel the short story the essay or autobiography Readings in criticism Nonmajor graduate credit

Engl 453 Seminar in Film (3-0) Cr 3 each time taken Alt S offered 2004 *Prereq Completion of or concurrent enrollment in 339* Film history theory genre or authorship Readings in criticism Nonmajor graduate credit

Engl 460 Seminar in Women s and/or Multicultural Literature (3 0) Cr 3 each time taken Alt F offered 2004 *Prereq Completion of or concurrent enrollment in 339* Selected readings of various authors movements eras or genres Readings in criticism Nonmajor graduate credit

Engl 461 Seminar in Single Figure Study Canon and Context (3 0) Cr 3 each time taken Alt S offered 2005 *Prereq Completion of or concurrent enrollment in 339* Single figure (e g Austen Chaucer Milton Morrison Twain or Woolf) studied through literary social critical and historical contexts Nonmajor graduate credit

Engl 463 Seminar in Literature and Culture (3-0) Cr 3 each time taken F Prereq *Completion of or concurrent enrollment in 339* Interrelationships among literary works social and historical contexts and reception Texts by several authors Readings in criticism Nonmajor graduate credit

Engl 480 Field Experience for Secondary Teaching Preparation (Same as C I 480) See *Curriculum and Instruction*

Engl 487 Internship in Business, Technical, and Professional Communication Cr 1 to 3 S *Prereq 9 credits in 302 309 313 314 413 414 415 (preferred) or 416 senior classification and permission of coordinator* An opportunity to write edit and design business and technical documents in a professional setting Projects include reports proposals manuals brochures newsletters

Engl 489 Undergraduate Seminar (Same as Ling 489) (3 0) Cr 3 each time taken Alt F offered 2003 *Prereq 9 credits in English beyond 105* Intensive study of a selected topic in literature criticism rhetoric writing or language Cross listing with linguistics acceptable only when offered as a course in linguistics Nonmajor graduate credit

Engl 490 Independent Study Cr var FS *Prereq 9 credits in English beyond 105 appropriate to the section taken junior classification permission of Undergraduate Studies Committee* No more than 9 credits of Engl 490 may be used toward graduation Designed to meet the needs of students who wish study in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields
A Literature
B Linguistics Semantics (Ling 490B)
C Rhetoric Teaching of Composition
D Criticism and Theory of Literature
E Reading Instructional Methods and Research
F Creative Writing
G Business/Technical Communication
H Honors

Engl 494 Practice and Theory of Teaching Literature in the Secondary Schools (Same as C I 494) (3 0) Cr 3 FS *Prereq 310 392 9 other credits in English beyond 105 Psych 333 admission to teacher education program* Portfolio review Current theories and practices in the teaching of literature to secondary school students Integrating literary study and writing Preparation and selection of materials Classroom presentation Unit planning (Taken concurrently with C I 280 Cr 2)

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

(Open on a priority basis to graduate students admitted to one of the degree programs in English open by permission of instructor to other qualified graduate students and to qualified undergraduates)

Engl 500 Proseminar Teaching English Composition (3 0) Cr 3 F Required of all new English teaching assistants Introduction to the teaching of English 101 and 104/105 Current theories and practices related to 101 and 104/105 objectives lesson planning and teaching methods development of writing assignments evaluation of student writing

Engl 503 Teaching Composition Theory and Research (3 0) Cr 3 Alt S offered 2005 *Prereq 6 credits in English* Consideration of current pedagogic theories and research in composition/rhetoric

Engl 504 Teaching Business and Technical Writing (3 0) Cr 3 Alt S offered 2004 *Prereq 302 309 or 314* Theory and practice of teaching college courses in business and technical writing Some consideration of in service writing courses for business and government Emphasis on applicable communication and composition theory curriculum planning assignment design materials development

Engl 505 Technology in Business Technical and Professional Communication (3 0) Cr 3 Alt S offered 2005 *Prereq Graduate classification* Examination of the role of technology especially computer technology in communication practices within academic and workplace settings

Engl 506 Theory and Research in Professional Communication (3 0) Cr 3 S *Prereq 6 credits in English* Introduction to professional communication as a discipline with emphasis on theories of communication and discourse that inform professional communication research and on trends and developments in that research and the field

Engl 507 Writing and Analyzing Professional Documents (3 0) Cr 3 F *Prereq 6 credits in English* Introduction to the theory and practice of writing and analyzing documents prepared in business science industry and government Guided readings Individual projects

Engl 508 Advanced Workshop in Academic Writing (3 0) Cr 3 each time taken maximum of 6 Alt SS offered 2005 *Prereq 6 graduate credits* Hands-on practice in writing academic discourse for publication rhetorical analyses of student selected academic journals discussion of current trends in academic writing professional perspectives on the referee process and on journal editorial decision making Focus on the writing of selected short pieces (opinion essays standard reviews conference length papers) and of article-length manuscripts

Engl 509 Writing Proposals and Grant Applications (3 0) Cr 3 F *Prereq 6 credits in English composition* Introduction to the theory and practice of preparing and analyzing proposals and grant applications intended for businesses governmental agencies and private and corporate foundations Individual assignments and group projects include text documents and oral presentations

Engl 510 Introduction to Computers in Applied Linguistics (3 0) Cr 3 F Prereq *Graduate classification* Use of applications software for language teaching linguistic analysis and statistical analysis issues and problems in applied linguistics related to computer methods

Engl 511 Introduction to Linguistic Analysis (Same as Ling 511) (3 0) Cr 3 F *Prereq Graduate classification* Principles and methods of linguistic analysis with emphasis on phonology morphology and syntax Description of linguistic variation and current theoretical approaches to linguistics

Engl 512 Linguistic Change in English Historical Analysis of Literary and Non Literary Texts (Same as Ling 512) (3-0) Cr 3 S *Prereq Graduate classification* Linguistic change in English connections to literary and rhetorical history Development of formal written English and its conventions Historical survey of ideas about the English language

Engl 514 Sociolinguistics (Same as Ling 514) (3 0) Cr 3 S *Prereq 511 or an introductory course in linguistics* Theories and methods of examining language in its social setting Analysis of individual characteristics (e g age gender ethnicity social class region) interactional factors (e g situation topic purpose) and national policies affecting language use

Engl 516 Grammatical Analysis (Dual listed with 419 Same as Ling 516) (3 0) Cr 3 F *Prereq 511 or an introductory course in linguistics* Theories and methods for analysis of English syntax with emphasis on the functions of language

Engl 517 Second Language Acquisition (Same as Ling 517) (3 0) Cr 3 F *Prereq 511 or an introductory course in linguistics* Theory methods and results of second language acquisition research with emphasis on approaches relevant to second language teaching

Engl 518 Teaching English as a Second Language Methods and Materials (Same as Ling 518) (3 0) Cr 3 F *Prereq 511 or an introductory course in linguistics* Issues in methods techniques materials curriculum design and evaluation for all levels of ESL instruction Practical application including group and individual projects

Engl 519 Second Language Assessment (3 0) Cr 3 S *Prereq 517* Principles of second language assessment including reliability validity authenticity and practicality Constructing scoring interpreting and evaluating second language tests for a variety of situations

Engl 521 Teaching of Literature and the Literature Curriculum (3 0) Cr 3 Alt F offered 2004 *Prereq 6 credits in literature* Examination of the roles of the literary work reader and teacher in literary study Responses to literature Place of literature in language arts Study and development of curriculum materials for middle school high school and college levels of instruction

Engl 522 Literary Theory and Criticism (3-0) Cr 3 Alt S offered 2004 *Prereq 6 credits in literature* Examination of the history logic and rhetoric of contemporary literary criticism and analysis

Engl 523 Introduction to Old English Language and Literature (Dual listed with 423) (3 0) Cr 3 Alt F offered 2003 *Prereq Graduate classification course in medieval literature or history or history of the English language recommended* Introductory study of Old English language and literature in prose and poetry including extracts from Beowulf Some attention to Anglo-Saxon culture

Engl 524 Literacy Issues and Methods for Nonnative Speakers of English (Same as Ling 524) (3 0) Cr 3 Alt S offered 2004 *Prereq 511 or an introductory course in linguistics* Issues related to education in a variety of situations including children and adults at basic skills levels as well as teens and adults in academic professional and vocational programs

Engl 525 Methods in Teaching Listening and Speaking Skills to Nonnative Speakers of English (Same as Ling 525) (3 0) Cr 3 Alt S offered 2005 *Prereq 511 or an introductory course in linguistics* Theoretical and practical issues and techniques in the

teaching of second language pronunciation listening and speaking skills to diverse student populations Topics will be relevant to those intending to teach in various situations including K 12 and adult learners in academic professional and vocational programs

Engl 526 Computer Assisted Language Learning (Same as Ling 526) (3 0) Cr 3 S *Prereq 511 and 513 or equivalent* Theory research and practice in computer use for teaching non native speakers of English Methods for planning and evaluating computer based learning activities

Engl 527 Discourse Analysis (Same as Ling 527) (3 0) Cr 3 S *Prereq 511 or an introductory course in linguistics* Methods and theoretical foundations for linguistic approaches to discourse analysis Applications of discourse analysis to the study of texts in a variety of settings including academic and research contexts

Engl 528 English for Specific Purposes (3 0) Cr 3 Alt F offered 2004 *Prereq 511 or an introductory course in linguistics* Issues and techniques in analyzing teaching and assessing English for specific purposes Topics include theories of specific purpose language use analysis of learner needs in target language contexts and syllabus and materials development for teaching and assessment

Engl 530 Research Tools and Tactics (3 0) Cr 3 Alt F offered 2003 *Prereq Graduate classification* Contemporary research methods in the library and online adjusted to the student s choice of subjects Reference tools and search methods for primary and secondary sources hands on experience with software books journals microforms interviews and the Internet

Engl 531 Topics in the Study of Literature (3-0) Cr 3 each time taken *maximum of 6 Alt S offered 2004 Prereq 6 credits in literature* Intensive study of literary genres periods movements or themes e g Literature and Historicism Narrating the Feminine Allegory

Engl 532 American Literature to 1865 (3-0) Cr 3 each time taken maximum of 6 Alt F offered 2004 *Prereq 6 credits in literature* Selected texts in American literature from Discovery to the Civil War Study may include Colonial and Revolutionary periods Early Republic and Jacksonian Era in critical and cultural contexts

Engl 533 British Literature to 1830 (3 0) Cr 3 each time taken maximum of 6 Alt S offered 2005 *Prereq 6 credits in literature* Selected texts from the Medieval Renaissance Restoration Eighteenth Century and/or Romantic periods in critical and cultural contexts

Engl 534 American Literature 1865 to the Present (3 0) Cr 3 each time taken maximum of 6 Alt F offered 2003 *Prereq 6 credits in literature* Selected texts in American literature from the Civil War to the present Study may include Realism Naturalism Modernism and Postmodernism with significant attention to race/ethnicity gender and identity and to contemporary critical views Range of authors and genres

Engl 535 British Literature 1830 to the Present (3 0) Cr 3 each time taken maximum of 6 Alt S offered 2004 *Prereq 6 credits in literature* Selected texts from the Victorian Edwardian Modernist and/or Contemporary periods in critical and cultural contexts

Engl 536 Postcolonial Literatures (3 0) Cr 3 each time taken maximum of 6 Alt F offered 2004 *Prereq 6 credits in literature* Colonial and postcolonial Anglophone literatures from various locations such as Africa Asia the Caribbean and the British Isles in critical and cultural contexts

Engl 538 Fiction (3 0) Cr 3 each time taken maximum of 6 Alt S offered 2005 *Prereq 6 credits in literature* Selected fiction writers in English range of authors and genres Emphasis on both male and female writers attention to the relationships between fiction and cultural change

Engl 539 Poetry (3-0) Cr 3 each time taken maximum of 6 Alt S offered 2004 *Prereq 6 credits in literature* Selected poets writing in English considered in representative groups Some emphasis on twentieth-century poets and poetics

Engl 540 Drama (3 0) Cr 3 each time taken maximum of 6 F *Prereq 6 credits in literature* Primary texts in dramatic genres from various literary periods in critical and cultural contexts Frequently concentrates on the English Renaissance and the Shakespearean stage

Engl 541 Autobiography Biography Memoir (3 0) Cr 3 each time taken maximum of 6 Alt S offered 2004 *Prereq 6 credits in literature* Study of lifewriting e g autobiography biography memoir cross genre writing autobiographical criticism Readings may be arranged by period nationality or subgenre (e g autobiography of childhood experience celebrity auto/biography)

Engl 544 Multicultural U S Literatures (3-0) Cr 3 each time taken maximum of 6 Alt S offered 2005 *Prereq 6 credits in literature* Primary texts by U S multicultural writers Development of U S literary traditions discourses of race and gender counter storytelling myths of origin phases and movements within the national literary canon Readings in several genres

Engl 545 Women s Literature (Same as W S 545) (3 0) Cr 3 each time taken maximum of 6 Alt F offered 2004 *Prereq 6 credits in literature* Primary texts by women writers historical thematic formal or theoretical approaches secondary readings e g Nineteenth Century Women Writers American Women s Personal Narratives Southern Women Writers of the U S

Engl 546 Issues in the Study of Literature (3 0) Cr 3 each time taken maximum of 6 Alt S offered 2005 *Prereq 6 credits in literature* Intensive study of current and emerging topics and problems concerning literature and its relationship to theory and to language study e g Theory of Metaphor Renegotiating the Canon Feminist Theory

Engl 547 The History of Rhetorical Theory I From Plato to Bacon (3-0) Cr 3 F *Prereq 6 credits in English* Rhetorical theory from the classical period of *ancient Greece and Rome through the Middle Ages* and the Renaissance attention to its relation to communication and pedagogy

Engl 548 The History of Rhetorical Theory II From Bacon to the Present (3 0) Cr 3 S *Prereq 6 credits in English* Rhetorical theory from the early modern period (Bacon Descartes and Locke) to the present attention to its relation to communication and pedagogy

Engl 553 Advanced Imaginative Writing The Long Project (3 0) Cr 3 each time taken maximum of 12 *Prereq Enrollment in the English M A Program* Individual long creative writing project ideas developed in course Portions of long creative writing project workshopped revised discussed in conferences

Engl 554 Advanced Imaginative Writing Fiction (3 0) Cr 3 each time taken maximum of 12 *Prereq Graduate classification* Individual projects in short fiction on a workshop and conference basis Readings in short fiction Discussion of elements of narrative such as plot point of view characterization theme setting

Engl 555 Advanced Imaginative Writing Nonfiction (3 0) Cr 3 each time taken maximum of 12 *Prereq Graduate classification* Individual projects in memoir immersion journalism character studies and/or the personal essay on a workshop and conference basis Readings in creative nonfiction

Engl 556 Advanced Imaginative Writing Poetry (3 0) Cr 3 each time taken maximum of 12 *Prereq Graduate classification* Individual projects in poetry on a workshop and conference basis Readings in poetry Discussion of poetic elements such as image sound internal structure rhythm tone figurative language

Engl 557 Studies in Creative Writing (3-0) Cr 3 each time taken maximum of 12 *Prereq Graduate classification* Special topics course on ideas issues and techniques in creative writing Subject matter may include specific genres aspects of the creative writing process or themes of particular interest Significant readings and written work required previous workshop experience helpful

Engl 558 Teaching Creative Writing (3 0) Cr 3 *Prereq Graduate classification* Pedagogical approaches that are effective for grade school through adult education creative writing teaching Writing exercises workshops text evaluation and visits from creative writers

Engl 559 Creative Writing Teaching Internship Cr 1 to 3 *Prereq Concurrent enrollment in 558 permission of participating instructors Students assist in an* introductory creative writing class Some supervised teaching but mainly evaluation of submissions and individual conferences Requirements and grades determined by participating instructors

Engl 583 Writing Manuals and Instructional Materials (3 0) Cr 3 Alt S offered 2005 *Prereq A course in business or technical communication* Application of rhetorical strategies to analysis and design of print and online instructions Principles and processes for developing business and technical manuals

Engl 584 Editing Principles and Practices (3-0) Cr 3 Alt S offered 2004 *Prereq 507* Principles of technical editing in business scientific and professional fields Emphasis on policymaking project management and methodology Both group and individual editing projects involving diverse fields audiences and formats

Engl 586 Visual Communication in Professional Writing (3-0) Cr 3 Alt F offered 2003 *Prereq A course in business or technical communication* Rhetorical theory and research in graphics document design and related principles of visual communication Methods of designing texts data displays illustrations and other visual elements in business and technical communication

Engl 587 Internship in Business Technical and Professional Communication (3 0) Cr 1 to 3 each *time taken maximum of 6 S Prereq 507 plus 3 additional graduate credits in business and technical writing or composition and rhetoric permission of instructor Limited to master s and doctoral degree candidates in the English Department* An opportunity to write edit and design business and technical documents in a professional setting Projects include reports proposals manuals brochures newsletters

Engl 588 Supervised Practicum in Teaching English as a Second Language (1 5) Cr 3 FS *Prereq 15 credits toward the TESL/Applied Linguistics master s degree* Intensive observation of ESL instruction and supervised practice in teaching learners of English in a context appropriate to the practicum student s goals Seminar discussion of observed practices in relation to language teaching theories and methods

Engl 590 Special Topics Cr var *Prereq Permission of the Graduate Studies Committee according to guidelines available in the department office*
A Literature
B Teaching English as a Second Language (TESL)/Linguistics same as Ling 590B)
C Composition and Rhetoric
E Rhetoric and Professional Communication
F Creative Writing

Engl 591 Studies in Applied Linguistics (Same as Ling 591) (3 0) Cr 3 each time taken maximum of 6 *Prereq 6 credits in TESL/linguistics* Intensive study of applied linguistic theory as it relates to specific issues in language acquisition teaching or use

Engl 592 Studies in Rhetoric and Professional Communication (3 0) Cr 3 each time taken maximum of 9 *Prereq 12 hours in rhetoric linguistics or literature excluding 104/105* Seminar on selected topics in rhetoric and professional communication or composition

Engl 599 Creative Component Cr 3 FS SS *Prereq Graduate classification, permission of major professor*

Courses for Graduate Students

Engl 601 Research Methods in Rhetoric and Professional Communication (3 0) Cr 3 Alt S offered 2004 *Prereq 6 graduate credits in English* Survey of the major qualitative and quantitative methods used in research on communication and language in academic and nonacademic settings

Engl 602 Research Design in Rhetoric and Professional Communication (3 0) Cr 3 Alt F offered 2004 *Prereq 601* A workshop for advanced graduate students in rhetoric and professional communication Focus on qualitative and/or quantitative methods

Engl 603 Advanced Pedagogy in Rhetoric and Composition Theory and Research (3 0) Cr 3 Alt S offered 2004 *Prereq 503 or 504* Exploration of relationships between theory and practice in current pedagogy Examination of poststructuralist theories and their impact on current pedagogical practice Participation in pedagogical research and theory building

Engl 611 Topics in the History of Rhetorical Theory (3 0) Cr 3 each time taken Alt F offered 2003 *Prereq 547 or 548* Rhetorical theory criticism and/or practice in relation to a historical period the historical development of a rhetorical concept

Engl 621 Topics in Current Rhetorical Theory (3 0) Cr 3 each time taken S *Prereq 503 or 506* Aspects of current rhetorical theory criticism and practice

Engl 699 Research Cr variable FS SS *Prereq Graduate classification permission of major professor* Research

Interpersonal and Rhetorical Communication (Sp Cm)

(Administered by the Department of English)

The following courses are part of the Speech Communication program For more information refer to that section Sp Cm 110 171 212 223 290 298 305 312 313 321 322 323 324 325 327 398 404 410 412 416 417 490 493 495A 495B 497 499 504 513 590

Entomology

www ent iastate edu

Joel Coats Chair of Department

Professors Baker Coats DeWitt D Lewis Obrycki Rice Rowley Tollefson Wintersteen

Professors (Collaborators) Enan L Lewis

University Professors (Emeritus) Pedigo

Professors (Emeritus) Guthrie Hart Krafsur R Lewis Mutchmor Showers Stockdale

Associate Professors Bonning Courtney Holscher Jurenka

Associate Professors (Collaborators) Perich

Assistant Professors Beetham

Assistant Professors (Collaborators) Cosse Hellmich

Instructors (Adjunct) VanDyk

Undergraduate Study

For undergraduate curriculum in entomology see *College of Agriculture Curricula*

The undergraduate curriculum in entomology is designed for persons interested in studying insects their adaptations and the practicalities of dealing with them Students electing entomology as a major will prepare themselves for positions in industry business government education and public health Graduates may acquire positions in research development and technical sales for agricultural chemical and seed companies State and federal agencies employ entomologists as consultants extension directors mosquito abatement agents inspectors and research aides Entomologists may also find employment with urban or agricultural pest management or consulting firms large private farms and ranches and horticultural nurseries

All graduates understand the principles of insect structure and function They understand the evolutionary and ecological relationships of insects with other life forms and the impact of insects relative to human and animal health as well as the relationships between insects and humanity s food fiber structural and aesthetic needs and expectations Graduates understand the principles and methods available to manage beneficial and pest insect populations They are skilled in identifying insects and related groups and understand the biology ecology behavior diversity and evolutionary relationships of the major groups of insects They understand the application of the scientific method in problem solving and the principles of experimental design and analysis Graduates are able to communicate research and educational materials properly and competently - orally visually and in writing and are able to work effectively with others

Graduates of the agricultural and horticultural insect management option are skilled in determining pest levels and impact on plant and animal hosts and the management of these pests They understand the environmental legal and ethical issues involved in insect population management

Graduates of the insect biology option have achieved an understanding of the biochemical and physiological processes governing insect metabolism growth and form They understand the evolutionary and ecological significance of insects They also have a broad background in the biological sciences Assuming good academic performance graduates of this option are prepared to enter graduate or professional schools

Entomology participates in the interdepartmental undergraduate majors in plant health and protection and in integrated pest management

The department offers a minor in entomology that may be earned by completing 370 374 376 and 6 credits in courses selected from an approved list supplied by the department

A preveterinary program is available in entomology

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with a major in entomology or toxicology Within the entomology major the student may concentrate in aquatic entomology biological control chemical ecology genetics forest entomology host plant resistance medical/veterinary entomology morphology pathology pest management physiology population ecology/genetics systematics or insecticide toxicology

Graduates have a broad understanding of entomology and related disciplines and an in-depth command of their area of concentration They are able to communicate effectively with scientific colleagues and the general public in both formal and informal settings Graduates are able to address complex problems facing entomology or toxicology professionals taking into account related ethical social legal economic and environmental issues They are skilled in research methods data analyses and interpretation of results They also are skilled in working effectively with their colleagues and writing concise and persuasive grant proposals They have an understanding of and can critically evaluate current entomological literature

Prerequisite to the entomology major and to minor graduate work in the department is completion of at least two years of zoological courses for part of which credit in other closely allied biological sciences may be substituted Specific course requirements for advanced degrees depend partly upon previous training and experience in the major field of specialization

Any student receiving the M S in entomology shall have at least one course in insect physiology one course in insect systematics two courses of Ent 590 (selected from topics A through D F through I M and N inclusive) and at least 1 credit of Ent 600 Any student receiving the Ph D in entomology shall have at least one course in insect physiology one course in insect systematics four additional courses of Ent 590 (selected from topics A through D and F through I L through N inclusive) and at least 1 credit of Ent 600 In addition Ph D students majoring either in Entomology or Toxicology shall have two semesters of teaching experience taken as Ent 590K both semesters or Ent 590K one semester and Ent 590L the other semester

Entomology participates in the interdepartmental majors in ecology and evolutionary biology and genetics and in the interdepartmental major and minor in toxicology (see *Index*)

The Federal Corn Insects and Crop Genetics Research Unit and the North Central Plant Introduction Station are available for advanced study in certain phases of entomological research

More information about the department such as current research faculty resumes physical facilities and graduate students can be viewed on the department s world wide web page

Courses open for nonmajor graduate credit 370 372 374 376 386 483 493

Courses Primarily for Undergraduate Students

Ent 110 Technical Lecture (1-0) Cr R F Orientation to areas of and opportunities in entomology

Ent 201 Introduction to Insects (1 0) Cr 1 FS SS 5 weeks S Classroom section spring only World Wide Web section of course offered all semesters Obrycki Van Dyk Biological and ecological aspects of insects

Ent 211 Insects and Society (3 0) Cr 2 FS SS 11 weeks S Classroom section spring only World Wide Web section offered all semesters *Prereq 201* Holscher/Obrycki Van Dyk The importance of insects in human well being Insect human interactions Primarily for nonscience and nonagriculture majors

Ent 212 Livestock Entomology (3-0) Cr 1 S 5 weeks *Prereq 201* Holscher Overview of the biology ecology and economic importance of the insects that affect livestock production

Ent 214 Ecologically based Management of Horticultural Pests (3-0) Cr 1 F 5 weeks *Prereq 201* Obrycki Overview of ecologically-based management of pest and beneficial insects in horticultural crops

Ent 283 Pesticide Applicator Certification (Same as Agron 283 For 283 Hort 283 Pl HP 283 P M 283) (2 0) Cr 2 S Holscher Core background and specialty topics in agricultural forestry and horticultural pesticide applicator certification Students select certification categories and are eligible for pesticide applicator certification upon completion of course Commercial certification emphasized

Ent 360 Insect Behavior (Dual listed with 560) (3 0) Cr 3 S *Prereq Biol 202* Baker The mechanisms underlying the behavior of insects emphasis on neuroethological and evolutionary bases of insect orientation reproduction feeding oviposition defense learning and sociality

Ent 370 Insect Biology (2-3) Cr 3 F *Prereq Biol 109 or 201* Jurenka Structure physiology evolution behavior life histories and recognition of insects Collection required Voluntary field trips Nonmajor graduate credit

Ent 371l Introduction to Insect Ecology (Same as Ia LL 371l) See *Iowa Lakeside Laboratory*

Ent 372 Livestock Entomology (2 0) Cr 2 Alt S offered 2005 ICN and Videotape sections 12 weeks Holscher Recognition biology behavior economic importance and management of insects and other arthropods affecting livestock and poultry production Nonmajor graduate credit

Ent 374 Insects and Our Health (Same as Biol 374 Micro 374) (3 0) Cr 3 S *Prereq 3 credits in biological sciences* Rowley Identification biology and significance of insects and arthropods that attack people and animals particularly those that are vectors of disease Nonmajor graduate credit

Ent 375 Plant Protection Using Natural Enemies (Dual listed with 575) (3-0) Cr 3 Alt S offered 2004 *Prereq 370 or 376* Bonning Obrycki Overview of the biology ecology and classification of insect pathogens predators and parasitoids Discussion of the use of these organisms in plant protection including an emphasis on genetic alteration of natural enemies

Ent 376 Fundamentals of Entomology and Pest Management (Same as P M 376 and Pl HP 376) (2 3) Cr 3 FS *Prereq Biol 109 or 201* Tollefson Introduction to entomology and insect pest management including life processes ecology economics tactics of population suppression and ecological backlash Credit for either 376 or 386 but not both may be applied toward graduation Nonmajor graduate credit

Ent 386 Management of Insect Pests (2-0) Cr 2 Alt S offered 2004 *Prereq Biol 109 or 201* Tollefson Introduction to insects and their lifestyles Theory and application of pest-management practices Examples drawn primarily from field crops Nonmajor graduate credit Credit for either 376 or 386 but not both may be applied for graduation

Ent 425 Aquatic Insects (Dual listed with 525 same as A Ecl 425) (2 3) Cr 3 Alt S offered 2005 *Prereq Biol 312 or equivalent* Courtney Morphology ecology diversity and significance of aquatic insects with emphasis on the collection curation and identification of taxa in local streams and lakes

Ent 452 Integrated Management of Diseases and Insect Pests of Turfgrasses (Dual listed with 552 same as Pl P 452 Hort 452) (3 0) Cr 3 Alt S offered 2004 *Prereq Hort 351* Gleason Lewis Identification and biology of important diseases and insect pests of turfgrasses Development of integrated pest management programs in various turfgrass environments

Ent 478 Global Protozoology - Molecular Biology of Protozoa (Dual listed with 578 same as V Pth 478) See *Veterinary Pathology* Graduate credit given for 578

Ent 483 Wood Deterioration and Preservation (Same as For 483) See *Forestry* Nonmajor graduate credit

Ent 490 Independent Study Cr 1 to 3 each time taken *Prereq 15 credits in biological sciences junior or senior classification* A maximum of 6 credits of 490 may be used toward the total of 128 credits required for graduation
E Research or work experience
U Laboratory teaching experience For students registering to be undergraduate laboratory assistants

Ent 493 Workshop on Insect Management Cr 1 SS *Prereq 370 372 376 or 386* Tollefson Holscher Insect recognition and sampling will be practiced in agricultural systems The applications of current pest management practices will be demonstrated in both crop and livestock systems Nonmajor graduate credit

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Ent 511 Integrated Management of Tropical Crops (Same as Pl P 511) See *Plant Pathology*

Ent 525 Aquatic Insects (Dual listed with 425 same as A Ecl 525) (2 3) Cr 3 Alt S offered 2005 *Prereq Biol 312 or equivalent* Courtney Morphology ecology diversity and significance of aquatic insects with emphasis on the collection curation and identification of taxa in local streams and lakes

Ent 530 Ecologically Based Pest Management Strategies (Same as SusAg 530) See *Sustainable Agriculture*

Ent 550 Pesticides in the Environment (Same as Tox 550) (2 0) Cr 2 S *Prereq Graduate classification* Coats Fate and significance of pesticides in soil water plants animals and the atmosphere

Ent 552 Integrated Management of Diseases and Insect Pests of Turfgrasses (Dual listed with 452 same as Pl P 552 Hort 552) (3 0) Cr 3 Alt S offered 2004 *Prereq Hort 351* Gleason Lewis Identification and biology of important diseases and insect pests of turfgrasses Development of integrated pest management programs in various turfgrass environments

Ent 555 Insect Physiology (3 3) Cr 4 S *Prereq 370* Jurenka Life processes of the insects including reviews of current problems in insect physiology

Ent 560 Insect Behavior (Dual listed with 360) (3 0) Cr 3 S *Prereq Biol 202* Baker The mechanisms underlying the behavior of insects emphasis on neuroethological and evolutionary bases of insect orientation reproduction feeding oviposition defense learning and sociality

Ent 568 Advanced Systematics (Same as Bot 568) See *Botany*

Ent 570 Host Plant Resistance to Insects (2 0) Cr 2 Alt S offered 2004 *Prereq 370 or 376* Tollefson Principles of insect and host interactions and mechanisms of insect control by host plant resistance

Ent 573 Advanced Insect Pest Management (3 3) Cr 4 Alt S offered 2005 *Prereq 370* Tollefson Contemporary concepts of insect biology and applications of insect population management

Ent 574 Medical Entomology (3 3) Cr 4 Alt S offered 2004 *Prereq 9 credits in biological sciences* Rowley Identification biology and significance of insects and other arthropods that attack people and animals particularly those that are vectors of disease

Ent 575 Plant Protection Using Natural Enemies (Dual listed with 375) (3 0) Cr 3 Alt S offered 2004 *Prereq 370 or 376* Bonning Obrycki Overview of the biology ecology and classification of insect pathogens predators and parasitoids Discussion of the use of these organisms in plant protection including an emphasis on genetic alteration of natural enemies

Ent 576 Systematic Entomology (3-6) Cr 5 Alt F offered 2003 *Prereq 370* Courtney Classification distribution and natural history of insects including fundamentals of phylogenetic systematics biogeography taxonomic procedures and insect collection and curation

Ent 578 Global Protozoology Molecular Biology of Protozoa (Dual listed with 478 same as V Pth 578) See *Veterinary Pathology*

Ent 580 Sustainable Agriculture Seminar (Same as An S 580) See *Animal Science*

Ent 590 Special Topics Cr 1 to 3 each time taken *Prereq 15 credits in zoological sciences*
A Biological Control and Pathology
B Chemical Ecology and Behavior
C Ecology and Pest Management
D Evolution and Systematics
E Special Research Topics
F Medical and Veterinary Entomology
G Molecular Entomology
H Morphology and Physiology
I Toxicology and Biochemistry
K Teaching Experience
L Extension Internship
M Immature Insects
N Insect Genetics

Courses for Graduate Students

Ent 600 Seminar Cr 1 FS SS Presentation of research results

Ent 671 Insect Ecology (2 3) Cr 3 Alt F offered 2004 *Prereq 370 Biol 312 Stat 401* Concepts of insect population dynamics emphasizing sampling outbreaks analysis and bioeconomics

Ent 673 Advanced Plant Protection Using Natural Enemies (2 3) Cr 3 Alt S offered 2005 *Prereq 375 or 575* Bonning Obrycki The ecological physiological and genetic bases of biological control including consideration of both micro and macro organisms used in plant protection Genetic engineering of insect natural enemies for insect pest suppression Review of case histories

Ent 675 Insecticide Toxicology (Same as Tox 675) (2 3) Cr 3 Alt F offered 2004 *Prereq 555 or Tox 501* Coats Principles of insecticide toxicology classification mode of action metabolism and environmental effects of insecticides

Ent 699 Research Cr var

Entrepreneurial Studies

(Interdepartmental Undergraduate Minor)

Supervisory Committee Howard E Van Auken (Business) Chair D Draper (Vet Med) Eric O Hoiberg (Ag) Pat Patterson (Engineering) Linda Niehm (Family & Cons Science) Kate Schwensen (Design) Peter Orazem (LAS) Roger A Smith (Education)

Entrepreneurial Studies is an interdisciplinary program that provides opportunities to students to learn about entrepreneurship—the starting of new business ventures It serves to complement the student s major area of study whether it be electrical engineering horticulture textiles and clothing or veterinary medicine by offering a means of putting theory and science into practice The goal of the Entrepreneurial Studies program is to provide the knowledge and skills needed to start and manage new ventures In addition to feasibility analysis and business planning the program deals with the topics of innovation technology transfer industry analysis and competitive strategy Although the program introduces some fundamental concepts from accounting finance marketing and management it does not attempt to substitute for any business courses in these areas

A minor in entrepreneurial studies is available to all undergraduate students at ISU (Students majoring in the College of Business may major or minor in Management with an option in Entrepreneurship and Strategy and are thus not eligible for the entrepreneurial studies minor) Students must follow college specific rules in selecting courses and must consult with the representative of that college to the Entrepreneurial Studies Supervisory Committee The college representatives to the supervisory committee will be responsible for advising students in their college and will inform students about the details of the college rules

Minor
A student seeking a minor in entrepreneurial studies must successfully complete a minimum of 15 credits in courses approved for use in the entrepreneurial studies program including the two required courses Management 310 and 313 Management 310 *Entrepreneurship and Innovation* is the introductory course and provides an overview of the entire field Management 313 *Feasibility Analysis and Business Planning* serves as the capstone course through its emphasis on developing an idea for a new venture conducting a feasibility study researching the potential market analyzing the competition and preparing a formal business plan Up to six of the 15 credits required for the minor may also be used in the student s required program of study Interested students should see a representative of the Entrepreneurial Studies Supervisory Committee in the college of their primary major for the list of approved courses

Environmental Science

www ensci iastate edu

(Interdepartmental Undergraduate Program)

William G Crumpton Coordinator

Environmental Science provides an integrated quantitative and interdisciplinary approach to the study of environmental systems The magnitude and

complexity of environmental problems are creating a growing need for scientists with rigorous interdisciplinary training in environmental science The Environmental Science curriculum is designed to prepare students for positions of leadership in this rapidly changing discipline Environmental Science graduates have a solid foundation in biological and physical natural sciences and the specialized training necessary for integrated analysis of environmental systems Scientific rigor is stressed throughout the program beginning with the foundation courses in the first two years of the curriculum The upper level core courses emphasize a dynamic systems approach that provides a framework for integrating physical chemical and biological aspects of environmental systems

The Environmental Science major is offered through both the College of Agriculture and the College of Liberal Arts and Sciences Environmental Science majors complete foundation courses in biology chemistry earth science geology physics and mathematics plus a major consisting of an integrated core of Environmental Science courses and additional advanced course work in Environmental Science General requirements for the major are outlined below and additional information is available in the Environmental Programs Office 131 Bessey Hall

Students seeking an Environmental Science major complete the following (1) A foundation of approved supporting courses in science and mathematics including biology chemistry earth science physics calculus and statistics (2) Twenty nine credits of course work in the major including the Environmental Science core (EnSci 295 330 402 403 404 and 495) and 12 additional credits of approved course work in Environmental Science A combined average grade of C or higher is required in courses applied in the major (3) Practical experience consisting of EnSci 290 390 or equivalent experience

English proficiency requirement Beyond first year composition (Engl 104 and 105) Environmental Science majors must demonstrate proficiency in written communication by completing an approved advanced course and maintaining a portfolio of term papers and other major writing assignments for departmental evaluation

A minor in Environmental Science may be earned by completing 15 credits in Environmental Science including EnSci 330 and at least 7 credits from EnSci 402 403 and 404

Courses open for nonmajor graduate credit 301 330 345 402 402l 403 404 405 410 410L 411 422 422l 434 461l 473 473l 475 485 487

Courses Primarily for Undergraduate Students

EnSci 290 Apprenticeship Cr Var Staff *Prereq Approval of the Environmental Science Coordinator* Practical experience in an approved setting such as a research laboratory government office or private office This should be completed prior to being classified as a senior or completing EnSci 390 Offered on a satisfactory fail grading basis only

EnSci 295 Sophomore Seminar (1 0) Cr R F Burras *Prereq Sophomore classification in EnSci* Discussion of current issues in Environmental Science Offered on a satisfactory fail grading basis only

EnSci 301 Forest Ecology and Soils (Same as NREM 301) See *Natural Resource and Ecology Management* Nonmajor graduate credit

EnSci 304l Physical Geology (Same as Ia LL 304l) See *Iowa Lakeside Laboratory*

EnSci 312 Ecology (Same as Biol 312) See *Biology*

EnSci 312l Ecology (Same as Ia LL 312l) See *Iowa Lakeside Laboratory*

EnSci 330 Environmental Systems (Same as Bot 330 Env S 330 Micro 330) (2 4) Cr 4 F *Prereq Biol 202 or Micro 201 Chem 164 167 or 178 Math 165 or 181* Crumpton Introduction to the dynamics of metabolic and biogeochemical processes in environmental systems emphasizing microbial processes Environmental factors controlling major autotrophic and heterotrophic processes of microbes and higher organisms Laboratory emphasizes mass balance analysis and environmental simulation modeling Nonmajor graduate credit

EnSci 345 Natural Resource Photogrammetry and Geographic Information Systems (Same as NREM 345) (2 3) Cr 3 F *Prereq Junior classification* Use of aerial photos and remotely sensed imagery in resource management Training in techniques of photo measurement interpretation and use of Geographic Information Systems (GIS) Principles of remote sensing Nonmajor graduate credit

EnSci 360 Environmental Soil Science (Same as Agron 360) (2 3) Cr 3 S *Prereq Agron 260 or Geol 100 or 201* Burras Killorn Application of soil science to contemporary environmental problems comparison of the impacts that different management strategies have on short and long term environmental quality and land development Emphasis on participatory learning activities

EnSci 390 Internship in Environmental Science Cr var *Prereq Approval of the Environmental Science coordinator* Supervised off campus work experience in the field of environmental science Offered on a satisfactory fail grading basis only

EnSci 402 Watershed Hydrology and Surficial Processes (Same as Agron 402 For 402 Geol 402) (3 3) Cr 4 F *Prereq Credit or enrollment in EnSci 330 or Geol 100 or 201 Math 165 or 181* Burras Simpkins Examination of watersheds as systems wherein biological and physical factors control hydrology soil formation and nutrient transport Laboratory emphasizes field investigation of watershed scale processes Nonmajor graduate credit

EnSci 402l Watershed Hydrology and Surficial Processes (Same as Ia LL 402l) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

EnSci 403 Environmental Biogeochemistry (Same as Bot 403 Geol 403) (3 2) Cr 4 S *Prereq EnSci 330 and 402 or 402l* Fang Raich Biological chemical and physical phenomena controlling material energy and elemental fluxes in the environment Human interactions with and effects on environmental systems Nonmajor graduate credit

EnSci 404 Global Change (Same as Agron 404 Env S 404 Mteor 404) (3 0) Cr 3 S *Prereq Four courses in physical or biological sciences or engineering* Takle Recent changes in global biogeochemical cycles and climate models of future changes in the climate system impacts of global change on agriculture water resources and human health ethical issues of global environmental change Nonmajor graduate credit

EnSci 405 GIS and Natural Resources Management (Same as A E 405) (2-2) Cr 3 F *Prereq Working knowledge of computers and Windows environment* Introduction to fundamental concepts and applications of GIS in natural resources management with specific focus on watersheds Topics include basic GIS technology data structures database management spatial analysis and modeling visualization and display of natural resource data Case studies in watershed and natural resource management using ArcView GIS Nonmajor graduate credit

EnSci 410 Aquatic Ecology (Same as A Ecl 410 Bot 410) (3 0) Cr 3 F *Prereq 301 312 or 330* Structure and function of aquatic ecosystems with application to fishery and pollution problems Emphasis on lacustrine riverine and wetland ecology Nonmajor graduate credit

EnSci 410L Aquatic Ecology Laboratory (Same as A Ecl 410L Bot 410L) (0 3) Cr 1 F *Prereq Concurrent enrollment in 410* Field trips and laboratory exercises to accompany 410 Hands-on experience with aquatic research and monitoring techniques and concepts Nonmajor graduate credit

EnSci 411 Hydrogeology (Same as Geol 411) (3-2) Cr 4 F *Prereq Geol 100 or 201 Math 165 or 181 Phys 111 or 221* Simpkins Physical principles of groundwater flow nature and origin of aquifers and confining units well hydraulics and containment transport Lab emphasizes applied field and laboratory methods for hydrogeological investigations Nonmajor graduate credit

EnSci 422 Environmental Geochemistry (Same as Geol 422) (2 2) Cr 3 F *Prereq 402 or 411 or equivalent* Geochemistry of natural waters including inorganic and organic constituents and water rock interactions Interpretation of water quality data Geochemical equilibrium modeling and introduction to kinetics Laboratory emphasizes chemical analysis of waters and computer modeling Nonmajor graduate credit

EnSci 422l Prairie Ecology (Same as Ia LL 422l) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

EnSci 434 Contaminant Hydrogeology (Same as Geol 434) (3 0) Cr 3 S *Prereq 411 or equivalent* Brief review of organic and inorganic contaminants in industrial and agricultural settings Process-oriented approach to abiotic and biological fate and transport of contaminants Investigation of coupled processes (diffusion advection dispersion sorption biodegradation) using computer models Groundwater remediation strategies Nonmajor graduate credit

EnSci 446 Integrating GPS and GIS for Natural Resource Management (Same as NREM 446) (2 3) Cr 3 S *Prereq 12 credits in student's major at 300 level or above* Emphasis on the use of GPS as a data collection tool for GIS Basic theory of GPS Use of Global Positioning System technology for spatial data collection and navigation Post processing and real time correction of GPS data GPS data transfer to GIS for mapping applications Use of GIS to construct waypoints for use in GPS navigation

EnSci 459 Environmental Soil and Water Chemistry (Same as Agron 459) (3 0) Cr 3 Alt F offered 2003 *Prereq 401 or Agron 354 Chem 210 or 211* An introduction to the chemical properties of soils chemical reactions and transformations occurring in the soils and their impact on the environment Topics include composition of soils acid base equilibria buffer systems mineral dissolution and precipitation speciation ion exchange redox reactions absorption phenomena soil pollution and chemical equilbria computer programs

EnSci 461l Introduction to GIS (Same as Ia LL 461l) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

EnSci 473 Soil Genesis and Landscape Relationships (Same as Agron 473) (2 3) Cr 4 S *Prereq 402 or Agron 154* Sandor Relationships between soil formation geomorphology and environment Soil description classification geography mapping and interpretation for land use Two weekend field trips Credit for 473 or 473l may be applied for graduation not both Nonmajor graduate credit

EnSci 473l Soil Genesis and Landscape Relationships (Same as Ia LL 473l) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

EnSci 475 Surficial Processes (Same as Geol 475) (2 2) Cr 3 F *Prereq Geol 100 or 201 or equivalent experience* Iverson Study of surficial processes in modern and ancient geological environments Topics include weathering sediment transport and landform genesis with emphasis on fluvial glacial hillslope eolian and coastal processes Applications to engineering and environmental problems Laboratory emphasizes aerial photo and topographic map interpretation Nonmajor graduate credit

EnSci 485 Soil Microbial Ecology (Same as Agron 485 Micro 485) (2 3) Cr 3 F *Prereq Agron 154 Micro 201 (Micro 203 recommended)* Loynachan The living organisms in the soil and what they do Emphasis on soil plant microbial relationships and environmental issues Nonmajor graduate credit

EnSci 487 Aquatic and Wetland Microbial Ecology (Same as Bot 487 Micro 487) (3 0) Cr 3 S *Prereq 6 credits in biology and 6 credits in chemistry* Crumpton Introduction to major functional groups of autotrophic and heterotrophic microorganisms and their roles in aquatic and wetland ecosystems Emphasis on energy flow and nutrient dynamics Nonmajor graduate credit

EnSci 490 Independent Study Cr Var *Prereq Permission of the instructor and approval of the Environmental Science coordinator*

EnSci 495 Current Topics and Case Studies in Environmental Science Cr 1 to 3 each time taken maximum of 3 credits S Schultz Current topics and case studies related to the analysis and management of environmental systems Open to Environmental Science majors only 495B will include field trips and cooperative group projects to assess environmental problems in heavily impacted landscapes and develop alternative management plans
A (1 0) Cr 1 each time taken *Prereq Junior classification in Environmental Science*
B (1 2) Cr 2 *Prereq Senior classifcation in Environmental Science*

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

EnSci 505I Watershed Modeling and GIS (Same as Ia LL 505I) See *Iowa Lakeside Laboratory*

EnSci 508I Aquatic Ecology (Same as Ia LL 508I) See *Iowa Lakeside Laboratory*

EnSci 513 EcologicalToxicology (Same as A Ecl 513) See *Animal Ecology*

EnSci 518 Stream Ecology (Same as A Ecl 518) See *Animal Ecology*

EnSci 535 Restoration Ecology (Same as A Ecl 535) See *Animal Ecology*

EnSci 535I Restoration Ecology (Same as Ia LL 535I) See *Iowa Lakeside Laboratory*

EnSci 544 AquaticToxicology (Same as A Ecl 544) See *Animal Ecology*

EnSci 564 Wetland Ecology (Same as Bot 564) See *Botany*

EnSci 564I Wetland Ecology (Same as Ia LL 564I) See *Iowa Lakeside Laboratory*

EnSci 584 Ecosystem Ecology (Same as Bot 584) See *Botany*

Environmental Studies

www envs iastate edu

(Interdepartmental Undergraduate Program)

William G Crumpton Coordinator

The Environmental Studies Program deals with the relationship between humans and nature or between humans and natural systems The curriculum is designed to give students an understanding of regional and global environmental issues and an appreciation of different perspectives regarding these issues Courses are provided for students pursuing careers related to the environment and for others who simply want to know more about environmental issues In addition students in any college may elect to take a secondary major or minor in Environmental Studies Additional information is available in the Environmental Programs Office 131 Bessey Hall

Secondary Major

The Environmental Studies secondary major is taken in addition to one s first major and provides the breadth of preparation and integrated perspective necessary to understand environmental issues Students seeking a major in Environmental Studies complete 24 credits of Env S coursework including (1) at least one general survey course chosen from Env S 101 120 123 and 201 (2) at least one integrative/ issues course chosen from Env S 324 340 342 404 424 and 450 and (3) at least two human/societal perspectives courses chosen from Env S 303 334 345 380 382 472 482 484 and 491 Beyond these three requirements any Environmental Studies course and up to six credits of approved departmental coursework may be applied toward the 24 credit total for the major Regardless of their home college Environmental Studies majors must complete 12 credits of approved coursework in natural science including coursework from life sciences and physical sciences Since Environmental Studies is a secondary major courses used in the major may also be used to satisfy general education and other requirements of departments and colleges A combined average grade of C or higher is required in courses applied to the major

Minor

Students seeking a minor in Environmental Studies complete 15 credits in Environmental Studies courses including (1) at least one general survey course chosen from Env S 101 120 123 and 201 (2) at least one integrative/ issues course chosen from Env S 324 340 342 404 424 and 450 and (3) at least one human/societal perspectives course chosen from Env S 303 334 345 380 382 472 482 484 and 491 Beyond these three requirements any Environmental Studies course may be applied toward the 15 credit total for the minor A combined average grade of C or higher is required in courses applied to the minor and the minor must include at least 9 credits that are not used to meet any other department college or university requirement

Courses open for nonmajor graduate credit 303 330 334 342 404 407 415 421 461I 472 480I 482

Courses Primarily for Undergraduate Students

Env S 101 Environmental Geology Earth in Crisis (Same as Geol 101) (3-0) Cr 3 or (3 1) Cr 4 FS Windom An introduction to geologic processes and the consequences of human activity from local to global scales Discussion of human population growth resource depletion pollution and waste disposal global warming and ozone depletion desertification and geologic hazards such as earthquakes landslides flooding and volcanism

Env S 108 Introduction to Oceanography (Same as Geol 108) (3 0) Cr 3 S Surge Introduction to study of the oceans Ocean exploration Waves and currents Shape structure and origin of the ocean basins Sedimentary record of oceanic life Composition of seawater and its significance for life Ocean circulation and its influence on climate Life of the oceans including coral reefs Use and misuse of ocean resources Anthropogenic impacts on the oceanic environment

Env S 120 Introduction to Renewable Resources (Same as Agron 120 AST 120 NREM 120) (3 0) Cr 3 FS Overview of soil water plants and animals as renewable natural resources in an ecosystem context History and organization of resource management Concepts of integrated resource management

Env S 123 Environmental Biology (Same as Biol 123) (3 0) Cr 3 FS An introduction to the structure and function of natural systems at scales from the individual to the biosphere and the complex interactions between humans and their environment Discussions of human population growth biodiversity sustainability resource use and pollution

Env S 201 Introduction to Environmental Issues (4 0) Cr 2 FS First 8 weeks *Prereq Sophomore classification* Ecological and human/societal dimensions of environmental issues how humans and their institutions interact with and affect the environment how societies are affected by environmental change Selected issues such as human population growth loss of biodiversity and effects of agriculture on the environment

Env S 293 Environmental Planning (Same as C R P 293 Dsn S 293) (3 0) Cr 3 F *Prereq Sophomore classification* Comprehensive overview of the field of environmental relationships and the efforts being made to organize control and coordinate environmental aesthetic and cultural characteristics of land air and water

Env S 303 Great Environmental Writings (4-0) Cr 2 FS Second 8 weeks Students will read works by such authors as Thoreau Muir Leopold and Abbey Nonmajor graduate credit

Env S 324 Energy and the Environment (Same as Geol 324 Mteor 324) (3 0) Cr 3 S Renewable and non renewable energy resources Origin occurance and extraction of fossil fuels Nuclear wind and solar energy Energy efficiency Environmental effects of energy production including air pollution acid precipitation and global change

Env S 330 Environmental Systems (Same as Bot 330 EnSci 330 Micro 330) (2-4) Cr 4 F *Prereq Biol 202 or Micro 201 Chem 164 167 or 178 Math 165 or 181* Crumpton Introduction to the dynamics of metabolic and biogeochemical processes in environmental systems emphasizing microbial processes Environmental factors controlling major autotrophic and heterotrophic processes of microbes and higher organisms Laboratory emphasizes mass balance analysis and environmental simulation modeling Nonmajor graduate credit

Env S 334 Environmental Ethics (Same as Phil 334) (3 0) Cr 3 F *Prereq Three credits in philosophy or junior classification* Thorough study of some of the central moral issues arising in connection with human impact on the environment e g human overpopulation species extinction forest and wilderness management pollution Several world views of the proper relationship between human beings and nature will be explored Nonmajor graduate credit

Env S 340 Biodiversity (Same as Bot 340) (4 0) Cr 2 S Second 8 weeks *Prereq One course in life sciences* Clark Survey of the major groups of organisms and biological systems Definition measurement and patterns of distribution of organisms Sources of information about biodiversity Not intended for major credit in the biological sciences

Env S 342 World Food Issues Past and Present (Same as Agron 342 FS HN 342 T SC 342 U St 342) (3 0) Cr 3 S Salvador World food problems in context of historical development of agriculture in major cradles of civilization Emphasis on population trends and socioeconomic policies to understand disparities between potential agricultural production and present energy and nutritional deficiencies in key areas of the developing world Team projects Nonmajor graduate credit

Env S 345 Population Problems and Society (Same as Soc 345) (3 0) Cr 3 F *Prereq Soc 130 or 134* Human overpopulation impact on food resources and services population growth and development trends of births deaths and geographic movement projecting future population population control and family planning population policies and laws comparison of the United States with other societies throughout the world

Env S 380 Environmental and Resource Economics (Same as Econ 380) (3 0) Cr 3 F *Prereq Econ 101* Natural resource availability use conservation and government policy including energy issues Environmental quality and pollution control policies

Env S 382 Environmental Sociology (Same as Soc 382) (3 0) Cr 3 FS *Prereq Soc 130 134 or Env S 201* Environment society relations social construction of nature and the environment social and environmental impacts of resource extraction production and consumption environmental inequality environmental mobilization and movements U S and international examples

Env S 390 Internship in Environmental Studies Cr var *Prereq Approval of the Environmental Studies Coordinator* Practical experience with nature centers government agencies schools private conservation groups and other organizations Offered on a satisfactory fail grading basis only

Env S 404 Global Change (Same as Agron 404 EnSci 404 Mteor 404) (3 0) Cr 3 S *Prereq 4 courses in physical or biological sciences or engineering* Takle

Recent changes in global biogeochemical cycles and climate models of future changes in the climate system impacts of global change on agriculture water resources and human health ethical issues of global environmental change Nonmajor graduate credit

Env S 407 Watershed Management (Same as NREM 407) (3-3) Cr 4 S *Prereq A course in general biology* Managing human impacts on the hydrologic cycle Field and watershed landscape best manage ment practices for modifying the impacts on water quality quantity and timing are discussed Field project includes developing a management plan using landscape buffers Nonmajor graduate credit

Env S 415 Environmental Studies Seminar (1-0) Cr 1 each time taken Offered on an irregular basis *Prereq Junior classification* Current or historic topics in Environmental Studies Nonmajor graduate credit

Env S 421 Field Seminar (0 6) Cr 1 to 2 Offered on an irregular basis Field trips during semester or break to varied sites of environmental interest in or outside of Iowa preceded by readings lectures and examinations about the areas to be visited Nonmajor graduate credit

Env S 424 Sustainable and Environmental Horticulture Systems (Same as Hort 424) (2 0) Cr 2 F Inquiry into ethical issues and environmental consequences of horticultural cropping systems and production practices Emphasis on production systems that are resource efficient environmentally sound socially acceptable and profitable

Env S 450 Issues in Sustainable Agriculture (Same as Agron 450) (2 0) Cr 2 F Salvador Agricultural science as a human activity contemporary agricultural issues from agroecological perspective Comparative analysis of intended and actual consequences of development of industrial agricultural practices

Env S 461I Introduction to GIS (Same as Ia LL 461I) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

Env S 472 American Environmental History (Same as Hist 472) (3 0) Cr 3 F *Prereq Sophomore classification* Taylor Conceptual approach to human history in North America by examining the impact of nature from precontact through the 20th century Explores material interactions intellectual modes aesthetic relationships and management strategies from aboriginal society through the environmental age Nonmajor graduate credit

Env S 480I Introduction to Environmental Planning (Same as Ia LL 480I) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

Env S 482 Environmental Politics and Policies (Same as Pol S 482) (3 0) Cr 3 F *Prereq 3 credits in Political Science or 3 credits in Environmental Studies junior classification* Major ideologies relation to conservation and ecology Processes participants and institutions involved in state national and global environmental policymaking Case studies of environmental controversies and proposals for policy reform Nonmajor graduate credit

Env S 484 Sustainable Communities (Same as C R P 484 Dsn S 484) (3 0) Cr 3 S *Prereq Senior status* The theory and application of sustainability to the physical and social planning of communities We will examine environmental ethics as a basis for sustainability the history of the idea itself and the movement toward indicators as outcome measure ments both in the U S and internationally We then explore how these ideas have been or might be applied in communities here and abroad

Env S 490 Independent Study Cr var *Prereq Permission of instructor and approval of Environmental Studies coordinator*

Env S 491 Environmental Law (Same as C R P 491 Dsn S 491) (3-0) Cr 3 S *Prereq 6 credits in natural sciences* Legal precedents and alternative policies for environmental protection rights to and regulations for uses of water air and land Federal environmental control acts and leading federal court cases

Family and Consumer Sciences

Master of Family and Consumer Sciences (M F C S)

The College of Family and Consumer Sciences offers a nonthesis degree program designed to enhance the skills of post baccalaureate individuals whose work or family obligations preclude study on the Ames campus Completion of the MFCS degree has permitted many individuals to obtain the credential needed for advancement while continuing their current employment The program is considered to be a professional master s degree and not preparation for further graduate study

Students select either a comprehensive option or a specialization option The comprehensive option can be followed on or off campus and requires 36 credits covering a variety of family and consumer sciences subject matter Off campus courses are offered at several locations via the Iowa Communications Network (ICN) or the World Wide Web (WWW) Specializations are available in Nutrition Dietetics Human Development and Family Studies Foodservice and Lodging Management and Textiles and Clothing

In addition students may select a 42-credit specialization in Family Financial Planning (FFP) or a 36-credit specialization in Gerontology The FFP and Gerontology specializations offered in collaboration with six other universities in the Great Plains are offered exclusively through courses on the Web The FFP program has been approved by the Board of Examiners of the Certified Financial Planner Board of Standards as a program with the competencies required to permit those completing the degree to sit for the CFP® Certification Examination CFP® is a certification mark owned by the Certified Financial Planner Board of Standards

The Program of Study committee in consultation with the student establishes the courses to be taken and the acceptability of transfer credits The major professor is selected from the discipline in which the concentration of coursework will be taken Written and oral final integrative examinations are required in lieu of a thesis or creative component A thesis or creative component could be included on mutual agreement of the student and major professor with approval of the Graduate College

Admission requirements for the MFCS include a bachelor s degree in a family and consumer sciences/ home economics subject area or related disciplines Graduate Record Examination (GRE) scores official transcripts three letters of recommendation a goal statement and graduation in the upper one half of class with a bachelor s degree from a regionally accredited U S institution or graduation in the upper one half of class from a recognized foreign institution Non English speaking international students are required to have a TOEFL score of at least 550 at time of admission

Graduate Certificates

To meet the requirements of the American Dietetics Association for the professional development of registered dietitians graduate certificates are available in Dietetics Communication Counseling Dietetics Management and Advanced Medical Nutrition Therapy and Family Financial Planning For detailed information about the certificates contact the Department of Food Science and Human Nutrition or Foodservice and Lodging Management program in the Department of Apparel Educational Studies and Institution Management

For additional information students should contact the CFCS Research and Graduate Education Office 126 MacKay Hall Ames Iowa 50011
mfcsinfo@iastate edu

Family and Consumer Sciences Education and Studies

(Administrated by the Department of Apparel Educational Studies and Hospitality Management)

Mary B Gregoire, Chair of Department

Professors Cowan

Distinguished Professors (Emeritus) Fanslow Moyer

Professors (Emeritus) Anderson Beavers Brun Crabtree Smith Williams

Associate Professors Gentzler Hausafus

Associate Professors (Emeritus) Amos Ebert

Assistant Professors (Adjunct) Kruempel

Instructors (Adjunct) Becker

Undergraduate Study

For undergraduate curricula in family and consumer sciences education and studies leading to the degree bachelor of science see *Family and Consumer Sciences Education and Studies*

The program offers one curriculum for the bachelor of science degree in Family and Consumer Sciences Education and Studies Students in the curriculum choose one of three options Teacher Licensure Educational Services or General Studies Graduates of the teacher licensure option teach in general vocational and occupational programs of family and consumer sciences in middle junior and senior high schools Graduates of the Educational Services option develop implement and evaluate family and consumer sciences programs for intended audiences in a variety of educational settings such as Coopera tive Extension business community agencies community colleges and public school adult education Graduates of the General Studies option may pursue individualized career goals in family and consumer sciences that apply integrative knowledge of family and consumer sciences in diverse careers for domestic and international settings

Admission to all three options is initiated in the course FCEdS 206 In addition students in Teacher Licensure follow program and university procedures for admission to the university teacher education program This program option is approved by the Iowa Department of Education for the preparation of vocational family and consumer sciences teachers For additional teacher education requirements see *College of Education*

Graduates in Family and Consumer Sciences Education and Studies have a broad understanding of individual and family well being Graduates apply knowledge of family and consumer sciences content in domestic and/or international professional settings They use research findings to improve the well being of individuals families and communities Due to the integrative and synergistic nature of family and consumer sciences graduates address and act on complex problems confronting individuals families and communities

Opportunities are available for obtaining a minor from other departments through careful selection of elective credits and consultation with an adviser For example students pursuing the Educational Services and General Studies options are encouraged to consider obtaining a minor in journalism and mass communications or in one of the subject matter areas of family and consumer sciences such as resource management and consumer sciences or housing and the near environment They also are encouraged to enhance their program by electing additional courses in an area of business Students in the Teacher Licensure option may choose to add a second teaching area specialization such as middle school health education or coaching

The program offers a minor in educational services in family and consumer sciences The minor is earned by successfully completing 15 credits in FCEdS 206 306 415 and 418 See program for details

English Proficiency Requirement C or better in Engl 104 and 105

Graduate Study

The program offers work for the degrees master of science master of education and doctor of philosophy each with the major family and consumer sciences education The M S degree requires a thesis the M Ed degree requires a creative component the Ph D requires a dissertation Minors are available

Programs for advanced degrees with a major in family and consumer sciences education are tailored to fit the educational background experience and professional goals of the student Areas of study provided by the department include program planning curriculum evaluation research methods supervision and administration international education and development and teacher education Opportunities are available for strengthening one s background in subject matter in other departments in the College of Family and Consumer Sciences

Students who complete a graduate program are professional family and consumer sciences educators and teacher educators who foster program planning implementation and evaluation at state national and international levels They are producers and disseminators of research and scholarship in family and consumer sciences education and are leaders in programs and services for clientele in diverse settings

The program cooperates in the gerontology interdepartmental minor

Courses open for nonmajor graduate credit 415

Courses Primarily for Undergraduate Students

FCEdS 110 College of Family and Consumer Sciences Orientation (1-0) Cr 5 to 1 FS Orientation to the university the college and the college curricula Adjustment to the university discussion of student responsibilities interpersonal and study skills and management of time and energy Development of a long-term curriculum plan Offered on a satisfactory fail grading basis only

FCEdS 160 Foundations of Family and Consumer Sciences (1 0) Cr 1 FS Historical development and philosophical base of family and consumer sciences Integrative focus for disciplines and areas of specialization

FCEdS 206 Professional Roles in Family and Consumer Sciences (2-3) Cr 3 F *Prereq 160 or concurrent enrollment* Introduction to various roles in professional settings e g community agencies secondary schools business and industry Cooperative Extension Observation participation and teaching experienes in educational settings

FCEdS 306 Educational Principles for Family and Consumer Sciences (2 2) Cr 3 F *Prereq 15 credits in family and consumer sciences subject matter* Principles of teaching and learning applied to family and consumer sciences content Instructional methods appropriate for formal and nonformal educational settings Specific strategies for diverse audiences May be used for family life certification

FCEdS 318 Occupational Career and Technical Programs (Dual listed with 518) (2-0) Cr 2 S *Prereq 206 and 400 hours work experience in a family and consumer sciences related job* Planning and implementing programs in occupational family and consumer sciences including FCCLA Impact of selected legislation on family and consumer sciences programs Techniques for cooperative education school to-work and work based education programs May be used toward Multi-Occupation Cooperative endorsement

FCEdS 379 Educational Aspects of Family and Comsumer Social Issues (3-0) Cr 3 F Examination of family and consumer social issues from diverse perspectives Application of critical thinking and reflection to family and social issues within formal and nonformal educational settings

FCEdS 403 Student Assessment for Vocational Family and Consumer Sciences (2 3) Cr 3 S *Prereq Enrollment in 413* Philosophy of student assessment Development and critique of tests and authentic assessment tools to measure cognitive affective psychomotor and perceptual learning Procedures for grading interpreting and reporting assessment data Includes 40 hours of experience in public school setting

FCEdS 413 Curriculum Planning for Family Life and Vocational Family and Consumer Sciences (2 3) Cr 3 S *Prereq 306* Philosophy of vocational education Curriculum development in family and consumer sciences programs for school settings Accommodating exceptional learners May be used for family life certification

FCEdS 415 Program Planning and Evaluation in Family and Consumer Sciences (3 0) Cr 3 S *Prereq 15 credits in Family and Consumer Sciences subject matter* Program development principles including needs analysis planning instruction promotion evaluation grant writing and reporting Approaches appropriate for diverse groups Environmental and cultural conditions affecting programs Nonmajor graduate credit

FCEdS 417 Supervised Teaching in Family and Consumer Sciences F *Prereq 413 24 credits in family and consumer sciences subject matter cumulative grade point of 2 50 full admission to teacher education* Supervised teaching experience in secondary schools Examination of ways to implement actions that reflect a professional philosophy of family and consumer sciences for teaching middle and high school level students May be taken more than once for credit Reservation required
A Vocational family and consumer sciences Cr 8
B Family and consumer sciences Cr 3 to 8

FCEdS 418 Supervised Experiences in a Professional Setting Cr 3 to 8 FS SS Supervised professional experience in an approved setting such as Cooperative Extension business community human service or government agency May be taken more than once for credit Reservation required
A Educational Services *Prereq 415 24 credits in family and consumer sciences*
B General Studies *Prereq 421 24 credits in family and consumer sciences*

FCEdS 421 International Perspectives of Family and Consumer Sciences (Dual listed with 521) (3-0) Cr 3 S *Prereq 6 credits in family and consumer sciences* Examination of family and consumer sciences from an international perspective focus on the roles and responsibilities of women in development Application and adaptation of content to working with families in other countries and cultures Student participation in cultural activities

FCEdS 424 International Study Abroad Seminar (Dual-listed with 524) Cr 1 to 3 FS SS Orientation to study abroad program considering topics related to country and location travel arrangements and preparation for study abroad on-site fieldwork and academic experiences in an international setting

FCEdS 460 Integrative Approaches in Family and Consumer Sciences (1-0) Cr 1 S *Prereq 160 senior classification in Family and Consumer Sciences Education* Seminar on ways professionals work across disciplines to address contemporary social issues that affect individuals and families Methods to initiate public policy at the local national and international levels Transition from student to professional role

FCEdS 490 Independent Study Cr arr *Prereq Departmental approval*
A Adult Education
C Curriculum
D Evaluation
E Cooperative Extension
G General
H Honors
I International
K Occupational Education
N Human Relations
P Special Needs/Mainstreaming
R Vocational Education
S Distance Education

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

FCEdS 500 Short Course Current Family and Consumer Sciences Offerings Cr 1 to 3 FS SS *Prereq 6 credits in family and consumer sciences or education* May be taken more than once for credit
A Adult Education
B Supervision and Administration
C Curriculum
D Evaluation
E Teacher Education
F Occupational Career and Technical Education
G General
H Research Methodology
I International Education
J Middle Level Education

FCEdS 501 Trends, Issues and Public Policy (3-0) Cr 3 Alt F offered 2003 Alt SS offered 2004 *Prereq 6 credits in family and consumer sciences or education* Discussion of current topics affecting the family and consumer sciences profession

FCEdS 507 Program Development in Family and Consumer Sciences (3-0) Cr 3 Alt F offered 2004 Alt SS offered 2005 *Prereq Professional experience in family and consumer sciences or related area* Application of principles of program development to formal and nonformal educational settings e g secondary school family and consumer sciences programs training positions in business Cooperative Extension human services agencies

FCEdS 508 Models for Teaching Family and Consumer Sciences (3 0) Cr 3 Alt S offered 2005 *Prereq 6 credits in family and consumer sciences* Selecting teaching strategies and instructional materials based on theories of learning and human development that reflect a professional philosophy of family and consumer sciences Application to formal and nonformal educational settings with diverse audiences

FCEdS 511 Research Methods (3 0) Cr 3 F *Prereq Graduate classification* An overview of diverse research approaches focusing on methods for collecting and analyzing quantitative and qualitative data Critique of research reports and development of research proposals

FCEdS 515 Assessment in Family and Consumer Sciences (3-0) Cr 3 Alt S offered 2004 Alt SS offered 2005 *Prereq Introductory statistical and program development skills* Role of assessment in family and consumer sciences education programs Planning and constructing test items and other assessments of school and nonschool learning

FCEdS 518 Occupational, Career and Technical Programs (Dual listed with 318) (2 0) Cr 2 S *Prereq 400 hours work experience in a family and consumer sciences related job* Planning and implementing programs in occupational family and consumer sciences including FCCLA Impact of selected legislation on family and consumer sciences programs Techniques for cooperative education school to-work and work based education programs Critique of national occupational competency standards May be used toward Multi Occupation Cooperative endorsement

FCEdS 520 Supervision in Family and Consumer Sciences Programs (3 0) Cr 3 Alt F offered 2003 *Prereq Professional experience or 6 credits in family and consumer sciences* Examination of change communication and leadership theories as related to supervision Application of conferencing techniques observation skills and performance evaluation to professional leadership positions in educational settings

FCEdS 521 International Perspectives of Family and Consumer Sciences (Dual listed with 421) (3-0) Cr 3 S Alt SS offered 2005 *Prereq 6 credits in family and consumer sciences* Examination of family and consumer sciences from an international perspective focus on the roles and responsibilities of women in development Application and adaptation of content to working with families in other countries and cultures Student participation in cultural activities and critique of international research articles

FCEdS 524 International Study Abroad Seminar (Dual listed with 424) Cr 1 to 3 FS SS Orientation to study abroad program considering topics related to country and location travel arrangements and preparation for study abroad on site fieldwork and academic experiences in an international setting Individually developed research project on a topic related to study abroad

FCEdS 590 Special Topics Cr arr *Prereq 6 credits in family and consumer sciences or education*
A Adult Education
B Administration
C Curriculum
D Evaluation
E Teacher Education
F Occupational Career and Technical Education
G General
H Research Methodology
I International Education
J Educational Gerontology
K Human Relations
L Special Needs
M Family Life Education
N Human Sexuality
O Technology
P Supervision
Q Family/Individual Health
R Consumer Education
S Distance Education

FCEdS 593 Workshop Cr 1 to 3 FS SS *Prereq 6 credits in family and consumer sciences or education* Concentrated group study of new developments in family and consumer sciences education Sections offered will vary from year to year May be taken more than once for credit

FCEdS 599 Creative Component

Courses for Graduate Students

FCEdS 607 Curriculum Theory and Philosophy in Family and 5 *Prereq 507 or curriculum development experience* Integration of philosophies of education and family and consumer sciences into an operative philosophy of curriculum development Study of various curriculum theories and approaches to curriculum development

FCEdS 610 Seminar Cr 1 FS SS *Prereq Graduate classification* Exploration of trends and issues in the profession May be taken more than once for credit Offered on a satisfactory fail grading basis only

FCEdS 611 Program Evaluation in Family and Consumer Sciences (3-0) Cr 3 Alt SS offered 2004 *Prereq 511 515* Application of program evaluation approaches and models to family and consumer sciences programs Standards for program evaluation

FCEdS 618 Coordination of Educational Programs in Family and Consumer Sciences Cr 2 Alt SS offered 2004 *Prereq 520* Approaches to coordination of family and consumer sciences programs in adult education extension state department of education and teacher education Study of undergraduate programs in family and consumer sciences education observation and participation in undergraduate courses and practicum experience

FCEdS 620 Theories of Administration in Family and Consumer Sciences (3-0) Cr 3 Alt SS offered 2004 *Prereq Professional Experience* Review of administrative theory application to family and consumer sciences programs with emphasis on higher education Administrative leadership roles and their interrelationships Consideration of current issues

FCEdS 699 Research

Family Financial Planning

www fcs iastate edu/rge/education/programs/

(Interinstitutional Program)

Contact Mary Winter

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Family Financial Planning is an interinstitutional distance education program offered through the Web The student selects a home institution which grants the degree After admission at the home institution the student takes courses from each of the seven institutions Iowa State University Kansas State University Oklahoma State University Montana State University University of Nebraska North Dakota State University and South Dakota State University Upon completion of the curriculum students are eligible to sit for the CRP® Certification Examination

At Iowa State University Family Financial Planning is a specialization within the Master of Family and Consumer Sciences degree program (MFCS FFP) that consists of 42 semester credit hours of which 12 credits must be taken from Iowa State University Neither a thesis nor a creative component is required Students typically complete the program in three years while employed full time A computer with minimum specifications Web access and an email address are required for completing the program

FFP Graduate Certificate Program
The Graduate Certificate in Family Financial Planning consists of the six courses from the MFCS FFP that contain the competencies required for the CFP® Certification Examination Students interested in attaining the CFP® credential and not a master s degree should enroll in the certificate program Courses included in the FFP graduate certificate program include FFP 530 540 545 555 565 583

Admission Procedures Admission to the FFP Certificate Program requires exactly the same procedures as admission to the Graduate College See *Graduate College* section in the catalog

Registration
Students choosing to receive their degree from Iowa State University complete all the admissions registration and fee payment processes through ISU

Courses Primarily for Graduate Students

FFP 520 Family Systems Cr 3 F Research and theory related to family functioning throughout the life cycle especially financial decision making during crisis and conflict Emphasis is given to factors that shape family values attitudes and behaviors from a multicultural perspective New and emerging issues critical to family functioning are addressed

FFP 525 Family Economics Cr 3 SS Major issues related to the economics of families including household production and human captial develop ment the economics of crises public policy and family life cycle spending saving and borrowing new and emerging issues in the field of family economics special attention to the role of ethics in family economic issues A theoretical and research perspective are used to illuminate the concepts in the course

FFP 530 Fundamentals of Family Financal Planning Cr 3 F The nature and functioning of financial systems including currencies markets monetary and fiscal policy and supply/demand for land labor and capital Focus is on the impact of global financial interdependence on individuals and families in the U S Current and emerging issues as well as current research and theory relative to financial systems

FFP 535 Financial Counseling Cr 3 S Theory and research regarding the interactive process between the client and the practitioner including communica tion techniques motivation and esteem building the counseling environment ethics and methods of data intake verification and analysis Other topics include legal issues compensation uses of technology to identify resources information management and current or emerging issues

FFP 540 Estate Planning for Families Cr 3 S Fundamentals of the estate planning process including estate settlement estate and gift taxes property ownership and transfer and powers of appointment Tools and techniques used in implement ing an effective estate plan ethical considerations used in providing estate planning services and new and emerging issues in the field Case studies provide experience in developing estate plans suitable for varied family forms

FFP 541 Housing and Real Estate in Family Financial Planning (Same as HD FS 541) See *Human Development and Family Studies*

FFP 545 Retirement Planning, Employee Benefits, and the Family Cr 3 F Study of micro and macro considerations for retirement planning Survey of various types of retirement plans ethical consider ations in providing retirement planning services assessing and forecasting financial needs in retirement and integration of retirement plans with government benefits

FFP 555 Insurance Planning for Families Cr 3 S An in depth study of risk management concepts tools and strategies for individuals and families including life insurance property and casualty insurance liability insurance accident disability health and long term care insurance and govern ment subsidized programs Current and emerging issues as well as ethical considerations relative to risk management are discussed Case studies provide experience in selecting insurance products suitable for individuals and family study of investment options for clients including common stocks fixed income securities convertible securities and related choices Relationships between investment options and employee/employer benefit plan choices are studied Current and emerging issues and ethics are an integral part of the course

FFP 565 Personal Income Taxation Cr 3 F In-depth information on income tax practices and procedures including tax regulations tax return preparation the

tax audit processes the appeals process preparation for an administrative or judicial forum and ethical considerations of taxation New and emerging issues related to taxation are covered Family/individual case studies provide practice in applying and analyzing tax information and recommending appropriate tax strategies

FFP 570 Professional Practices in Financial Planning Cr 3 S Challenges of managing financial planning practices including but not limited to business valuation personnel marketing client services ethics and technological applications Relying both on a theoretical as well as an applied approach students analyze case studies that provide relevant practical exposure to practice management issues with a strong emphasis on current research findings

FFP 583 Investing for the Family's Future (Same as HD FS 583) See *Human Development and Family Studies*

FFP 591 Practicum Cr 3 6 FS SS Supervised experience in family financial planning

FFP 595 Financial Planning Case Studies Cr 3 SS *Prereq Completion of FFP courses* Professional issues in financial planning including ethical considerations regulation and certification require ments communication skills and professional responsibility Students are expected to utilize skills obtained in other courses and work experiences in the completion of personal finance case studies the development of a targeted investment policy and other related financial planning assignments

Finance

Richard B Carter, Chair of Department

Professors Carter Hayes Power Stover

Associate Professors Campbell Cowan Dark Koppenhaver

Assistant Professors Piwowar Sapp

Undergraduate Study

For undergraduate curriculum in business major in finance see *College of Business Curricula*

In addition to the basic business requirements finance majors must also complete (1) Fin 310 320 (2) select four from Fin 330 361 371 380 415 424 425 445 462 and 472 of which two must be at the 400 level and (3) select one from Acct 383 384 386 387 any 400 level accounting course and Finance courses listed in (2) above Statistics 326 is highly recommended to be taken prior to Fin 310 and Fin 320 Statistics 326 is required for Fin 380 and 400 level finance courses

The courses in finance constitute a broad program of study designed to provide a descriptive behavioral and analytical background of financial management to enable students to qualify for opportunities in financial services insurance brokerage government real estate and financial management of business enterprises Finance is also an excellent area for those who wish to become more knowledgeable as consumers particularly in the fields of investments insurance and real estate

Areas of study in the field of finance include financial management investments insurance real estate and financial services Upper level courses include a review of contemporary literature in the field case studies and financial problem analysis integrating finance courses previously taken

The instructional objective of the Finance program is to provide a well rounded professional education in finance Such an education should provide the student with (1) a mastery of basic financial concepts and methods of analysis (2) an understanding of financial operations in a global setting and of the role of financial institutions in the economics system (3) an ability to effectively communicate and work with others as the finance member of a team (4) an ability to demonstrate leadership capabilities in financial analysis and portfolio management

The department also offers a minor for non Finance majors in the College of Business The minor requires 15 credits from an approved list of courses of which 9 credits must stand alone Students with declared majors have priority over students with declared minors in courses with space constraints

Graduate Study

The department participates in two graduate degree programs the M S in business and the M B A full time and part time programs The M S degree in business is a 30-credit curriculum culminating in a thesis The M B A program is a 48-credit nonthesis noncreative component c curriculum Twenty four of the 48 credit hours are core courses and the remaining 24 are graduate electives Within the M B A program students may develop an area of specialization in finance This specialization requires that 12 of the 24 credit hours of the graduate electives be from an approved list of graduate finance courses

Courses open for nonmajor graduate credit 415 424 445 462 472

Courses Primarily for Undergraduate Students

Fin 301 Principles of Finance (3-0) Cr 3 FS SS *Prereq Acct 284 Econ 101 Stat 226* Introduction to financial management with emphasis on corporate financing and investment decision making time value of money asset valuation capital budgeting decision methods cash budgeting and financial markets

Fin 310 Corporate Finance (3 0) Cr 3 FS SS *Prereq 301* Theory used in a firm s investment and financing decisions Analysis of environment in which financial decisions are made applications of analytical techniques to financial management problems

Fin 320 Investments (3 0) Cr 3 FS SS *Prereq 301* Introduction to various investment media and markets from the viewpoint of the individual investor Emphasis on mechanics of trading behavior of security prices corporate stocks and bonds mutual funds individual asset and portfolio selection techniques and performance evaluation

Fin 330 Financial Markets and Institutions (3-0) Cr 3 FS *Prereq 301* Introduction to the structure and operations of the United States financial system and its markets and institutions Emphasis on developing and integrated understanding of markets and financial service providers including global linkages

Fin 361 Personal Risk Management and Insurance (3 0) Cr 3 FS *Prereq Econ 101* Risk concepts and the use of insurance by individuals and families Emphasis on the insurance mechanism and methods of dealing with income property and liability risks

Fin 371 Real Estate Principles (3 0) Cr 3 SS *Prereq Econ 101* Legal economic social and financial aspects of real estate including property rights contracts mortgage instruments tax factors brokerage valuation risk and return analysis financing techniques and investments

Fin 380 International Finance (3 0) Cr 3 FS *Prereq 301 and Stat 326* Advanced study of contemporary topics and issues in international finance

Fin 415 Business Financing Decisions (3 0) Cr 3 *Prereq 301 and Stat 326* In depth study of the firm s external financing decision Emphasis on the development of cash flow statements projected financing needs and the selection of the appropriate financing instrument Focus on case studies and application of developed techniques on actual field project Nonmajor graduate credit

Fin 424 Financial Futures and Options (3 0) Cr 3 *Prereq 320 and Stat 326* Advanced study of the pricing and use of derivative market instruments current topics and issues Nonmajor graduate credit

Fin 425 Security Analysis and Portfolio Manage ment (3 0) Cr 3 FS *Prereq 320 Stat 326 and permission of instructor* Advanced study of security analysis security selection techniques and portfolio management Emphasis on the applications of methods learned via the selection and evaluation of a portfolio of actual securities purchased in securities markets in the U S or abroad Tracking and periodic reporting of the portfolio s performance relative to standard benchmarks is also required

Fin 445 Bank Management Decisions (3 0) Cr 3 FS *Prereq Stat 326 and Fin 330 or Econ 353* Analysis of operations of depository financial institutions from management viewpoint Emphasis on evaluating performance policy formation asset and liability management the role of capital and the operating environment Nonmajor graduate credit

Fin 462 Corporate Risk Management and Insurance (3 0) Cr 3 F *Prereq 301 and Stat 326* Analysis of an organization s approaches to the management of price credit and pure risk Emphasis on the consideration and selection of risk control and financing treatments and the decision making framework underlying the alternatives selected Covers commercial insurance self insurance and alternative financing arrangements Nonmajor graduate credit

Fin 472 Real Estate Finance (3-0) Cr 3 *Prereq 301 and Stat 326* Introduction to the techniques of assessing the value of real estate and real estate financing instruments Nonmajor graduate credit

Fin 490 Independent Study Cr 1 to 3 each time taken *Prereq 301 Stat 326 and permission of instructor*

Fin 499 Finance Internship (3-0) Cr 1 to 3 FS SS *Prereq GPA 2 5 permission of internship coordinator Stat 326 499A 330 445 499B 361 499C 472* Supervised experience in a private sector banking insurance or real estate organization or in a govern mental agency that regulates such organizations Offered on a satisfactory-fail grading basis only
A Banking
B Insurance
C Real Estate

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Fin 505 Financial Valuation and Corporate Financial Decisions (2-0) Cr 2 *Prereq Graduate classification* Shareholder wealth maximization as the goal of the firm financial math valuation of securities the financial market place as the test of value estimation of cost of capital capital investment decisions capital structure policy working capital management

Fin 510 Advanced Financial Management (3 0) Cr 3 *Prereq 505* Modern theory of corporate finance and its application to financial management problems Advanced treatment of firm s investment financing and dividend decisions and survey of related research Examples of potential topics are the investment banking process convertible securities and warrants financial derivatives asset leasing mergers and divestitures leveraged buyouts international financial management executive compensation and pension fund strategy

Fin 515 Case Studies in Financial Decision Making (3 0) Cr 3 *Prereq 505* This course focuses on case studies to develop an integrated set of financial decisions Topic areas include fixed asset working capital capital structure dividend and merger/ acquisition decisions The objective of the course is to examine different firm settings and establish a framework within which to apply financial tools

Fin 520 Investments (3-0) Cr 3 *Prereq 505* A comprehensive survey of the classical and contempo rary theories of optimum portfolio construction determinants of risk return trade-off in selection of securities emphasis on the theory and evidence of efficient capital markets and implications for security selection and portfolio management

Fin 534 Agricultural Markets (3-0) Cr 3 F *Prereq Graduate classification* A method based course in agricultural markets Topics covered include futures and options markets option pricing use and rating of insurance products in agriculture alternative forms of reinsurance emerging forms of vertical coordination

world grain and livestock markets and the institutions that control these markets Topical issues such as the impact of new trade arrangements on world agricultural markets will be examined

Fin 567 Employee Benefits Seminar (3-0) Cr 3 *Prereq Graduate classification* Theory of employee benefits including benefit types purpose utilization costs/methods of benefit financing and regulation

Fin 590 Special Topics Cr 1 to 3 each time taken FS SS *Prereq Permission of instructor* For students wishing to do individual research in a particular area of finance

Food Science and Human Nutrition

www fcs iastate edu/fshn

Diane F Birt Chair of Department

University Professors Glatz Hammond Murphy Sebranek P White

Professors Birt Flakoll Hendrich Hurburgh Jane Johnson Kaplan Nikolau Pometto Prusa Robson Sharp Stromer Wilson Woteki Wurtele

Professors (Collaborators) Nikolov

Distinguished Professors (Emeritus) Jacobson Roderuck

University Professors (Emeritus) Parrish

Professors (Emeritus) Dupont Garcia Kraft Lagrange McMillan Runyan Rust Schafer Swan Topel Walker

Associate Professors Alekel Ford J Love M Love Madden Myers Oakland Reitmeier W White

Associate Professors (Collaborators) Lewis

Associate Professors (Emeritus) Bohnenkamp McComber

Assistant Professors Boylston Gonzalez Hansen Litchfield Marquis Mendonca Reddy Schalinske Wang

Assistant Professors (Collaborators) Robinson

Instructors (Adjunct) Anderson Bassler Hanson Oldham Strohl Svendsen

The Department of Food Science and Human Nutrition is jointly administered by the College of Agriculture and the College of Family and Consumer Sciences All curricula offered by the department are available to students in either college These curricula include dietetics food science and nutritional science Visit our web site at www fcs iastate edu/fshn/

Undergraduate Study

The general dietetics curriculum is approved by the American Dietetic Association (ADA) and meets the academic requirements for admission to accredited dietetics internships The dietetic program includes study in basic sciences nutrition and food science with applications to medical dietetics and community nutrition Foodservice management is also an important aspect of the program Graduates work in hospitals clinics long term care facilities food and pharmaceutical industries and government nutrition programs some are private and home health care nutrition consultants There is a $30 fee for a statement of verification of completion of the approved program For information about verification statements provided to non ISU students or students with degrees from international universities see the departmental website www fcs iastate edu/fshn/

Food science is a discipline in which the principles of biological and physical sciences are used to study the nature of foods the causes of their deterioration and the principles underlying the processing and preparation of food It is the application of science and technology to the provision of a safe wholesome and nutritious food supply Biotechnology and toxicology interrelate with food science in the area of food safety In the food industry food scientists work in research and development of products or processes production supervision quality control marketing and sales test kitchens and recipe development product promotion and communication Food scientists also serve in government regulatory agencies and academic institutions

Three options are available in food science food science and technology food science and industry and consumer food science The food science and technology option is approved by the Institute of Food Technologists the national professional organization of food science Students interested in quality control/assurance production supervision management and sales or research careers in the food industry government or academia should elect either the food science and technology or the food science and industry option Students who wish to go to graduate or professional schools or who are biotechnology scholars in the College of Agriculture should elect food science and technology Students who wish to emphasize business journalism or special aspects of food science should elect food science and industry Students interested in test kitchen positions food product formulation and recipe development food promotion and consumer services in government and industry should elect the consumer food science option

Students who wish to combine education in engineering with food science may select additional courses in chemical or agricultural engineering Double majors are available and may require an additional year

Nutritional science offers students a strong basic science and general education that can serve as a preprofessional program for medicine dentistry veterinary medicine or for graduate study in nutrition or other biological sciences This curriculum enables students to gain the knowledge and skills necessary to work in research laboratories of colleges and universities government agencies industries and foundations

Students graduating with degrees in dietetics food science or nutritional science will be able to 1) demonstrate technical competency in chosen field of study 2) demonstrate proficiency in interpersonal communication and the ability to work successfully in teams to solve multidisciplinary problems 3) effectively prepare and deliver technical information to food science and human nutrition professionals as well as to the general public 4) find evaluate and accurately interpret research literature 5) critically evaluate information including the ability to distinguish verifiable facts from value claims detect bias and identify sources of conflicts 6) understand the dimensions of issues facing professionals in the field including ethical cultural and environmental components

See also the B S /M S program under *Graduate Study*

The department offers minors in food science and in nutrition and participates in the interdepartmental minor in food safety See department office or web site for requirements

English proficiency is certified by a grade of C or better in 6 credits of coursework in composition (Engl 104 and 105 or other communication intensive courses) and a grade of C or better in 3 credits of coursework in oral communication

Postbaccalaureate Program

A dietetic internship program has received initial accreditation from the American Dietetic Association For more information refer to Special Interest Programs listed under the College of Family and Consumer Sciences or visit our website at www dietetics iastate edu There is a nonrefundable application fee of $30 and a program fee of $500 payable upon acceptance into the program

Food Safety Minor

Patricia A Murphy (Coordinator)

The Interdepartmental Food Safety minor is designed to provide undergraduate students with exposure to the principles of food safety to complement their current major and offer new opportunities for their future careers The Food Safety minor provides training in human health risks and issues that arise from globalization of agriculture intensification of food production and food processing effects of global warming/environmental changes on food safety and the prevention of agricultural bioterrorism Depending on the student s major the minor enhances the student s expertise in food safety issues pertinent to the student s major Student learning outcomes include awareness of food safety issues as they appear in each step of the food chain ability to analyze a situation identify food safety problems use resources to gain additional information develop a procedure or solution to identified problems examine proposed solutions for viability and effectiveness and to be able to speak and write about food safety issues at professional meetings ISU graduates with Food Safety minor are better prepared for employment in agricultural medical and veterinary medical agencies and with state national and international businesses

The Food Safety minor requires 15 credits of course work with 9 credits drawn from 3 core courses with the balance of courses to supplement the training in the minor Students electing the minor will receive core training in basic food processing or food service (FS HN 101 or 272 or HRIM 233) food microbiology or food borne hazards (FS HN 420 or 419) food laws (FS HN 403) and a food safety issues seminar (FS HN/An S/HRIM/VDPAM 489) Students will then elect three additional credits from the Food Microbiology area and three credits from the Food Processing area See approved list for minor elective courses at www fcs iastate edu/fshn/ugrad/ugminors htm

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with majors in food science and technology and in nutrition and minors in food science and technology and in nutrition Graduate work in meat science is offered as a co major in animal science and food science and technology

Prerequisite to major work is a baccalaureate degree in food science nutrition or other physical or biological sciences or engineering that is substantially equivalent to those at Iowa State University

Students taking major work for the degree doctor of philosophy either in food science and technology or in nutrition may choose minors from other fields including anthropology chemistry biochemistry economics education journalism microbiology psychology physiology sociology statistics toxicology or other related fields

Faculty in the department participate in the major in microbiology the interdepartmental majors in genetics MCDB (molecular cellular and developmental biology) biorenewable resources sustainable agriculture toxicology and water resources and the interdepartmental minors in gerontology and biorenewable resources

The department in conjunction with the Hotel Restaurant and Institution Management department offers three dietetics certificates of 11 credits each and participates in the Master of Family and Consumer Sciences with a Dietetics specialization The certificate program meets continuing education requirements of The American Dietetic Association for advanced preparation in communication and counseling dietetics management and medical nutrition therapy The graduate certificate courses may be applied to the Master of Family and Consumer Sciences Dietetics specialization These programs are open only to registered dietitians A second Master of Family and Consumer Sciences specialization offered in the area of Nutrition does not require certification as a registered dietitian for admittance

Those interested in these programs should contact the department for details

The department offers a B S /M S program that allows students to obtain both the B S and M S degrees in 5 years The program is available to students in the food science and technology option or the nutritional science curriculum Students interested in this program should contact the department for details Application for admission to the Graduate College should be made near the end of the junior year Students begin research for the M S thesis during the summer after their junior year and are eligible for research assistantships

Students graduating with advanced degrees in Nutrition and in Food Science and Technology will demonstrate competency in their chosen discipline Measurable outcomes will include the ability to 1) design conduct and interpret research 2) apply theoretical information to solve practical problems 3) prepare and communicate discipline specific information in written and oral forms to scientific and lay audiences 4) facilitate learning in the classroom 5) submit a paper for publication in a peer reviewed journal 6) secure professional level positions in academia industry government or health care

Courses open for nonmajor graduate credit 311 342 351 360 361 362 403 405 410 411 412 419 420 421 463 471

Courses Primarily for Undergraduate Students

FS HN 101 Food and the Consumer (3 0) Cr 3 FS *Prereq High school biology and chemistry or 3 credits each of biology and chemistry* The food system from point of harvest to the consumption of the food by the consumer Properties of food constituents Protection of food against deterioration and microbial contamination Introduction of foods into the marketplace Processes for making various foods Government regulations Use of food additives Current and controversial topics Electronic communication from web emphasized for class reports notes and assignments

FS HN 110 Orientation (1 0) Cr 1 F Orientation to the department to Iowa State University and to careers in food science nutrition and dietetics Curriculum and career planning Offered on a satisfactory-fail grading basis only

FS HN 111 Fundamentals of Food Preparation (2 3) Cr 3 FS *Prereq 101 or 167 high school chemistry or Chem 160* Principles involved in preparation of food products of standard quality Influence of composition and techniques on properties of food products Standard methods of food preparation with emphasis on quality nutrient retention and safety

FS HN 167 Introduction to Human Nutrition (3 0) Cr 3 FS SS *Prereq High school biology or 3 credits of biology* Understanding and implementing present day knowledge of nutrition The role of nutrition and food intake in the health and well being of the individual and family

FS HN 203 Contemporary Issues in Food Science and Human Nutrition (1 0) Cr 1 FS Discussion of current domestic or international issues in family and consumer sciences and agriculture and the relationship to food science nutrition and dietetics Emphasis on professional ethics and communication

FS HN 214 Scientific Study of Food (3 6) Cr 5 FS *Prereq 167 or 261 Chem 231 or 331* Composition and structure of foods Principles and practice of preparation of standard quality food products Behavior and interactions of food constituents

FS HN 261 Fundamentals of Human Nutrition (2-0) Cr 2 S *Prereq Credit or enrollment in BBMB 301 or Biol 302* Sources of nutrients nutrient requirements and dietary recommendations fundamentals of digestion absorption transport function and metabolism nutrient deficiency and toxicity

FS HN 272 Basic Principles of Food Processing (1 6) Cr 3 F *Prereq Credit or enrollment in Chem 231 & 231L and Biol 202* Biological and physico-chemical principles of food processing as they determine the quality of foods

FS HN 298 Cooperative Education Cr R FS SS *Prereq Permission of the department chair sophomore classification* Required of all cooperative education students Students must register for these courses prior to commencing each work period

FS HN 311 Food Chemistry (2 3) Cr 4 F *Prereq 203 Chem 231 and 231L or 331 and 331L credit or enrollment in BBMB 301* The structure properties and reactions of food constituents Nonmajor graduate credit

FS HN 340 Introduction to Dietetics (1 0) Cr 1 F Roles of dietitians professional ethics health care delivery systems with emerging issues in the practice of dietetics Offered on a satisfactory fail grading basis only

FS HN 342 World Food Issues Past and Present (Same as Agron 342 Env S 342 T SC 342 U St 342) (3 0) Cr 3 S World food problems in context of historical development of agriculture in major cradles of civilization Emphasis on population trends and socioeconomic policies to understand disparities between potential agriculture production and present energy and nutritional deficiencies in key areas of the developing world Team projects Nonmajor graduate credit
H Honors Section (For students in the University Honors Program only)

FS HN 351 Unit Operations in Food Processing (3 0) Cr 3 S *Prereq A course in calculus and Phys 106* Introduction to material and energy balances Fluid flow physical and thermal properties of food materials Fundamentals of heat and mass transfer Application of momentum and heat transfer to unit operations in food processing Calculations and computer applications in food processing Nonmajor graduate credit

FS HN 360 Advanced Human Nutrition and Metabolism (3-0) Cr 3 F *Prereq 261 3 credits in biochemistry 3 credits in physiology recommended* Physiological and biochemical basis for nutrient needs assessment of nutrient deficiency and toxicity examination of nutrient functions and regulation of metabolism nutrient gene interactions Nonmajor graduate credit

FS HN 361 Human Nutrition Laboratory (1 3) Cr 2 FS *Prereq Credit or enrollment in 360 3 credits in statistics* The assessment of nutritional status in healthy individuals Laboratory experiences in food composition and assessment of dietary intake body composition and biochemical indices of nutritional status Nonmajor graduate credit

FS HN 362 Nutrition in Growth and Development (3 0) Cr 3 S *Prereq 360 credit or enrollment in a course in physiology* Nutrient needs throughout the life cycle Interrelationships of genes gene expression and nutrients with physiological outcomes during human development and aging Nonmajor graduate credit

FS HN 398 Cooperative Education Cr R FS SS *Prereq Permission of the department chair junior classification* Required of all cooperative education students Students must register for these courses prior to commencing each work period

FS HN 403 Food Laws, Regulations, and the Regulatory Process (2 0) Cr 2 S SS *Prereq 3 credits in food science coursework at 200 level or above* History of the development of the current federal and state food regulations Guidelines that govern the practice of regulating the wholesomeness of red meats poultry and eggs Presentations by state and federal food regulators Nonmajor graduate credit

FS HN 405 Food Quality Assurance (2 2) Cr 3 S *Prereq 214 or 272 or 471 Stat 101 or 104* Basis of food quality control/assurance programs and establishment of decision-making processes using official (government and industry) instrumental chemical and sensory procedures Statistical process and quality control procedures and their applications to various food systems Development of hazard analysis procedures specifications grades and standards Nonmajor graduate credit

FS HN 406 Sensory Evaluation of Food (Dual listed with 506) (2-3) Cr 3 F *Prereq 214 or 311 or An S 360 3 credits in statistics* Sensory test methods and procedures used to evaluate the flavor color and texture of foods Relationships between sensory and instrumental measurements of color and texture Acceptance and preference testing

FS HN 407 Microbial Safety of Food (Same as Micro 407) See *Microbiology*

FS HN 410 Food Analysis (2 3) Cr 3 S *Prereq 203 214 or 311 or BBMB 311 or Chem 211* An introduction to the theory and application of physical and chemical methods for determining the constituents of food Modern separation and instrumental analysis Use of food composition data bases Nonmajor graduate credit

FS HN 411 Experimental Study of Food (2 3) Cr 3 F *Prereq 214 or 311 a course in biochemistry* Experimental approach to the study of factors influencing behavior of foods Nonmajor graduate credit

FS HN 412 Food Product Development (Dual listed with 512) (2 6) Cr 4 S *Prereq 311 or 411 471* Principles of developing consumer packaged food products Application of skills gained in food chemistry formulation microbiology and processing Some pilot plant experiences Electronic communication from web emphasized for class reports notes and assignments Nonmajor graduate credit

FS HN 419 Foodborne Hazards (Same as Micro 419 Tox 419) (3-0) Cr 3 Alt S offered 2004 *Prereq Micro 201 or 302 a course in biochemistry* Pathogenesis of human microbiological foodborne infections and intoxications principles of toxicology major classes of toxicants in the food supply governmental regulation of foodborne hazards Only one of 419 and 519 may count toward graduation Nonmajor graduate credit

FS HN 420 Food Microbiology (Same as Micro 420 Tox 420) (3 0) Cr 3 F *Prereq Micro 201 or 302* Effects of microbial growth in foods Methods to control detect and enumerate microorganism in food and water Foodborne infections and intoxications Nonmajor graduate credit

FS HN 421 Food Microbiology Laboratory (Same as Micro 421) (1 5) Cr 3 F *Prereq Micro 201 or 302 201L Credit or enrollment in 420 (Micro 420) FS HN 203* Standard techniques used for the microbiological examination of foods Independent and group projects on student generated questions in food microbiology Emphasis on oral and written communication and group interaction Nonmajor graduate credit

FS HN 441 Dietetics Management (1 9) Cr 5 S SS For students enrolled in the dietetic internship program Supervised participation in and analysis of food production delivery and other functions related to quantity food and nutrition services Offered on a satisfactory fail grading basis only

FS HN 442 Medical Dietetics I (3 15) Cr 8 FSS For students enrolled in the dietetic internship program Biological basis of medical drug and diet therapy for selected pathologies Consideration of factors in planning and conducting nutritional care of patients Integration of principles with clinical experience Offered on a satisfactory fail grading basis only

FS HN 443 Medical Dietetics II (1 6) Cr 3 F SS *Prereq Concurrent enrollment in 442* For students enrolled in the dietetic internship program Supervised clinical experience in assessing implementing and evaluating nutritional care of patients in specialized clinical settings Offered on a satisfactory-fail grading basis only

FS HN 445 Experience in Community Dietetics (1 12) Cr 5 S SS For students enrolled in the dietetic internship program Supervised experience in planning and providing nutritional care for individuals and

groups in a variety of community settings Offered on a satisfactory fail grading basis only

FS HN 446 Experience in Dietetic (2 0) Cr 2 FS *Prereq For students enrolled in dietetics internship* Supervised experience in planning and providing nutrition education for individuals and groups in a variety of dietetic settings Offered on a satisfactory fail grading basis only

FS HN 448 Professional Development Assessment (Dual listed with 548) (0-3) Cr 1 FS SS *Prereq Concurrent enrollment dietetic internship* For students enrolled in the dietetic internship program Web-based course providing information and practice for students to assess and evaluate their own professional development and continuing professional education needs Offered on a satisfactory fail grading basis only

FS HN 461 Disease and Medical NutritionTherapy I (Dual listed with 561) (3 2) Cr 4 F *Prereq 360 3 credits in physiology* Pathophysiology of selected disease states and medical problems Clinical nutrition applications in acute and chronic disease Assessment of nutritional problems nutrition care planning and documentation Specific attention will be directed to nutrition needs and treatment of each disease state with medical nutrition therapy

FS HN 463 Community Nutrition (3 0) Cr 3 S *Prereq 203 362 credit or enrollment in 466* Survey of current public health nutrition problems among nutritionally vulnerable individuals and groups Discussion of the multidimensional nature of those problems and of community programs designed to help solve them The role of community nutritionists in grant writing for project development Significant emphasis on written and oral communication Nonmajor graduate credit

FS HN 464 Disease and Medical NutritionTherapy II (Dual listed with 564) (2 3) Cr 3 S *Prereq 461* Pathophysiology of selected disease states and medical problems Clinical nutrition applications in acute and chronic disease Assessment of nutritional problems nutrition care planning and documentation Specific attention will be directed to nutrition needs and treatment of each disease state with medical nutrition therapy

FS HN 466 Nutrition Counseling and Education Methods (Dual listed with 566) (2 2) Cr 3 FS *Prereq 203 362 Sp Cm 212* Application of counseling and learning theories with individuals and groups in community and clinical settings Includes discussion and experience in building rapport data assessment and interpretation developing goals/outcomes selecting learning activities evaluation and documentation

FS HN 471 Food Processing (3-0) Cr 3 F *Prereq Micro 201 or 302 Chem 163 Phys 106* Food preservation including packaging fermentation irradiation canning freezing dehydration additives Sanitation and plant design Applications to food products Nonmajor graduate credit

FS HN 472 Food Processing Laboratory (Dual listed with 572) (1 3) Cr 2 F *Prereq 351 credit or enrollment in 471* Pilot plant experiences such as thermal processing food fermentations oil seed processing food extrusion corn wet milling and industrial baking Special emphasis on interpreting data and writing project reports

FS HN 480 Professional Seminar in Food Science and Human Nutrition (1 0) Cr 1 FS *Prereq Senior classification in the department* Discussion and presentation of current research and issues in food science and human nutrition with emphasis on communication in the profession

FS HN 489 Issues in Food Safety (Same as An S 489 HRI 489 VDPAM 489) (1 0) Cr 1 Alt S offered 2005 *Prereq Credit or enrollment in FS HN 101 or 272 or HRI 233 FS HN 419 or 420 FS HN 403* Capstone seminar for the food safety minor Case discussions and independent projects about safety issues in the food system from a multidisciplinary perspective

FS HN 490 Independent Study Cr arr FS SS *Prereq Permission of instructor* A maximum of 6 credits of 490 may be used toward graduation Independent work in food science nutrition or dietetics
A Dietetics
B Food Science
C Nutrition
D International Experience
H Honors

FS HN 491 Supervised Work Experience Cr arr FS SS *Prereq Advance approval of instructor adviser and department chair* A maximum of 3 credits of 491 may be used toward graduation Supervised off campus work experience relevant to the academic major Offered on a satisfactory fail grading basis only
A Dietetics
B Food Science
C Nutrition

FS HN 496 Food Science and Human Nutrition Travel Course (Dual listed with 596) Cr 2 to 4 May be repeated (One credit per week traveled) FS SS *Prereq Permission of instructor* Limited enrollment Tour and study of food industry dietetic and nutritional agencies in different regions of the world Pre travel session arranged Travel expenses paid by students Offered on a satisfactory fail grading basis only
A International travel
B Domestic travel

FS HN 498 Cooperative Education Cr R FS SS *Prereq Permission of the department chair senior classification* Required of all cooperative education students Students must register for these courses prior to commencing each work period

FS HN 499 Undergraduate Research Cr arr FS SS *Prereq Permission of staff member with whom student proposes to work* A maximum of 6 credits of 499 may be used toward graduation Research under staff guidance

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

FS HN 500 Short Course Cr arr FS SS *Prereq Permission of instructor*
A Nutrition
B Food Science

FS HN 502 Advanced Food Science Chemistry (1-0) Cr 1 S *Prereq 3 credits in organic chemistry* Key principles and applications in the chemistry of food

FS HN 503 Advanced Food Science Processing (1 0) Cr 1 S *Prereq 3 credits each in physics and mathematics* Key principles and applications in the processing of food

FS HN 504 Advanced Food Science-Microbiology (1 0) Cr 1 S *Prereq 3 credits each in microbiology and organic chemistry* Key principles and applications in the microbiology of food

FS HN 506 Sensory Evaluation of Food (Dual listed with 406) (2 3) Cr 3 F *Prereq 214 or 311 or An S 360 3 credits in statistics* Sensory test methods and procedures used to evaluate the flavor color and texture of foods Relationships between sensory and instrumental measurements of color and texture Acceptance and preference testing

FS HN 507 Microbial Safety of Food (Same as Micro 507) See *Microbiology*

FS HN 512 Food Product Development (Dual listed with 412) (2 6) Cr 4 S *Prereq 311 or 411 471* Principles of developing consumer packaged food products Application of skills gained in food chemistry formulation microbiology and processing Some pilot plant experiences Electronic communication from web emphasized for class reports notes and assignments

FS HN 519 FoodToxicology (Same as Tox 519) (3 0) Cr 3 Alt F offered 2004 *Prereq A course in biochemistry* Basic principles of toxicology Toxicants in the food supply modes of action toxicant defense systems toxicant/nutrient interactions risk assessment Only one of 419 and 519 may count toward graduation

FS HN 542 Introduction to Molecular Biology Techniques (Same as Zool 542) See *Zoology and Genetics*

FS HN 543 Medical Dietetics II (1-6) Cr 3 FSS For students enrolled in the dietetics internship Discussion of the assessment diagnosis intervention and outcomes of nutritional problems in complex medical conditions with supervised practice experience

FS HN 548 Professional Development Assessment (Dual listed with 448) (0 3) Cr 1 FS SS *Prereq Concurrent enrollment dietetic internship or MFCS Dietetic Option* For students enrolled in Dietetics Certificates programs and the Master of Family and Consumer Sciences Dietetics Specialization Web-based course providing information and practice for student to assess and evaluate own professional development and continuing professional education needs Completion of professional 5 year plan Offered on a satisfactory fail grading basis only

FS HN 553 Biochemical and Physiological Basis of Nutrition Macronutrients (Same as An S 553) (3 0) Cr 3 S *Prereq BBMB 420 or BBMB 404 and credit or enrollment in BBMB 405* Integration of the molecular cellular and physiologic aspects of macronutrient and energy metabolism in mammalian systems Dietary energy carbohydrates fiber lipids proteins nutritional interactions and metabolic consequences

FS HN 554 Biochemical and Physiological Basis of Nutrition Vitamins and Minerals (Same as An S 554) (3 0) Cr 3 F *Prereq BBMB 420 or BBMB 404 and credit or enrollment in BBMB 405* Integration of the molecular cellular and physiologic aspects of vitamin and mineral metabolism in mammalian systems Interactions among nutrients metabolic consequences of deficiencies or excesses relevant polymorphisms and current topics related to micronutrients and non nutrient components

FS HN 561 Disease and Medical Nutritional Therapy I (Dual listed with 461) (3 2) Cr 4 F *Prereq 362 or 553 or 554 3 credits in physiology* Pathophysiology of selected disease states and medical problems Clinical nutrition applications in acute and chronic disease Assessment of nutritional problems nutrition care planning and documentation Specific attention will be directed to nutrition needs and treatment of each disease state with medical nutrition therapy

FS HN 562 Assessment of Nutritional Status (3 0) Cr 3 Alt S offered 2005 *Prereq 461/561 or 553* Overview and practical applications of methods for assessing nutritional status including theoretical framework of nutritional health and disease dietary intake biochemical indices clinical examination and body composition

FS HN 564 Disease and Medical NutritionTherapy II (Dual listed with 464) (2 3) Cr 3 S *Prereq 561* Pathophysiology of selected disease states and medical problems Clinical nutrition applications in acute and chronic disease Assessment of nutritional problems nutrition care planning and documentation Specific attention will be directed to nutrition needs and treatment of each disease state with medical nutrition therapy

FS HN 565 Malnutrition in Low Income Countries (2 0) Cr 2 Alt S offered 2004 *Prereq Graduate student status* Identification and assessment of malnutrition in low income countries Social cultural political economic and geographic determinants of malnutrition Protein-energy malnutrition vitamin and mineral deficiencies Intervention approaches international efforts and local sustainability

FS HN 566 Nutrition Counseling and Education Methods (Dual listed with 466) (2 2) Cr 3 FS *Prereq Graduate student status* Application of counseling and learning theories with individuals and groups in community and clinical settings Includes

discussion and experience in building rapport data assessment and interpretation developing goals/outcomes selecting learning activities evaluation and documentation

FS HN 567 Nutrition for Dietitians (3 0) Cr 3 Alt F offered 2005 *Prereq 360 BBMB 301 undergraduate course in physiology* For students enrolled in Dietetics Certificates programs and the Master of Family and Consumer Sciences Dietetics Specialization Study of the current scientific literature to evaluate current trends and issues in nutrition science and dietetic practice Emerging areas of research investigating the role of nutrients in health and disease in humans will be explored Emphasis on the impact of emerging research on nutrition recommendations and interventions designed to promote human health

FS HN 572 Food Processing Laboratory (Dual listed with 472) (1 3) Cr 2 F *Prereq 503 or equivalent* Pilot plant experiences such as thermal processing food fermentation oil seed processing food extrusion corn wet milling and industrial baking Special emphasis on interpreting data and writing project reports

FS HN 575 Processed Foods (3 0) Cr 3 F *Prereq 214 or 311 a course in nutrition* Survey of the effects of home and commercial food preparation and processing on the nutrients in food

FS HN 580 Orientation to Food Science and Nutrition Research (1-0) Cr 1 F Orientation to and discussion of research interests in food science and nutrition Discussion of policy and ethical issues in the conduct of research Intended for entering students in FS HN and related disciplines Offered on a satisfactory fail grading basis

FS HN 581 Seminar (1-0) Cr 1 S Discussion and practice of oral presentation of scientific data in a professional setting Discussion of issues related to data presentation Offered on a satisfactory-fail grading basis only

FS HN 590 Special Topics Cr arr FS SS *Prereq Permission of instructor*
A Nutrition
B Food Science
C Teaching

593 Workshop Cr arr FS SS *Prereq Permission of instructor*

FS HN 596 Food Science and Human Nutrition Travel Course (Dual listed with 496) Cr 2 to 4 May be repeated (One credit per week traveled) FS SS *Prereq Permission of instructor* Limited enrollment Tour and study of food industry dietetic and nutritional agencies in different regions of the world Presentation of selected topics Pre travel session arranged Travel expenses paid by students Offered on a satisfactory fail grading basis only
A International travel
B Domestic travel

FS HN 599 Creative Component Cr Var Nonthesis option only

Courses for Graduate Students

FS HN 606 Instrumental Measurement of Food Quality (2 3) Cr 3 Alt S offered 2004 *Prereq 311 or 411 or 502 or BBMB 404* Principles of instrumental measurements of color aroma and flavor Rheological techniques and instrumentation for measuring the mechanical properties of foods relationship of these properties to food textural qualities Application of methods to various foods and biorenewable materials

FS HN 610 Food Enzymology (2 3) Cr 3 Alt F offered 2004 *Prereq 311 or 411 or 502 or BBMB 404* Properties of enzymes important in food processing and production Experimental determination and quantitative evaluation of the influence of concentration of substrates enzyme and inhibitors pH and temperature Specificity and mechanisms important to food and agricultural biochemistry

FS HN 612 Food Lipids (3-0) Cr 3 Alt S offered 2004 *Prereq 311 or 411 or 502 or BBMB 404* Structure and analysis of food lipids glyceride structure crystal form and texture autoxidation refining and processing of fats and oils food applications of fats and oils

FS HN 613 Food Proteins (3 0) Cr 3 Alt F offered 2003 *Prereq 311 or 411 or 502 or BBMB 404* Properties of proteins found in milk eggs meat legumes and cereal grains Effect of processing on food proteins

FS HN 614 Carbohydrates in Foods (3-0) Cr 3 Alt S offered 2005 *Prereq 311 or 411 or 502 or BBMB 404* Study of chemical and physical properties of carbohydrates used in foods and changes they undergo during processing and storage of food

FS HN 626 Advanced Food Microbiology (Same as Micro 626 Tox 626) (3 0) Cr 3 Alt S offered 2004 *Prereq 420 or 421 or 504* Topics of current interest in food microbiology including new foodborne pathogens rapid identification methods effect of food properties and new preservation techniques on microbial growth and mode of action of antimicrobials

FS HN 643 Natural Toxins (Same as Pl P 643 Tox 643) (3-0) Cr 3 Alt S offered 2005 *Prereq Courses in biochemistry and physiology* Naturally occurring toxins in foods and feeds plant-derived toxins mechanisms of action regulatory issues

FS HN 665 Selected Topics in Nutrition (2 0) Cr 1 2 each time taken Alt F offered 2003 *Prereq 553 554 graduate course in physiology* Series of courses on such topics as proteins vitamins minerals lipids energy metabolism evaluation of nutritional status Classical and current research literature in each area

FS HN 680 Modern Views of Nutrition (Same as An S 680) See *Animal Science*

FS HN 681 Seminar (1-0) Cr 1 FS SS Presentation of thesis or dissertation research May be taken once for M S program and twice for the Ph D program

FS HN 690 Special Problems Cr var FS SS *Prereq 502 or 503 or 504 or 553 or 554*

FS HN 695 Grant Proposal Writing (1 0) Cr 1 Alt F offered 2004 *Prereq 3 credits of graduate course work in food science and/or nutrition* Grant proposal preparation experiences including writing and critiquing of proposals and budget planning Formation of grant writing teams in food science and/or nutrition Offered on a satisfactory fail grading basis only

FS HN 699 Research Cr var FS SS Offered on a satisfactory fail grading basis only
A Nutrition
B Food Science

Foreign Languages and Literatures

Dawn Bratsch Prince Chair of Department

University Professors Courteau

Professors Bernard Bratsch Prince Dow Judith Lacasa Leonard M Rectanus

Professors (Emeritus) Frink

Associate Professors Henry Jaime Lacasa Mariner Matibag Mattson McGlew Mook Nabrotzky

Associate Professors (Adjunct) Rosenbusch

Associate Professors (Emeritus) Dial Thogmartin

Assistant Professors Allen Amidon Bowles Gasta LHote Mu O Neill Stinchcomb Thomas

Assistant Professors (Emeritus) Chatfield Johnson

Instructors (Adjunct) Kottman Liu E Rectanus

Lecturers Mesropova Taoutel

Undergraduate Study

Foreign language study should be a part of the program of most students The theoretical understanding of and practical experience in language underlie many intellectual disciplines that try to meet the complex problems of contemporary society Courses offered by the Department of Foreign Languages and Literatures are designed to offer students an understanding of a second culture through the language spoken by that culture as well as a thorough knowledge of the fundamentals of the language itself

Graduates will achieve both linguistic proficiency and cultural literacy through the study of the language and culture of their program Linguistic proficiency entails the ability to function effectively in the target language and the ability to communicate competently with native speakers of the target language (This will vary somewhat for students of Latin and Ancient Greek) Cultural literacy includes a general knowledge of the culture s history familiarity with its literature and basic knowledge of its social and political institutions

The Department offers both majors and minors in French German Russian Studies and Spanish leading to the bachelor of arts degree minors in Chinese Studies Latin and Portuguese and instruction in Italian and Classical Greek A minor in any foreign language or any area studies program requires at least 15 credits nine of which must be at the 300 level or higher Of these 3 credits must be in literature or culture Courses numbered in the 370s generally may not be used toward the minor or major Please consult the specific requirements for each language group A full statement of requirements for majors and minors may be obtained from the Department For a complete statement of all the college degree requirements see *Liberal Arts and Sciences Curriculum* Current and detailed information about the Department including placement information is available on line at www public iastate edu/~flng_info / homepage html

Students who have had formal training in foreign languages offered at Iowa State may obtain credit by passing appropriate examinations Students with native fluency in languages taught at Iowa State may not enroll or take the Exam for Credit in elementary or intermediate courses (100 and 200 level) in their native language (Students with questions about this issue should consult the Department) Students with native fluency may be eligible to enroll in literature and civilization courses in their native language at the 300 level or above such students must also consult the department office to determine eligibility for advanced composition and conversation courses (300 level and above)

Students who have completed *three or more years* of high school foreign language study may not enroll in or receive credit for 101 102 or 110 in those languages credit may be obtained by passing the appropriate Exam for Credit or by completing an advanced sequence (200 level or higher) in that language 101 102 may not be taken on a remedial basis

Students who have completed *more than one year but less than three years* of high school foreign language study may not enroll in 101 in the same language Before enrolling in 102 these students are recommended but not required to take the first year Exam for Credit Students who pass the Exam for Credit at the 101 102 level receive credit for two semesters of first year language study students wishing to continue their study in the language should consult with the Department s academic advisor Students who pass the Exam for Credit at the 101 level receive credit for one semester of first year language study these students may enroll in 102 and participate in 97 an intensive review module Students who fail to pass at the 101 level may enroll in 102 with the required review module 101 may not be taken on a remedial basis Students who receive a grade of C or higher in 102 and who have taken 97 receive credit for 101

Students with disabilities who need to satisfy the foreign language requirement may direct questions to the Advising Coordinator in the Foreign Language Department and the Disability Resource Office

Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are

not currently enrolled in the course Credit by examination for other courses in the Department is not normally available

The Department of Foreign Languages and Literatures participates in the Iowa Board of Regents foreign language summer programs in France and Spain and the Regents semester program in Spain The Department also offers summer programs in Bolivia Greece Russia Spain and Mexico and a semester program in Mexico and Spain Information concerning these programs can be obtained directly from the Department The Department also houses the Classical Studies Program

Language and literature courses numbered 300 and above are principally taught in the target language courses numbered in the 370s are taught in English For courses taught in English about Classical Greek or Latin see Classical Studies Students may not take intermediate (200 level) courses for credit after successfully completing any advanced (300/400 level) course except those in the 370 series or courses taught in English translation Students who have successfully completed any course in the intermediate (200 level) sequence may not take a lower numbered course in that sequence for a grade

Courses numbered 110 are essentially equivalent to 101 and 102 combined credit toward graduation may not be acquired in more than one of these options

Students at all levels of foreign language study will have access to the Language Learning Resource Center located in 312 Pearson The resource center contains an extensive collection of foreign language materials including films music books computer software and hardware and course related materials

Materials fees A materials fee is assessed for all courses offered in this Department except those with the F Lng designation

English proficiency requirement The Department requires a grade of C- or better in each of Engl 104 and 105 (105H) and a grade of C or better in any course numbered between 370 and 379 (with the exception of Rus 375 and Rus 376) taught by the Department of Foreign Languages and Literatures or the interdepartmental program in Classical Studies

Graduate Study

The Department of Foreign Languages offers a graduate minor in French German Latin Russian Studies and Spanish The graduate minor in each of these languages is designed to provide an opportunity for graduate students to further their knowledge of that language to complement work in their major disciplines The graduate minor provides formal recognition of student achievement and expertise in one of the languages above Graduate minor credits are also offered in Greek and Portuguese

Graduate Minor

Program Requirements

a **Prerequisites** Graduate students who wish to minor in one of the languages above must have 400-level proficiency in that language When this is not the case the student may be required to take a language course below the 400 level which would not count towards the graduate minor requirements

b **Course Requirements** For the M A or M S Three courses in the language of the minor No more than three credits may be in courses numbered 401 402 and 403 For the Ph D Four courses in the language of the minor which must include at least one three credit course at the 500 level No more than three credits may be in courses numbered 401 402 or 403 At least two courses for the M A and the Ph D minors must be taken in residence at Iowa State University Papers written for these courses are expected to have a content and depth commensurate with the graduate status of the student

Courses open for nonmajor graduate credit Chin 490 F Lng 486 498 Frnch 440 471 472 Ger 440 471 472 Greek 441 442 Ital 490 Latin 441 442 Port 340 341 440 441 Rus 401 402 440 Span 304 330 331 332 351 352 401 403 440 441 442 443 444 445 462 463 480 493

Courses Primarily for Undergraduate Students

Chinese (Chin)

Minors in Chinese Studies are required to take Chin 201 202 and 9 credits at the 300 level of these at least 3 additional credits are in Chinese (courses taught in Chinese or English) and 3 credits in one of the following Chin 375 Hist 337 Pol S 342 The remaining 3 credits are chosen from Anthr 326 Arch 427 Chin 301 302 370 375 490 Hist 336 337 Pol S 342

Chin 101 Elementary Mandarin Chinese I (5 1) Cr 5 F Introduction to spoken and written colloquial Mandarin through pinyin and simplified characters Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Chin 102 Elementary Mandarin Chinese II (5 1) Cr 5 S *Prereq 101* Introduction to spoken and written colloquial Mandarin through pinyin and simplified characters Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Chin 201 Intermediate Mandarin Chinese I (5 1) Cr 5 F *Prereq 102* Development of speaking writing reading and listening skills Review and expansion of grammar skills introduction to traditional characters and dictionaries intensification of character acquisition Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Chin 202 Intermediate Mandarin Chinese II (5 1) Cr 5 S *Prereq 201* Development of speaking writing reading and listening skills Review and expansion of grammar skills introduction to traditional characters and dictionaries intensification of character acquisition Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is not normally available

Chin 301 Advanced Chinese Readings I (3 0) Cr 3 F *Prereq 202 or equivalent* Continuing study of Chinese beyond intermediate level with a focus on reading and writing skills Cultural literacy through a variety of texts from the humanities social sciences mass media and business

Chin 302 Advanced Chinese Readings II (3 0) Cr 3 S *Prereq 301 or equivalent* Continuing study of Chinese beyond intermediate level with a focus on reading and writing skills Cultural literacy through a variety of texts from the humanities social sciences mass media and business

Chin 370 Chinese Literature in English Translation (3 0) Cr 3 F *Prereq Engl 105 or equivalent* Topics may include traditional prose poetry and drama the Chinese novel twentieth-century fiction and film gender and cosmology in Chinese literature All readings and class discussions in English

Chin 375 China Today (3 0) Cr 3 S *Prereq Engl 105 or equivalent* Topics may vary from year to year Readings discussions and papers in English on contemporary society culture literature and the arts

Chin 490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in Chinese and permission of department chair* Designed to meet the needs of students who seek work in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields Nonmajor graduate credit

French (Frnch)

Majors are required to complete at least 30 credits in French beyond the intermediate (201-202) level Courses required for the major are 301 310 314 333 334 6 credits of 440 471 472 each for four credits 3 additional credits at the 300 or 400 level 471 or 472 and at least 3 credits of 440 must be completed on campus

Minors are required to complete at least 16 credits above the elementary (101 102) level Option 1 16 credits in French at least 10 of which at the 300 level including 301 310 314 and 333 or 334 Option 2 16 credits in French at least 10 of which at the 300 level including 395

Courses Primarily for Undergraduate Students

Frnch 97 Review Module (0-4) Cr 0 FSS *Prereq More than one year but less than three years of high school French* Modular self paced review course preparing students for 102 Course components include review of key language skills covered in 101 audio components help sessions and testing Students who have taken two semesters of college French or three years high school French are not eligible to enroll

Frnch 101 Elementary French I (4 1) Cr 4 FSS Beginning level development of reading writing listening comprehension and speaking in French within the context of French culture Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Frnch 102 Elementary French II (4 1) Cr 4 S SS *Prereq 101 or 97* Beginning level development of reading writing listening comprehension and speaking in French within the context of French culture Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Frnch 201 Intermediate French I (4 1) Cr 4 F *Prereq 102* Intermediate level development of reading writing listening comprehension and speaking in French within the context of French culture Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Frnch 202 Intermediate French II (4 1) Cr 4 S *Prereq 201* Intermediate level development of reading writing listening comprehension and speaking in French within the context of French culture Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Frnch 301 Reading and Writing French (3-0) Cr 3 F *Prereq 202* Emphasis on developing functional language skills in reading and writing Selective review of grammar within the context of cultural and literary prose Concurrent enrollment in Frnch 305 and/or 310 is encouraged

Frnch 304 Business French (3 0) Cr 3 *Prereq 301* Introduction to business language and culture in Francophone Europe and Canada Practical applications of the four language skills to various business sectors (finance marketing advertising engineering) Overview of Francophone business culture through readings and films Prepares students for the Paris Chamber of Commerce International Business Certification Exam

Frnch 305 Advanced Conversation (3 0) Cr 3 *Prereq Credit or concurrent enrollment in 301* Intensive conversational and listening practice Communicative study of contemporary French culture

Frnch 310 French Pronunciation and Phonetics (2-0) Cr 1 FS Half Term *Prereq Credit or concurrent enrollment in 301* Practice and theory of correct pronunciation of sounds in French Techniques of teaching French pronunciation Correlation between sound and spelling in French Relationship between pronunciation and grammar

Frnch 314 Textual Analysis (3 0) Cr 3 S *Prereq 301* Readings in French prose theater and poetry Introduction to literary analysis and stylistics Development of reading and writing skills for upper level culture and literature courses

Frnch 333 Modern French Literature (3 0) Cr 3 F *Prereq 314* Cultural approaches to nineteenth and twentieth century French Literature Emphasis on reading skills and textual analysis

Frnch 334 The French Literary Tradition (3-0) Cr 3 S *Prereq 314* Cultural approaches to French literature from the Middle Ages through the eighteenth century Emphasis on reading skills and textual analysis

Frnch 370 French Studies in English (3-0) Cr 3 Topics vary according to faculty interest Author genre or period study such as Francophone literature women writers cinema or contemporary theory Readings discussions and papers in English May be repeated up to a maximum of 6 credits

Frnch 375 Contemporary France (3-0) Cr 3 Readings discussions and papers in English on contemporary thought politics history anthropology arts etc

Frnch 378 French Film Studies in English (3 0) Cr 3 Analysis and interpretation of film in twentieth century French society Topics vary according to faculty interest Film directors genres movements (e g The New Wave) historical survey aesthetics and cinematography Readings discussions and papers in English

Frnch 395 Study Abroad Cr 1 to 10 *Prereq 2 years university-level French* Supervised instruction in language and culture of France formal class instruction at level appropriate to student s training augmented by practical living experience

Frnch 440 Seminar in French Studies (3-0) Cr 3 *Prereq 333 or 334* Study of a selected topic in literature literary criticism or civilization May be repeated Nonmajor graduate credit

Frnch 471 Foundations of French Civilization (3 0) Cr 3 or (3 2) Cr 4 F *Prereq For fourth credit 314* Study of French history and culture (e g art architecture music) from its origins through the French Revolution Readings discussions and papers in English Fourth credit supplementary readings and compositions in French Nonmajor graduate credit

Frnch 472 Modern France and French Civilization (3-0) Cr 3 or (3-2) Cr 4 S *Prereq For fourth credit 314* Study of French history and culture (e g art architecture music) from the Napoleonic era to the present Readings discussions and papers in English Fourth credit supplementary readings and compositions in French Nonmajor graduate credit

Frnch 490 Independent Study Cr 1 to 6 each time taken *Prereq Permission of French staff and department chair* No more than 9 credits in 490 may be counted toward graduation Designed to meet the needs of students who wish to focus on areas other than those in which courses are offered

Frnch 499 Internship in French Cr 1 3 each time taken FS SS *Prereq 9 credits of French at the 300 level permission of advisory and FLL Internship Coordinator* Work experience using French language skills in the public or private sector combined with academic work under faculty supervision Offered on a satisfactory fail grading basis only May be repeated to maximum of 6 credits Available only to majors and minors Credits do not apply to major or minor requirements

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Frnch 590 Special Topics in French Cr 2 to 4 each time taken *Prereq Permission of instructor 6 credits of 400 level French*

A Literature or Literary Criticism
B Linguistics
C Language Pedagogy
D Civilization

German (Ger)

Majors in German are required to complete at least 30 credits beyond the intermediate (201 202) level Courses required for the German major are 301 or 304 302 305 320 or 330 at least one 440 course for 4 cr and 471 472 each for 4 cr Majors may enroll in no more than three of the following courses for the fourth credit 371 375 378 471 472 and F Lng 498

The minor in German requires at least 15 credits nine of which must be at the 300 level or higher of these three credits must be in literature or culture taught in German

Courses Primarily for Undergraduate Students

Ger 97 Review Module (0-4) Cr 0 FSS *Prereq More than one year but less than three years of high school German* Modular self paced review course preparing students for 102 German Course components include review of key language skills covered in 101 audio components help sessions and tests Students who have taken two semesters of college German or three years of high school German are not eligible to enroll

Ger 101 Elementary German I (4 1) Cr 4 FSS Introduction to German language within the context of German culture practice in the basic skills Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Ger 102 Elementary German II (4-1) Cr 4 S *Prereq 101 or 97* Continuation of German 101 Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Ger 201 Intermediate German I (4 1) Cr 4 F *Prereq 102* Review of grammar selected readings further practice in oral and written communication Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Ger 202 Intermediate German II (4-1) Cr 4 S *Prereq 201 Continuation of German 201* One section will emphasize the use of German in professional contexts Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Ger 301 Reading (3-0) Cr 3 F *Prereq 202* Emphasis on the development of reading skills through a variety of text types with a focus on German Culture from circa 1900 to Post WWII

Ger 302 Composition (3 0) Cr 3 S *Prereq 301* Emphasis on writing skills with further development of grammar and reading skills

Ger 304 German for Business and Professions (3-0) Cr 3 F *Prereq 202* Communication in business and professional contexts in German speaking countries Development of effective communication strategies and project management in the workplace Cultural contexts of business and professional practice Preparation for internships and the Certificate in German for Professions

Ger 305 Advanced Conversation and Listening Comprehension (3 0) Cr 3 S *Prereq 202 concurrent enrollment in 302 recommended* Intensive conversational and listening practice in German with an emphasis on a major German speaking city

Ger 320 Germany Today (3 0) Cr 3 S *Prereq 301 or 304* Selected topics dealing with contemporary German society and culture Introduction to materials resources and forms of communication available on the Internet and in other electronic and print media

Ger 330 Introduction to German Literature (3-0) Cr 3 F *Prereq 3 credits at 300 level or concurrent enrollment in 301 or 304* Selected readings in German literature from Classicism to present Emphasis on techniques of reading and analysis of literary texts

Ger 370 German Studies in English (3-0) Cr 3 Alt F offered 2004 Topics vary according to faculty interest

Ger 371 The Holocaust in Text Image and Memory (3 0) Cr 3 or (3 2) Cr 4 Alt F offered 2003 *Prereq For fourth credit six credits in German at the 300 level* Examination of such topics as the origins and expressions of Anti-Semitism in central Europe the political events and structures of the Holocaust the reality of ghettos and concentration camps the impact of technological modernization on the Final Solution and resistance to the Nazis Materials will include non-fictional texts literature art and music Taught in English Fourth credit supplementary readings and compositions in German

Ger 375 Grimms' Tales (3 0) Cr 3 or (3 2) Cr 4 Alt S offered 2005 *Prereq For fourth credit six credits in German at the 300 level* Introduction to Germanic antiquities mythology and heroic legends Herder s concept of Naturpoesie Emphasis on the Grimm tales theoretical approaches to the tales from the late 19th and early 20th centuries perversions of these traditional tales by the National Socialists (Nazis) Readings in contemporary Grimm scholarship Taught in English Fourth credit supplementary readings and compositions in German

Ger 378 German Film and Media Studies (3-0) Cr 3 or (3 2) Cr 4 F *Prereq For fourth credit six credits in German at the 300 level* Analysis and interpretation of film or media in German society Study of media production and reception within multicultural and global contexts Thematic emphases based on faculty and student interest including 1) film directors genres movements (e g New German Cinema) aesthetics and cinematography or 2) media studies (e g television mass press popular culture) Taught in English Fourth credit supplementary readings and compositions in German

Ger 395 Study Abroad Cr 1 to 10 *Prereq 2 years university-level German* Supervised instruction in language and culture of Germany formal class instruction at level appropriate to student s training augmented by practical living experience

Ger 440 Seminar in German Studies (3-0) Cr 3 or (4-0) Cr 4 May be repeated up to a maximum of nine credits FS *Prereq 302 and either 320 or 330* Fourth credit required for the major Nonmajor graduate credit

Ger 471 Foundations of German Civilization (3 0) Cr 3 or (3 2) Cr 4 F *Prereq For fourth credit six credits in German at the 300 level* Study of various aspects of German history and culture from the Germanic tribes and Christianization to the Middle Ages Taught in English Fourth credit supplementary readings and compositions in German Nonmajor graduate credit

Ger 472 Topics in German Cultural Studies (3-0) Cr 3 or (3-2) Cr 4 S *Prereq For fourth credit six credits in German at the 300 level* This course is a continuation of 471 and will cover German history and culture up to the modern era Taught in English Fourth credit supplementary readings and compositions in German Nonmajor graduate credit

Ger 490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in German and permission of department chair* No more than 9 credits of Ger 490 may be counted toward graduation Designed to meet the needs of students who seek work in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields

Ger 499 Internship in German Cr 1 3 each time taken FS SS *Prereq 9 credits of German at the 300 level permission of advisor and FLL Internship coordinator* Work experience using German language skills in the public or private sector combined with academic work under faculty supervision Offered on a satisfactory fail grading basis only May be repeated to a maximum of 6 credits Available only to majors and minors Credits do not apply to major or minor requirements

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Ger 590 Special Topics in German Cr 2 to 4 each time taken *Prereq Permission of instructor 6 credits of 400 level German*

A Literature or Literary Criticism
B Linguistics
C Language Pedagogy
D Civilization

Greek (Greek)

For courses in Greek literature taught in English see *Classical Studies*

Courses Primarily for Undergraduate Students

Greek 101 Elementary Classical Greek I (4 1) Cr 4 F Grammar and vocabulary of ancient Attic Greek within the context of Greek culture reading knowledge through texts adapted from classical authors Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 and 201 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Greek 102 Elementary Classical Greek II (4 1) Cr 4 S *Prereq 101* Grammar and vocabulary of ancient Attic Greek within the context of Greek culture reading knowledge through texts adapted from classical authors Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 and 201 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Greek 201 Intermediate Classical Greek (4 1) Cr 4 F *Prereq 102* Emphasis on grammatical principles composition and reading classical or Hellenistic texts Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 and 201 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the department is normally not available

Greek 332 Introduction to Classical Greek Literature (3-0) Cr 3 S *Prereq 201* Readings in ancient Greek Literature with emphasis on critical analysis of style structure or thought includes composition

Greek 441 Advanced Readings in Greek Literature (3-0) Cr 3 F *Prereq 332* Study of individual authors or genres intensive reading in the original supplemented by modern criticism and analysis in English Authors and genres will vary courses may be repeated to a maximum of 6 credits each Nonmajor graduate credit

Greek 442 AdvancedTopics in Greek Literature (3 0) Cr 3 S *Prereq 332* Advanced study of authors or topics relating to Greek Literature Authors and topics will vary courses may be repeated to a maximum of 6 credits each Nonmajor graduate credit

Greek 490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in Greek and permission of department chair* No more than 9 credits of Greek 490 may be counted toward graduation Designed to meet the needs of students who seek work in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields

Courses Primarily for Graduate Students, open to qualified undergraduate students

Greek 590 SpecialTopics in Greek Cr 2 to 4 each time taken *Prereq Permission of instructor 6 credits of 400 level Greek*

A Literature or Literary Criticism
B Linguistics
C Language Pedagogy
D History and Culture

Italian (Ital)

Courses Primarily for Undergraduate Students

Ital 101 Elementary Italian I (4 1) Cr 4 F Introduc tion to basic grammar and structure of the language use of audio materials supplemented by graded reading within the context of Italian culture Especially recommended as a second area of language study for majors in French and Spanish Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Ital 102 Elementary Italian II (4 1) Cr 4 S *Prereq 101* Introduction to basic grammar and structure of the language use of audio materials supplemented by graded readings within the context of Italian culture Especially recommended as a second area of language study for majors in French and Spanish Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Ital 201 Intermediate Italian I (4 1) Cr 4 Offered as demand warrants *Prereq 102* Review of first year principles and expanded study of grammar development of written and spoken skills introduction to Italian civilization and literature through extracts from noted authors Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Ital 202 Intermediate Italian II (4 1) Cr 4 Offered as demand warrants *Prereq 201* Review of first year principles and expanded study of grammar development of written and spoken skills introduction to Italian civilization and literature through extracts from noted authors Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Ital 490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in Italian and permission of department chair* No more than 9 credits in Ital 490 may be counted toward graduation Designed to meet the needs of students who seek work in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields Nonmajor graduate credit

Latin (Latn)

For courses in Latin literature taught in English see *Classical Studies*

Minor requirements

Minors are required to complete 9 credits at the 300 level or higher

Courses Primarily for Undergraduate Students

Latin 101 Elementary Latin I (4 1) Cr 4 F Grammar and vocabulary of classical Latin within the context of Roman culture reading knowledge through texts adapted from classical authors Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 and 201is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Latin 102 Elementary Latin II (4 1) Cr 4 S *Prereq 101* Grammar and vocabulary of classical Latin within the context of Roman culture reading knowledge through texts adapted from classical authors Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 and 201 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Latin 201 Intermediate Latin (4 1) Cr 4 F *Prereq 102* Emphasis on grammatical principles composition and reading Latin texts Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 and 201 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Latin 332 Introduction to Latin Literature (3 0) Cr 3 S *Prereq 201* Readings in Latin Literature with emphasis on critical analysis of style structure or thought includes composition

Latin 441 Advanced Readings in Latin Literature (3 0) Cr 3 F *Prereq 332* Study of individual authors or genres intensive readings in the original supplemented by modern criticism and analysis in English Authors and genres will vary courses may be repeated to a maximum of 6 credits each Nonmajor graduate credit

Latin 442 AdvancedTopics in Latin Literature (3-0) Cr 3 S *Prereq 332* S Advanced study of authors or topics relating to Latin Literature Authors and topics will vary courses may be repeated to a maximum of 6 credits each Nonmajor graduate credit

Latin 490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in Latin and permission of department chair* No more than 9 credits in Latin 490 may be counted toward graduation Designed to meet the needs of students who seek work in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Latin 590 Special Topics in Latin Cr 2 to 4 each time taken *Prereq Permission of instructor 6 credits of 400 level Latin*

A Literature or Literary Criticism
B Linguistics
C Language Pedagogy
D History and Culture

Portuguese (Port)

The minor in Portuguese requires at least 15 credits nine of which must be at the 300 level or higher of these 3 credits must be in literature or culture taught in Portuguese

Courses Primarily for Undergraduate Students

Port 101 Elementary Brazilian Portuguese I (4-1) Cr 4 F Introduction through the conversational approach within the context of Luso-Brazilian culture Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 211 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Port 102 Elementary Brazilian Portuguese II (4 1) Cr 4 S *Prereq 101* Introduction through the communicative approach within the context of Luso Brazilian culture Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 211 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Port 211 Intermediate Portuguese (4 0) Cr 4 F *Prereq 102 or equivalent* Intensive conversation review of grammar practice in writing reading of short original pieces All work in Portuguese Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 and 211 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Port 340 Brazilian Civilization and Culture (3 0) Cr 3 each time taken S *Prereq 211 or equivalent* Introduction to Brazilian civilization and culture through the study of historical and literary texts Readings discussion and papers in Portuguese Nonmajor graduate credit

Port 341 Portuguese Civilization and Culture (3 0) Cr 3 each time taken F *Prereq 211 or equivalent* Culture of Portugal and Lusophone Africa through the study of Portuguese cultural and literary texts Readings discussion and papers in Portuguese Nonmajor graduate credit

Port 370 Portuguese Language Literature in English Translation (3-0) Cr 3 Study of a particular period theme genre or author Topics chosen according to student and faculty interests Readings discussion and written work in English May be repeated for a maximum of 6 credits

Port 440 Advanced Readings in Brazilian Literature (3 0) Cr 3 each time taken S *Prereq 211 or equivalent* Study of individual authors genres or periods Intensive readings of original Brazilian texts supplemented by theoretical readings in English Authors genres and periods will vary Readings discussion and papers in Portuguese Nonmajor graduate credit

Port 441 Advanced Readings in Portuguese and African Literature (3 0) Cr 3 each time taken Alt F offered 2003 Intensive readings of Lusophone texts from Africa and Portugal Theory readings in English Discussion and papers in Portuguese Nonmajor graduate credit

Port 490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in Portuguese and permission of department chair* No more than 9 credits in Port 490 may be counted toward graduation Designed to meet the needs of students who seek work in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Port 590 Special Topics in Portuguese Cr 1 to 4 each time taken *Prereq Permission of instructor 6 credits of 300 level Portuguese*
A Brazilian Literature or Culture
B Linguistics and Language Pedogogy
C Lusophone Literature or Culture of Portugal or Africa

Russian (Rus)

Majors in Russian Studies are required to complete 30 credits beyond the intermediate (201 202) level Required Rus 301 314 401 440 The remaining 18 credits are selected from the following Hist 421 422 426 530 Pols S 349 355 363 Rus 304 321 322 375 376 401 490 590 including at least three credits outside the Russian curriculum

Minors in Russian Studies are required to complete 201 202 301 The remaining 9 credits must be at the 300 level and above including at least 3 additional credits in Russian (courses taught in English or Russian) and at least 3 credits outside the Russian curriculum

Courses Primarily for Undergraduate Students

Rus 101 Elementary Russian I (4-1) Cr 4 F Introduction to the Russian language grammar and syntax Practice in the four basic skills (listening speaking reading and writing) within the context of Russian culture Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Rus 102 Elementary Russian II (4 1) Cr 4 S *Prereq 101* Introduction to the Russian language grammar and syntax Practice in the four basic skills (listening speaking reading and writing) within the context of Russian culture Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Rus 201 Intermediate Russian I (4 1) Cr 4 F *Prereq 102* Thorough review of grammar and growth of vocabulary Selected readings Continued use of the four basic skills Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Rus 202 Intermediate Russian II (4 1) Cr 4 S *Prereq 201* Thorough review of grammar and growth of vocabulary Selected readings Continued use of the four basic skills Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Rus 301 Composition and Conversation I (3-0) Cr 3 F *Prereq 202* Thorough study of the Russian language with emphasis on strengthening proficiency in writing speaking reading and listening Increased focus on syntax and word formation

Rus 304 Russian for Science and Business (3 0) Cr 3 *Prereq 202* Designed to meet the needs of students who desire to integrate a study of Russian language with special problems in science and business Emphasis on scientific or business language Increased focus on reading grammar and standards for writing scholarly papers or business documents Taught in Russian

Rus 314 Reading Russian Literary and Cultural Texts (3 0) Cr 3 *Prereq 301* Selected readings in Russian literature and culture Emphasis on techniques of reading and analysis of literary and cultural texts

Rus 321 Russian Civilization I (3 0) Cr 3 Study of a particular period or phenomenon (i e cultural pattern myth or archetype in Russian cultural history from 988 to 1855

Rus 322 Russian Civilization II (3-0) Cr 3 Study of a particular period or phenomenon (i e cultural pattern myth or archetype in Russian cultural history from 1855 to the present

Rus 370 Russian Studies in English Translation (3-0) Cr 3 Study of a particular period theme genre or author Topics chosen in light of student and faculty interests Readings discussions and written work in English May be repeated for a maximum of 6 credits

Rus 375 Topics in Russian, East European and Eurasian Studies (3 0) Cr 3 Selected topics dealing with a particular area period or cultural pattern Offered in English by the Russian East European and Eurasian Studies Distance Learning Consortium Rus 375 does not fulfill the English proficiency requirement for FLL majors

Rus 376 Topics in Russian East European, and Eurasian Studies (3-0) Cr 3 Selected topics dealing with a particular area period or cultural pattern Offered in English by the Russian East European and Eurasian Studies Distance Learning Consortium Rus 376 does not fulfill the English proficiency requirement for FLL majors

Rus 395 Study Abroad Cr arr 1 to 6 Supervised instruction in language and culture of Russia formal class instruction at level appropriate to student s training augmented by practical living experience

Rus 401 Advanced Composition and Conversation (3 0) Cr 3 *Prereq 314* Intensive practice in composition and conversation with emphasis on mastery of speaking and writing skills development of idiomatic usage and effective expression of ideas Increased emphasis on vocabulary building grammatical correctness and compatibility of style and content Nonmajor graduate credit

Rus 440 Seminar in Russian Studies (3-0) Cr 3 *Prereq 314* Study of a selected topic in history politics Russian Orthodox religion literature art theater and/or cinema Nonmajor graduate credit

Rus 490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in Russian and permission of department chair* No more than 9 credits of Rus 490 may be counted toward graduation Designed to meet the needs of students who seek work in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields

Rus 499 Internship in Russian Cr 1-3 each time taken FS SS *Prereq 9 credits of Russian at the 300 level permission of advisor and FLL Internship Coordinator* Work experience using Russian language skills in the public or private sector combined with academic work under faculty supervision Offered on a satisfactory fail grading basis only May be repeated to a maximum of 6 credits Available only to majors and minors Credits do not apply to major or minor requirements

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Rus 590 Special Topics in Russian Cr 2 to 4 each time taken *Prereq Permission of instructor 6 credits of 400 level Russian*
A Literature or Literary Criticism
B Linguistics
C Language Pedagogy
D Civilization

Spanish (Span)

Majors in Spanish are required to complete a minimum of 39 credits beyond the intermediate level (i e numbered 202) Majors must take the following core courses 301 303 314 321 322 330 331 332 352 401 and at least one of the courses numbered 440-445 480/580 The remaining six credits should be chosen from Spanish courses numbered above 300 (except 370) with at least one course numbered above 440

The Spanish minor requires 16 credits at the 300 level or higher including 380 *Option 1* Hispanic Studies 9 credits in literature culture or linguistics *Option 2* Language and Cultures for the Professions 303B 304 321 322 351

Courses Primarily for Undergraduate Students

Span 97 Review Module (0-4) Cr 0 F *Prereq More than one year but less than three years of high school Spanish* Modular self paced course preparing students for 102 Course components include review of key language skills covered in 101 audio components help sessions and testing Students who have taken two semesters of college Spanish or three years of high school Spanish are not eligible to enroll

Span 101 Elementary Spanish I (4-1) Cr 4 FS SS A communicative approach to grammar and vocabulary within the context of Hispanic culture Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not

currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Span 102 Elementary Spanish II (4 1) Cr 4 FS *Prereq 101 or 97* Continuation of Spanish 101 A communicative approach to grammar and vocabulary within the context of Hispanic culture Credit by examination in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Span 110 Intensive Elementary Spanish Cr 8 SS Equivalent to 101 102 combined offered summer only

Span 201 Intermediate Spanish I (4-1) Cr 4 FS *Prereq 102 or 110* Intensive review of basic grammar and conversation Practice in oral and written communication Development of fluency with idiomatic expressions Selected readings on culture and literature Credit by examination in the Depart ment of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the Department is normally not available

Span 202 Intermediate Spanish II (4 1) Cr 4 FS *Prereq 201* Continuation of Spanish 201 Intensive review of basic grammar Practice in oral and written communication Development of fluency with idiomatic expressions Selected readings on culture and literature Credit by examination in the Depart ment of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course

Span 301 Spanish Grammar and Composition (3 0) Cr 3 FS *Prereq 202 or 4 years of high school Spanish* Review and application of grammar concepts in the development of writing skills Taught in Spanish

Span 303 Spanish Grammar and Conversation (3-0) Cr 3 FS *Prereq 202 or 4 years of high school Spanish* Intensive oral practice and improvement of oral proficiency Application of specific grammatical concepts for development of conversational skills within the context of Hispanic culture Taught in Spanish
A Conversation through Culture
B Conversation for Professionals

Span 304 Spanish for Business and Professions (3-0) Cr 3 S *Prereq 301* Introduction to basic business terminology within a cultural context Emphasis on professional writing Grammar review as needed Individual projects will focus on special interests Taught in Spanish Nonmajor graduate credit

Span 314 Introduction to Reading HispanicTexts (3-0) Cr 3 FS *Prereq 301 320 or 326* Critical reading of Hispanic literary and cultural texts Presentation of techniques and terminology of literary criticism Study of basic genres narrative poetry drama essay Required as prerequisite for 330 331 and 332 Taught in Spanish

Span 320 Introduction to Cultural Readings (3 0) Cr 3 FS *Prereq 202 or 4 years of high school Spanish* Readings may include philosophical essays mass media materials and other texts which illustrate cultural differences Readings discussions and compositions in Spanish

Span 321 Spanish Civilization (3 0) Cr 3 F *Prereq One course at the 300 level* A survey of the social political religious and cultural history of Spain Taught in Spanish

Span 322 Spanish American Civilization (3 0) Cr 3 S *Prereq 301 303 320 or 326* A survey of the social political religious and cultural history of Spanish America Taught in Spanish

Span 326 Hispanic Art in a Cultural Context (Dual listed with 526) (3 0) Cr 3 S *Prereq One course at the 300 level* Survey of major currents and figures in Spanish and Spanish American art alongside selected literary and documentary texts and films Taught in Spanish

Span 330 Survey of Spanish Literature to 1700 (3 0) Cr 3 F *Prereq 314* Introduction to Spanish literature from the earliest times through the Golden Age techniques of literary criticism Lectures discussion and analysis of individual selections in Spanish Taught in Spanish Nonmajor graduate credit

Span 331 Survey of Spanish Literature from 1700 to the Present (3 0) Cr 3 S *Prereq 314* Introduction to Spanish literature from the eighteenth century to the present techniques of literary criticism Lectures discussion and analysis of individual selections in Spanish Taught in Spanish Nonmajor graduate credit

Span 332 Survey of Spanish American Literature (3-0) Cr 3 S *Prereq 314* Introduction to Spanish American literature from the earliest times to the present techniques of literary criticism Lectures discussion and analysis of individual selections in Spanish Taught in Spanish Nonmajor graduate credit

Span 351 Introduction to Spanish English Translation (3 0) Cr 3 F *Prereq 301 303 or 304* Introduction to the theory methods techniques and problems of translation Consideration of material from business literature and the social sciences Taught in Spanish Nonmajor graduate credit

Span 352 Introduction to Spanish Phonology (Same as Ling 352) (3 0) Cr 3 S *Prereq 301 303 or 304* An introductory study of the articulation classification distribution and regional variations of the sounds of the Spanish language Taught in Spanish Nonmajor graduate credit

Span 370 HispanicTopics in EnglishTranslation (3 0) Cr 3 *Prereq Sophomore classification* Study of a selected period theme genre or author Readings discussions and written work in English May be repeated for a maximum of 6 credits

Span 380 Seminar for Spanish Minors (1 0) Cr 1 S *Prereq One Spanish course at the 300 level* Overview of Hispanic culture and language presented by specialists in the field Taught in Spanish

Span 394 Study Abroad Orientation (1 0) Cr 1 FS Overview of Spanish life and customs family religion politics economics system sports entertainment and consumer practices

Span 395 Study Abroad Cr 1 to 10 *Prereq Equivalent to 2 years university-level Spanish* Supervised instruction in Spanish and Hispanic culture formal class instruction at level appropriate to student s training enhanced by practical living experience

Span 401 Advanced Composition and Grammar (3 0) Cr 3 F *Prereq 301 or 303* Advanced study of Spanish grammar and syntax Students writing of compositions incorporates an advanced understanding of grammar syntax and principles of organization of thought and ideas Taught in Spanish Nonmajor graduate credit

Span 403 Advanced Conversation (3 0) Cr 3 S *Prereq 301 or 303* Intensive oral practice Development of fluency in the use of idiomatic expressions and application of grammar and syntax concepts to conversational skills Emphasis on organization of speeches and other oral presentations Taught in Spanish Nonmajor graduate credit

Span 440 Spanish Literature of the Middle Ages (Beginnings to 1500) (3 0) Cr 3 *Prereq 330* Discussion and analysis of major trends and figures in Medieval prose drama and poetry May be repeated for a maximum of 6 credits Taught in Spanish Nonmajor graduate credit

Span 441 Literature of the Golden Age (from 1500 to 1700) (3 0) Cr 3 *Prereq 330* Discussion and analysis of major trends and figures in Renaissance and Baroque prose drama and poetry May be repeated for a maximum of 6 credits Taught in Spanish Nonmajor graduate credit

Span 442 Spanish Literature of the 18th and/or 19th Century (3-0) Cr 3 *Prereq 330 or 331* Discussion and analysis of representative works authors and literary trends from Romanticism through Generation 98 May be repeated for a maximum of 6 credits Taught in Spanish Nonmajor graduate credit

Span 443 Spanish Literature of the 20th Century (3-0) Cr 3 *Prereq 330 or 331* Topics may include such themes as social protest in the post war novel modernism and surrealism in poetry and drama etc May be repeated for a maximum of 6 credits Taught in Spanish Nonmajor graduate credit

Span 444 Spanish American Literature from EarliestTimes to Independence (3 0) Cr 3 *Prereq 330 or 332* Study and analysis of representative works literary schools and movements of this period May be repeated for a maximum of 6 credits Taught in Spanish Nonmajor graduate credit

Span 445 Spanish American Literature from Independence to the Present (3-0) Cr 3 *Prereq 332* Critical and analytical study of Spanish American prose poetry and drama May be repeated for a maximum of 6 credits Taught in Spanish Nonmajor graduate credit

Span 462 Contrastive Analysis of Spanish/ English forTranslators (Same as Ling 462) (3 0) Cr 3 S *Prereq 351* Linguistic study of the major differences between the Spanish and English grammatical systems and their applications in the translation of Spanish to English Taught in Spanish Nonmajor graduate credit

Span 463 Hispanic Dialectology (Same as Ling 463) (3 0) Cr 3 *Prereq 352* Intensive study of the phonology morphosyntax and lexicon of the Hispanic dialects of Spain and Latin America in their historical context Taught in Spanish Nonmajor graduate credit

Span 480 Seminar in Hispanic Literature or Culture (3 0) Cr 3 each time taken *Prereq 330 331 or 332* Advanced study of a selected topic in Hispanic literature and literary criticism Taught in Spanish Nonmajor graduate credit

Span 490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in Spanish and permission of department chair* No more than 9 credits in Span 490 may be counted toward graduation Designed to meet the needs of students in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields

Span 493 Cultural Workshop for Second Language Teachers (Spanish) (1 3) Cr 1 to 3 SS *Prereq Experience in teaching Spanish* Review of special language problems within the context of Hispanic cultures May be repeated for a maximum of 9 credits Nonmajor graduate credit

Span 499 Internship in Spanish Cr 1 3 each time taken FS SS *Prereq 9 credits of Spanish at the 300 level permission of advisor and FLL Internship Coordinator* Work experience using Spanish language skills in the public or private sector combined with academic work under faculty supervision Offered on a satisfactory fail grading basis only May be repeated to a maximum of 6 credits Available only to majors and minors Credits do not apply to major or minor requirements

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Span 526 Hispanic Art in a Cultural Context (Dual listed with Span 326) (3 0) Cr 3 S *Prereq 6 credits in Spanish literature or culture at 400 level* Survey of major currents and figures in Spanish and Spanish American art alongside selected literary and documentary texts and films

Span 580 Graduate Seminar in Hispanic Literature or Culture Cr 1 to 3 FS SS *Prereq 6 credits of 400 level Spanish* Topics may include a particular period a genre an author a theme or a particular type of cultural production according to the interests of students and faculty May be taken for 1-3 credits each time for up to 9 credits Taught in Spanish

Span 590 Special Topics in Spanish Cr 1 to 4 each time taken *Prereq Permission of instructor 6 credits of 400 level Spanish*
A Literature or Literary Criticism
B Linguistics
C Language Pedagogy
D Civilization

Special Courses in Foreign Languages (F Lng)

Courses Primarily for Undergraduate Students

F Lng 417 Student Teaching (Same as C I 417) See *Curriculum and Instruction*

F Lng 480 Field Experience for Secondary Teaching Preparation (Same as C I 480) See *Curriculum and Instruction*

F Lng 486 Methods in Elementary School Foreign Language Instruction (Same as C I 486 Ling 486) (3-0) Cr 3 S *Prereq 25 credits in a foreign language* Current educational methods and their application in the elementary school classroom Special emphasis on planning evaluation and teaching strategies Nonmajor graduate credit

F Lng 487 Methods in Secondary School Foreign Language Instruction (Same as Ling 487 C I 487) (3 0) Cr 3 F *Prereq 25 credits in a foreign language admission to the teacher education program* Theories and principles of contemporary foreign language learning and teaching Special emphasis on designing instruction and assessments for active learning

F Lng 498 History of the Germanic Language (Same as Ling 498) (3 0) Cr 3 or (3 2) Cr 4 S *Prereq Reading knowledge of German* Early philological history of German as it separates from Indo-European development through the Old High and Middle High German periods including the earliest written evidence Influence of Martin Luther on modern German theory of the development of Yiddish modern sociolinguistic treatment of German outside of Germany particularly in the United States e g in the Amana Colonies as well as among the Old Order Amish Fourth credit supplementary readings and compositions in German Nonmajor graduate credit

Genetics - Interdisciplinary

www genetics iastate edu

e mail genetics@iastate edu

(Interdepartmental Graduate Major)

Supervisory Committee T Baum Chair
P Schnable Associate Chair S Carpenter P Becraft
B Bonning J Powell Coffman

Participating Faculty L Ambrosio D Bassham
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M G James J Jannink F Janzen K M Johansen
A Kanthasamy S J Lamont C Lashbrook M Lee
C Link J E Mayfield W A Miller F C Minion
R Mittler A M Myers J Nason G Naylor
B J Nikolau M Nilsen Hamilton D Oliver
R G Palmer R Peters P A Peterson T Peterson
G Phillips J Powell Coffman J Reecy
S R Rodermel M F Rothschild P S Schnable
M P Scott R C Shoemaker M H Spalding
L C Stephens R W Thornburg C K Tuggle
D F Voytas K Wang J F Wendel S Whitham
R P Wise E Wurtele

Undergraduate Study

Undergraduates wishing to prepare for graduate study in Genetics should elect courses in basic biology chemistry at least through organic chemistry one year of college level physics mathematics at least through calculus and at least one thorough course in basic transmission and molecular genetics One year of upper level statistics and a year of biochemistry are strongly encouraged

A bachelor of science degree in Genetics is offered by the Department of Zoology and Genetics

Graduate Study

Work is offered for the master of science and doctor of philosophy degrees with a major in Genetics in fourteen cooperating departments Agronomy Animal Science Biochemistry Biophysics and Molecular Biology Botany Entomology Food Science and Human Nutrition Horticulture Plant Pathology Statistics Microbiology Natural Resource Ecology and Managment Veterinary Microbiology and Preventive Medicine Veterinary Pathology and Zoology and Genetics

The diversity of faculty in the Interdepartmental Genetics major ensures a broad well balanced education from the best instructors while offering flexibility in choice of research area Genetics faculty have strengths in many areas from fundamental studies at the molecular cellular organismal and population levels to research with immediate practical application Ongoing research projects span all the major areas of theoretical and experimental genetics including molecular studies of gene regulation gene mapping transposable element studies developmen *tal genetics quantitative and mathematical genetics* computational molecular biology evolutionary genetics and population genetics

First-year students majoring in Genetics may enter the Interdepartmental Genetics major by either of two routes by direct admission to the Interdepartmental Genetics major or by admission to a department participating in the major followed by formal admission to the major Students admitted directly into the Interdepartmental Genetics major will take Genet 697 (graduate research rotation) in their first two semesters and by the end of their second semester enter a department by choosing a major professor from the participating faculty Students first admitted by a department will do research rotations within that department only and choose a major professor from participating Interdepartmental Genetics faculty in that department

All Ph D candidates take a core curriculum comprising one course each from the following four categories and attend seminars and workshops as described Transmission Genetics (Gen 510) Molecular Genetics (Gen 511 or BBMB 502) Quantitative Population and Evolutionary Genetics (An S/Agron 561 or Gen 562 or Gen 563 or Bot 567 or Gen 566) Biochemistry (BBMB 404 or BBMB 501) Students will make research presentations attend genetics faculty seminars and participate in three Workshops in Genetics (Genet 591) in the training period First-year graduate students will also take Genet 692 (Seminar in the Conceptual Foundations of Genetics) Ph D students may elect a computational molecular biology speciality within the genetics major This requires that the research project be in the field of computational molecular biology IG majors will be expected to complete all of the courses required for the major except that one semester of Student Research Seminar in Computational Biology may be substituted for one semester of GENET 690 Students will be expected to take additional courses in the area of specialization M S students will take the above core courses and seminars but will participate in only two workshops in Genetics Additional coursework may be selected to satisfy individual interests or departmental requirements The foreign language requirement and teaching requirement are determined by the student s department

The course designator Genet applies to graduate courses taught by the interdepartmental major in Genetics The course designator Gen applies to courses taught by the Department of Zoology and Genetics (see separate listing)

Students minoring in Genetics at the Ph D level must meet the following requirements Completion of three of the four categories of the common-core required lecture courses listed above One semester of seminar in Genetics (Genet 690 or 691 or 692) is recommended One member of the POS committee must be a Genetics faculty member

Student Outcomes Most students awarded doctoral degrees continue their training as postdoctoral associates at major research institutions in the U S or abroad in preparation for research and/or teaching positions in academia industry or government A few go directly to permanent research positions in industry Most students awarded master s degrees continue their training as doctoral students however some choose research support positions in academia industry or government A complete list of outcomes is available at our Web site

Courses for Graduate Students

Genet 590 Special Topics Cr arr

Genet 591 Workshop in Genetics (1 0) Cr 1 each time taken S *Prereq Permission of instructor* Current topics in genetics research Lectures by off-campus experts Students read background literature attend preparatory seminars attend all lectures meet with lecturers

Genet 690 Seminar in Genetics (1-0) Cr 1 each time taken F *Prereq Permission of instructor* Student research presentations

Genet 691 Seminar in Genetics (1 0) Cr 1 each time taken F *Prereq Permission of instructor* Faculty research series

Genet 692 Seminar in the Conceptual Foundations of Genetics (1 0) Cr 1 F *Prereq Permission of instructor* Student and faculty presentations of landmark papers in genetics Brief history of ideas of the period included as background material

Genet 697 Graduate Research Rotation Cr var each time taken FS SS Graduate research projects performed under the supervision of selected faculty members in the Interdepartmental Genetics major

Genet 699 Research

Geological and Atmospheric Sciences

www geology iastate edu/

Carl E Jacobson Chair of Department

Professors Chen Gutowski Jacobson Sandor Spry Takle

Professors (Collaborators) Branstator Tribbia

Distinguished Professors (Emeritus) Vondra

Professors (Emeritus) Nordlie Seifert Yarger

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Associate Professors (Emeritus) Cody

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Students minoring in Genetics at the Ph D level must meet the following requirements Completion of three of the four categories of the common-core required lecture courses listed above One semester of seminar in Genetics (Genet 690 or 691 or 692) is recommended One member of the POS committee must be a Genetics faculty member

Student Outcomes Most students awarded doctoral degrees continue their training as postdoctoral associates at major research institutions in the U S or abroad in preparation for research and/or teaching positions in academia industry or government A few go directly to permanent research positions in industry Most students awarded master s degrees continue their training as doctoral students however some choose research support positions in academia industry or government A complete list of outcomes is available at our Web site

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Genet 697 Graduate Research Rotation Cr var each time taken FS SS Graduate research projects performed under the supervision of selected faculty members in the Interdepartmental Genetics major

Genet 699 Research

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Assistant Professors (Adjunct) Dawson Ewing Kramer

Undergraduate Study

The department offers courses in Geology and Meteorology Majors can be earned in earth science (B A B S) geology (B S) and meteorology (B S) Candidates for all degrees must satisfy the require ments established by the College of Liberal Arts and

Sciences (see *Liberal Arts and Sciences Curriculum*) In addition the department has requirements for each major

The bachelor of science in Geology prepares the student for a professional career and/or graduate study in the geological sciences Students selecting geology as a major will elect an option in traditional geology or environmental geology/hydrogeology The traditional option prepares a student for employment in state and U S geological surveys mineral and petroleum exploration and graduate study in most aspects of geology Required courses in this option include Geol 100 100L 102 102L 302 311 (A) 356 365 368 451 and at least 6 credits of geology electives The environmental geology/hydrogeology option prepares a student for employment in environmental consulting state and U S geological surveys regulatory agencies and graduate study in the environmental aspects of geology Required courses in this option include Geol 100 100L 102 102L 302 311(B) 356 368 411 422 475 and at least 6 credits of geology electives Required supporting courses include Chem 163 163L 164 164L Phys 111 112 Math 165 166 or Math 181 182 at least 6 additional credits of mathematics statistics agronomy engineering or computer science from an approved departmental list No more than 9 credits in 490 may be counted toward a degree in Geology

A minor in Geology may be earned by taking 15 credits of geology coursework including Geol 100 and 100L (or 201) 102 and 102L The remainder should be at the 300 level or above

Graduates work to understand natural processes on Earth and other planets They are able to apply their knowledge of forces and factors that shape the Earth to reconstruct the past and anticipate the future Graduates provide essential information for solving problems for resource management environmental protection and public health safety and welfare They work as consultants on engineering and environmen tal problems explorers for new minerals and hydrocarbon resources researchers teachers writers editors and museum curators Graduates are able to integrate field and laboratory data and to prepare reports They are able to make presentations that include maps and diagrams that illustrate the results of their studies

The study of Meteorology involves the description of the earth s atmosphere and the processes responsible for its behavior Students majoring in Meteorology earn the bachelor of science Successful preparation for professional or graduate work in Meteorology requires that the student develop and integrate a diverse range of skills and knowledge bases These include weather observing the physics and dynamics of the global atmosphere application of new weather technologies advanced mathematical tools computer programming and modeling and effective oral and written communication The faculty view the senior thesis (Meteorology 499) in particular as a capstone experience in which students demonstrate they have achieved this integration Also contemporary meteorology is an earth system science with ties to a variety of human experiences The electives and general education requirements of the college are further experiences that the meteorology student must integrate with their core meteorology knowledge in order to function effectively in a global oriented profession The program requires the following courses Mteor 111 201 206 301 311 341 342 411 417 432 443 454 and 499 An additional 6 credits must be chosen from Mteor 306 404 406 407 455 490 and C E 372 Supporting work is required in areas at least equivalent to Chem 163 163L 164 Phys 221 222 Math 165 166 265 266 Com S 207 Stat 105 Sp Cm 212 A grade of C or better (not C-) is required in each of the following courses to meet minimum graduation requirements for a bachelor of science degree in Meteorology 206 301 311 341 342 411 417 432 443 and 454

Several co-op programs are available for upper division undergraduates Although a range of opportunities exists for men and women who terminate their studies with a bachelor of science students who meet the necessary academic standards are encouraged to continue their studies in a graduate program For these students minor work is recommended in a mathematical or physical science Other students can choose a wide range of supporting courses that will contribute to their particular area of interest in meteorology

The department offers a minor in Meteorology which may be earned by completing 15 credits including Mteor 111 Mteor 206 and Mteor 301 Further information concerning programs of study including sample degree programs is available from the department

The Earth Science major is a broad program that typically emphasizes an interdisciplinary field Programs leading to the bachelor of science may be individually designed but will include required courses in Geology and Meteorology and required supporting work in chemistry physics and mathematics Specific programs have been designed for students interested in a geology meteorology or an environmental earth science emphasis Programs leading to the bachelor of arts for earth science teaching are available The latter program must satisfy the requirements of the Teacher Education Program (see *Index Teacher Education*)

English proficiency requirement The department requires a grade of C or better in each of English 104 and 105 (or 105H) and a C or better in English 314 or 302 or JI MC 347

Graduate Study

The department offers programs leading to the master of science and doctor of philosophy with majors in Earth Science Geology and Meteorology Program options are available for the M S and Ph D degrees in earth science leading to careers in teaching The department also cooperates in the interdepartmental major in Water Resources (see *Index*) Students desiring a major in the above fields normally will have a strong undergraduate background in the physical and mathematical sciences Individuals desiring to enter a graduate program are evaluated by considering their undergraduate background and performance and their expressed goals

Programs of study are designed on an individual basis in accordance with requirements of the Graduate College and established requirements for each departmental major Minor work is normally taken in aerospace engineering agronomy (soil science) chemistry civil and construction engineering computer engineering computer science engineering mechanics materials engineering mathematics mechanical engineering microbiology physics or statistics Departmental requirements provide a strong broad background in the major and allow considerable flexibility in the program of each individual

A dissertation is required of all Ph D candidates M S students in Geology are required to complete a thesis The M S in Earth Science is available to students electing the non thesis (Creative Component) option in Geology or Meteorology A nonthesis option is also offered for the M S degree in Meteorology

Graduates in Geology specialize in a subdiscipline but they comprehend and can communicate the basic principles of geology and supporting sciences They possess the capacity for critical and independent thinking They are able to write a fundable research proposal evaluate current relevant literature carry out the proposed research and communicate the results of their research to peers at national meetings and to the general public They work as consultants on engineering and environmental problems explorers for new minerals and hydrocarbon resources researchers teachers writers editors and museum curators

All candidates for an advanced degree in Meteorology are expected to complete Mteor 542 543 and 555 In addition students without prior synoptic course work must complete Mteor 511 other students must complete Mteor 507 or Agron 507 Students must also complete Mteor 504 (or Agron 504) or Mteor 605 or Agron 505

Graduates in Meteorology have a good comprehen sion of basic principles a capacity for critical and independent thought and an ability to communicate effectively with scientific colleagues They have an appropriate breadth in their understanding of meteorology with a suitable specialization Graduates are able to undertake thorough research and explain the results in a scientifically reasonable fashion

Courses open for nonmajor graduate credit Geol 302 311 356 365 368 402 403 411 412 422 434 451 457 474 475 481 Mteor 301 306 311 341 342 404 406 407 411 417 432 443 454 455 and 475

Geology (Geol)

Courses Primarily for Undergraduate Students

Geol 100 The Earth (3 0) Cr 3 FS SS How does the earth work what is it made of and how does it cahnge through time? Plate tectonics earth materials landforms structures climate and natural resources Emphasis on the observations and hypotheses used to interpret earth system processes Students may also enroll in Geol 100L

Geol 100L The Earth Laboratory (0 2) Cr 1 FS *Prereq Credit or enrollment in 100* Characterization of rocks and minerals interpretation of structures and landforms

Geol 101 Environmental Geology Earth in Crisis (Same as Env S 101) (3 0) Cr 3 FS An introduction to geologic processes and the consequences of human activity from local to global scales Discussion of human population growth resource depletion pollution and waste disposal global warming and ozone depletion desertification and geologic hazards such as earthquakes landslides flooding and volcanism

Geol 102 History of the Earth (3 0) Cr 3 S *Prereq 100 or 201* The earth s physical and biological evolution concepts of global tectonics Methods used to decipher earth history Students majoring in geology must also enroll in Geol 102L

Geol 102L History of the Earth Laboratory (0 2) Cr 1 S *Prereq Credit or enrollment in 102* Introduction to the use of sedimentary rocks and fossils in reconstructing the earth s history

Geol 108 Introduction to Oceanography (Same as Env S 108) (3 0) Cr 3 F Introduction to study of the oceans Ocean exploration Waves and currents Shape structure and origin of the ocean basins Sedimentary record of oceanic life Composition of seawater and its significance for life Ocean circulation and its influence on climate Life of the oceans including coral reefs Use and misuse of ocean resources Anthropogenic impacts on the oceanic environment

Geol 201 Geology for Engineers and Environmen tal Scientists (2-2) Cr 3 FS Introduction to Earth materials and processes with emphasis on engineer ing and environmental applications

Geol 290 Independent Study Cr 2 to 4 each time taken *Prereq Permission of instructor*

Geol 298 Cooperative Education Cr R FS SS *Prereq Geol 100 or 201 100L 102 102L and permission of the department cooperative education coordinator sophomore classification* Required of all cooperative education students Students must register for this course prior to commencing the work period

Geol 302 Summer Field Studies Cr 6 to 8 SS *Prereq 102 356 368* Aerial mapping structural stratigraphic and geomorphologic analyses Written reports with appropriate illustrations required A 6 week summer field course required of all geology majors Students who enroll for the 8 credit option must participate in a two week excursion to selected regions of the western U S Nonmajor graduate credit

Geol 304I Physical Geology (Same as Ia LL 304I) See *Iowa Lakeside Laboratory*

Geol 306 Geology FieldTrip Cr 2 each time taken FS May be taken more than once *Prereq 100 or 201 permission of instructor* Geology of selected regions studied by correlated readings followed by a field trip to points of geologic interest Ten day field trip required

Geol 311 Mineralogy and Earth Materials (A 3-6 or B 2 6) Cr 4 or 5 S *Prereq 100 or 201 Chem 163* Introduction to mineral classification elementary crystal chemistry crystal morphology mineral stability and associations Laboratory problems in mineral identification methods including hand-specimen identification and x ray diffraction 311A includes more in depth treatment of crystallography and optical properties of minerals 311B emphasizes mineral associations stability of minerals in the weathering environment and environmental mineralogy Students in the traditional geology option and in earth science should enroll in 311A Students in the environmental geology/hydrogeology option should enroll in 311B Nonmajor graduate credit

Geol 324 Energy and the Environment (Same as Env S 324 Mteor 324) (3 0) Cr 3 S Renewable and non renewable energy resources Origin occurrence and extraction of fossil fuels Nuclear wind and solar energy Energy efficiency Environmental effects of energy production including air poliution acid precipitation and global climate change Does not count toward credits required in the Geology major

Geol 356 Structural Geology (3-6) Cr 5 S *Prereq 100 or 201 Phys 111 or 221 (preferred) Math 165 or 181* Principles of stress and strain Brittle and ductile behavior of rocks Description and classification of joints faults folds fractures foliation and lineation Plate tectonics and regional geology Laboratory includes application of geometrical techniques to solve structural problems emphasizes map interpretation and use of stereonet and computer methods Nonmajor graduate credit

Geol 365 Petrology (3-6) Cr 5 F *Prereq 311* Nature and origin of igneous metamorphic and sedimentary rocks Emphasis on important rock forming environments and processes and their influence on rock characteristics Laboratory includes thin section study of rock textures and mineralogy and the interpretation of these features Field trips Nonmajor graduate credit

Geol 368 Stratigraphy and Sedimentation (3-2) Cr 4 F *Prereq 311* Origin of sedimentary rocks and the characteristics of major depositional systems geologic time stratigraphic nomenclature methods of correlation facies and facies analysis sequence stratigraphy sedimentary tectonics and basin analysis *Required field and laboratory-based problem with a* comprehensive written report Nonmajor graduate credit

Geol 398 Cooperative Education Cr R FS SS *Prereq Geol 100 or 201 100L 102 102L and permission of the department cooperative education coordinator junior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Geol 402 Watershed Hydrology and Surficial Processes (Same as Agron 402 EnSci 402 For 402) (3 3) Cr 4 F *Prereq Credit or enrollment in EnSci 330 or Geol 100 or 201 Math 165 or 181* Examination of watersheds as systems wherein biological and physical factors control hydrology soil formation and nutrient transport Laboratory emphasizes field investigation of watershed scale processes Nonmajor graduate credit

Geol 403 Environmental Biogeochemistry (Same as Bot 403 EnSci 403) (3 2) Cr 4 S *Prereq EnSci 330 or permission of instructor* Biological chemical and physical phenomena controlling material energy and elemental fluxes in the environment Human interactions with and effects on environmental systems Nonmajor graduate credit

Geol 410 Field Methods in Hydrogeology (Dual listed with 510) (0-4) Cr 2 Alt SS offered 2004 *Prereq 411 or C E 473* Introduction to field methods used in groundwater investigations In field implementation of pumping tests slug tests monitoring well installation and drilling techniques geochemical and water quality sampling seepage meters miniplezometers stream gaging electronic instrumentation for data collection and geophysics Local field trips to investigate water resource water quality and remediation projects

Geol 411 Hydrogeology (Dual listed with 511 same as EnSci 411) (3 2) Cr 4 F *Prereq 100 or 201 Math 165 or 181 Phys 111 or 221* Physical principles of groundwater flow nature and origin of aquifers and confining units well hydraulics and contaminant transport Lab emphasizes applied field and laboratory methods for hydrogeological investigations Nonmajor graduate credit

Geol 412 Paleobiology (2 2) Cr 3 Alt S offered 2004 *Prereq 102* Introduction to the principles methods of analysis and major controversies within paleontology Examination of the fossil record and its application to problems in evolutionary biology paleoecology paleoclimatology and general Earth history Lab involves observation analysis and interpretation of fossil specimens and relevant material of living organisms Field/lab-based project Nonmajor graduate credit

Geol 422 Environmental Geochemistry (Dual listed with 522 same as EnSci 422) (2 2) Cr 3 F *Prereq 402 or 411 or equivalent* Geochemistry of natural waters including inorganic and organic constituents and water rock interactions Interpretation of water quality data Geochemical equilibrium modeling and introduction to kinetics Laboratory emphasizes *chemical analysis of waters and computer modeling* Nonmajor graduate credit

Geol 434 Contaminant Hydrogeology (Dual listed with 534 same as EnSci 434) (3-0) Cr 3 S *Prereq 411 or equivalents* Brief review of organic and inorganic contaminants in industrial and agricultural settings Process-oriented approach to abiotic and biological fate and transport of contaminants Investigation of coupled processes (diffusion advection dispersion sorption and biodegradation) using computer models Groundwater remediation strategies Nonmajor graduate credit

Geol 451 Applied and Environmental Geophysics (Dual listed with 551) (2 2) Cr 3 S *Prereq 100 or 201 Math 165 or equivalent experience* Seismic gravity magnetic resistivity electromagnetic and ground penetrating radar techniques for shallow subsurface investigations and imaging Data interpretation methods Lab emphasizes computer interpretation packages Field work with seismic and resistivity imaging systems and radar Nonmajor graduate credit

Geol 457 Exploration Seismology (Dual listed with 557) (2 2) Cr 3 Alt F offered 2004 *Prereq 100 or 201 Math 165 or equivalent experience* Physics of elastic wave propagation Seismic surveys in environmental imaging engineering and petroleum exploration Reflection and refraction techniques Data collection processing and geological interpretation Field work with state-of the art equipment Nonmajor graduate credit

Geol 474 Glacial and Quaternary Geology (Dual listed with 574) (2 2) Cr 3 Alt S offered 2005 *Prereq 100 or 201 or equivalent experience* The study of the depositional and erosional processes of glaciers using modern glacier analogs and landforms Discussion of glaciology glacier hydrology Quaternary history and stratigraphy paleoclimatology and causes of glaciation Laboratory emphasizes aerial photo and topographic map interpretation and the Quaternary stratigraphy of Iowa Two required field trips Nonmajor graduate credit

Geol 475 Surficial Processes (Dual listed with 575 same as EnSci 475) (2 2) Cr 3 F *Prereq 100 or 201 or equivalent experience* Study of surficial processes in modern and ancient geological environments Topics include weathering sediment transport and landform genesis with emphasis on fluvial glacial hillslope eolian and coastal processes Applications to engineering and environmental problems Laboratory emphasizes aerial photo and topographic map interpretation Nonmajor graduate credit

Geol 481 Economic Geology and the Environment (Dual listed with 581) (2 2) Cr 3 Alt F offered 2003 *Prereq 365* Review of major processes which concentrate economically important materials in the earth Nature and origin of metallic and non metallic ore deposits petroleum and coal Environmental effects of the production and use of mineral resources including discussions of acid mine drainage Laboratory emphasizes the study of economic minerals from metallic deposits Nonmajor graduate credit

Geol 490 Independent Study Cr 2 to 4 each time taken *Prereq 6 credits in geology and permission of instructor* No more than 9 credits of Geol 490 may be counted toward graduation

Geol 498 Cooperative Education Cr R FS SS *Prereq Geol 100 or 201 100L 102 102L and permission of the department cooperative education coordinator senior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Geol 506 Geology FieldTrip Cr 2 each time taken May be taken more than once FS *Prereq Graduate classification* Geology of selected regions studied by correlated readings followed by a field trip to points of geologic interest Ten day field trip

Geol 507 Mineral Resources FieldTrip Cr 1 each time taken May be taken more than once F *Prereq Geol 365* On site inspection of various coal and ore deposits mining operations and mineral processing plants Offered on a satisfactory fail grading basis only

Geol 510 Field Methods in Hydrogeology (Dual listed with 410) (0-4) Cr 2 Alt SS offered 2004 *Prereq 411 or C E 473* Introduction to field methods used in groundwater investigations In field implementation of pumping tests slug tests monitoring well installation and drilling techniques geochemical and water quality sampling seepage meters miniplezometers stream gaging electronic instrumentation for data collection and geophysics Local field trips to investigate water resource water quality and remediation projects

Geol 511 Hydrogeology (Dual listed with 411) (3 2) Cr 4 F *Prereq 100 or 201 Math 165 or 181 Phys 111 or 221* Physical principles of groundwater flow nature and origin of aquifers and confining units well hydraulics and contaminant transport Lab empha sizes applied field and laboratory methods for hydrogeological investigations

Geol 522 Environmental Geochemistry (Dual listed with 422) (2-2) Cr 3 F *Prereq 511 or equivalent* Geochemistry of natural waters including inorganic and organic constituents and water rock interactions Interpretation of water quality data Geochemical equilibrium modeling and introduction to kinetics Laboratory emphasizes chemical analysis of waters and computer modeling

Geol 534 Contaminant Hydrogeology (Dual listed with 434) (3 0) Cr 3 S *Prereq 511 or their equivalent* Brief review of organic and inorganic contaminants in industrial and agricultural settings Geochemical interactions with porous media Process-oriented approach to abiotic and biological fate and transport of contaminants Investigation of coupled processes (diffusion advection dispersion sorption and biodegradation) using computer models Groundwater remediation strategies

Geol 541 Geochemistry and Mineral Chemistry (3 0) Cr 3 Alt F offered 2003 *Prereq 311 physical chemistry recommended* Thermodynamics and kinetic methods for interpreting geochemical

processes and environments particularly those at elevated temperature and pressure Emphasis on crystal chemistry chemical bonding phase relations in binary and ternary systems and hydrothermal systems

Geol 542 Optical Mineralogy (1-2) Cr 2 S *Prereq 311* Introduction to using the microscope for mineral identification Optical properties of minerals in immersion oils and in thin section Research project required

Geol 550 Advanced Structural Geology (2 2) Cr 3 Alt F offered 2003 *Prereq 356* Principles of stress and strain folding faulting development of schistosity and lineation deformation mechanisms and flow laws development and tectonic implications of crystallographic preferred orientations Lab includes descriptive geometry use of the stereonet and computer applications

Geol 551 Applied and Environmental Geophysics (Dual listed with 451) (2-2) Cr 3 S *Prereq 100 or 201 Math 165 or equivalent experience* Seismic gravity magnetic resistivity electromagnetic and ground penetrating radar techniques for shallow subsurface investigations and imaging Data interpretation methods Lab emphasizes computer interpretation packages Field work with seismic and resistivity imaging systems and radar

Geol 555 Soil Clay Mineralogy (Same as Agron 555) See *Agronomy*

Geol 555L Soil Clay Mineralogy Laboratory (Same as Agron 555L) See *Agronomy*

Geol 557 Exploration Seismology (Dual listed with 457) (2 2) Cr 3 Alt F offered 2004 *Prereq 100 or 201 Math 165 or equivalent experience* Seismic surveys in environmental imaging engineering and petroleum exploration Reflection and refraction techniques Data collection processing and geological interpretation Field work with state-of the-art equipment

Geol 562 Advanced Igneous and Metamorphic Petrology (3 3) Cr 4 Alt F offered 2004 *Prereq 365* Origin and evolution of crystalline rocks Nature of crustal and mantle magma source regions chemical and physical changes accompanying crystallization heterogeneous phase equilibria mineral assemblages and textures of contact dynamic and regionally metamorphosed rocks processes of recrystallization and deformation regional patterns of metamorphic belts Laboratory involves microscopic examination of crystalline rocks in thin section and computer applications

Geol 571 Principles of Stratigraphy (3 0) Cr 3 Alt F offered 2003 *Prereq 412* Study of basic concepts of stratigraphy Stratigraphic processes and interpretation sedimentation and tectonics sequence stratigraphy basin analysis and relations between stratigraphy and fluid flow Aspects of field and seismic data observation and interpretation

Geol 574 Glacial and Quaternary Geology (Dual listed with 474) (2 2) Cr 3 Alt S offered 2005 *Prereq 100 or 201* The study of the depositional and erosional processes of glaciers using modern glacier analogs and landforms Discussion of glaciology glacier hydrology Quaternary history and stratigraphy paleoclimatology and causes of glaciation Laboratory emphasizes aerial photo and topographic map interpretation and the Quaternary stratigraphy of Iowa Two required field trips

Geol 575 Surficial Processes (Dual listed with 475) (2 2) Cr 3 F *Prereq 100 or 201 or equivalent experience* Study of surficial processes in modern and ancient geological environments Topics include weathering sediment transport and landform genesis with emphasis on fluvial glacial hillslope eolian and coastal processes Applications to engineering and environmental problems Laboratory emphasizes aerial photo and topographic map interpretation

Geol 576 Advanced Sedimentation (2 2) Cr 3 Alt S offered 2004 *Prereq 368 571* Study of the processes and products of sedimentation Modern and ancient sedimentary systems Study of facies models for carbonate siliciclastic and evaporite systems Field trips

Geol 581 Economic Geology and the Environment (Dual-listed with 481) (2 2) Cr 3 Alt F offered 2003 *Prereq 365* Review of major processes which concentrate economically important materials in the earth Nature and origin of metallic and non metallic ore deposits petroleum and coal Environmental effects of the production and use of mineral resources including discussions of acid mine drainage Laboratory emphasizes the study of economic minerals from metallic deposits

Geol 590 Special Topics Cr 1 to 3 each time taken *Prereq Permission of instructor*
A Surficial Processes
B Stratigraphy
C Sedimentation
D Paleontology
E Petrology
F Structural Geology
G Geochemistry
H Hydrogeology
I Earth Science
J Mineral Resources
K Geophysics
L Mineralogy
M Tectonics
N Paleoecology and Paleoclimatology
O Isotope Geochemistry

Geol 595 Graduate Seminar Cr R FS *Prereq Senior or graduate classification* Weekly seminar on topics of current research interest All students seeking a graduate degree in geology must enroll during each semester of residence Students pursuing a non thesis option for the M S in Earth Science must enroll for one semester

Geol 599 Creative Component Cr var

Courses for Graduate Students

Geol 610 Advanced Seminar Cr 1 to 3 each time taken FS *Prereq Graduate standing and permission of instructor*
A Earth Materials
B Economic Geology
C Environmental Geochemistry
D Geophysics
E Geotectonics
F Hydrogeology
G Surficial Processes
H Sedimentation and Stratigraphy
I Paleoecology and Paleoclimatology
J Isotope Geochemistry

Geol 699 Research Cr var
A Surficial Processes
B Stratigraphy
C Sedimentation
D Paleontology
E Petrology
F Structural Geology
G Geochemistry
H Hydrogeology
I Earth Science
J Mineral Resources
K Geophysics
L Mineralogy
M Tectonics
N Paleoecology and Paleoclimatology
O Isotope Geochemistry

Meteorology (Mteor)

Courses Primarily for Undergraduate Students

Mteor 111 Synoptic Applications (1-0) Cr 1 FS *Prereq Credit or enrollment in Math 165* Current weather discussions and introduction to synoptic-scale interpretation of meteorology Application and use of calculus in meterology Course restricted to majors Others with permission of instructor

Mteor 201 Introductory Seminar (1 0) Cr R F An overview of the atmospheric sciences the meteorology program at Iowa State and the major research journals used in the discipline

Mteor 206 Introduction to Meteorology (Same as Agron 206) (3 0) Cr 3 FS Basic concepts in meteorology including atmospheric measurements radiation stability precipitation winds fronts forecasting and severe weather Applied topics include global warming ozone depletion world climates weather safety and atmospheric optics

Mteor 265 Scientific Balloon Engineering and Operations (Same as Aer E 265) See *Aerospace Engineering*

Mteor 298 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator sophomore classification* Required of all cooperative education students Students must register for this course prior to commencing the work period

Mteor 301 General Meteorology I (4 0) Cr 4 S *Prereq Math 166 credit or enrollment in Phys 222* Global distribution of temperature wind and atmospheric constituents atmospheric thermodynamics radiative transfer global energy balance storms and clouds introductory dynamics Nonmajor graduate credit

Mteor 306 Use of Weather Data in Agriculture (Same as Agron 306) See *Agronomy* Nonmajor graduate credit

Mteor 311 Introduction to Synoptic Meteorology (1 2) Cr 2 F *Prereq 301* Concepts of weather map plotting and analysis Introduction to forecasting and to the use of real time UNIDATA computer products Nonmajor graduate credit

Mteor 321 Meteorology Internship Cr 1 or 2 each time taken maximum of 3 cr FS SS *Prereq 311 junior or senior standing permission of co-op program coordinator acceptance by sponsoring agency* Supervised practical experience in a professional meteorological agency Experiences may include providing weather information for radio TV utilities government agencies construction or agribusiness

Mteor 324 Energy and the Environment (Same as Env S 324 Geol 324) (3 0) Cr 3 S Renewable and non renewable energy resources Origin occurrence and extraction of fossil fuels Nuclear wind and solar energy Energy efficiency Environmental effects of energy production including air pollution acid precipitation and global climate change Does not count toward credits required in the Meterology major

Mteor 341 Atmospheric Physics I (3 0) Cr 3 F *Prereq Phys 222 credit or enrollment in Math 266* Basic laws of thermodynamics thermodynamics of water vapor mixtures of gases stability hydrostatics cloud physics Nonmajor graduate credit

Mteor 342 Atmospheric Physics II (3 0) Cr 3 S Prereq 341 Precipitation physics radar atmospheric radiation atmospheric optics atmospheric electricity Nonmajor graduate credit

Mteor 398 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator junior classification* Required of all cooperative education students Students must register for this course prior to commencing the work period

Mteor 404 Global Change (Dual listed with 504 same as Agron 404 EnSci 404 Env S 404) (3 0) Cr 3 S *Prereq Four courses in physical or biological sciences or engineering* Recent changes in global biogeochemical cycles and climate models of future changes in the climate system impacts of global change on agriculture water resources and human health ethical issues of global environmental change Nonmajor graduate credit

Mteor 406 Climates of the Continents (Same as Agron 406) See *Agronomy* Nonmajor graduate credit

Mteor 407 Mesoscale Meteorology (Dual listed with 507 same as Agron 407) (3 0) Cr 3 S *Prereq Math 166 and Mteor 454* Physical nature and practical consequences of mesoscale atmospheric phenomena Mesoscale convective systems fronts terrain forced circulations Observations analysis and

prediction of mesoscale phenomena Nonmajor graduate credit

Mteor 411 Synoptic Meteorology (Dual listed with 511) (1-4) Cr 3 F *Prereq Credit or enrollment in 454* Current weather forecasting and discussion Applications of atmospheric physics and dynamics in real-time weather situations Use of UNIDATA computer products Nonmajor graduate credit

Mteor 417 Mesoscale Forecasting Laboratory (Dual-listed with 517) (0-6) Cr 2 S *Prereq Credit or enrollment in 411* Real-time computer analysis of current weather with emphasis on small scale features Studies of severe weather lake effect snow CSI cold air damming Nonmajor graduate credit

Mteor 432 Instrumentation and Measurements *(Dual listed with 532)* (3-0) Cr 3 S *Prereq Credit or enrollment in Stat 105 Math 266 Phys 222* Measurement of meteorological variables and instruments used including surface upper air and remote sensors measurement errors signal processing recording and archiving quality assurance Nonmajor graduate credit

Mteor 443 Dynamic Meteorology I (3-0) Cr 3 S *Prereq 341* Conservation laws governing equations circulation and vorticity Development of quasi geostrophic theory Nonmajor *graduate credit*

Mteor 454 Dynamic Meteorology II (3 0) Cr 3 F *Prereq 443* Planetary boundary layer linear perturbation theory atmospheric wave motions baroclinic and convective instability mesoscale circulations Nonmajor graduate credit

Mteor 455 General Circulation/Advanced Dynamics (Dual listed with 555) (3 0) Cr 3 S *Prereq 454* Numerical simulation of fundamental physical laws applied to weather and climate processes General circulation theory including energy water and momentum balances Forecast and analysis systems with emphasis on their utility to end users Nonmajor graduate credit

Mteor 490 Independent Study Cr 1 to 3 each time taken *Prereq 6 credits in meteorology permission of instructor* No more than 9 credits in Mteor 490 may be counted toward graduation
A Synoptic Meteorology
B Dynamic Meteorology
C Physical Meteorology
D Instrumentation

Mteor 498 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator senior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Mteor 499 Senior Research (2 0) Cr 2 F Required of all senior meteorology majors Research projects in collaboration with faculty Written and oral presentations of results at the end of the semester

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Mteor 504 Global Change (Dual listed with 404 same as Agron 504) (3-0) Cr 3 S *Prereq Four courses in physical or biological sciences or engineering* Biogeochemical cycles ozone chemistry global energy balance structure and circulation of the atmosphere and oceans climate modeling climate variability and implications for agriculture water resources energy use sustainable development and public policy Human dimensions and ethical issues of global environmental change

Mteor 505 Biometeorology (Same as Agron 505) See *Agronomy*

Mteor 507 Mesoscale Meteorology (Dual listed with 407 same as Agron 507) (3-0) Cr 3 S *Prereq Math 166 and Mteor 454* Physical nature and practical consequences of mesoscale atmospheric phenom ena Mesoscale convective systems fronts terrain forced circulations Observations analysis and prediction of mesoscale phenomena

Mteor 511 Synoptic Meteorology (Dual listed with 411) (1-4) Cr 3 F *Prereq Credit or enrollment in 454* Current weather forecasting and discussion Applications of atmospheric physics and dynamics in real time weather situations Use of UNIDATA computer products

Mteor 517 Mesoscale Forecasting Laboratory (Dual listed with 417) (0-6) Cr 2 S *Prereq Credit or enrollment in 411* Real time computer analysis of current weather with emphasis on small scale features Studies of severe weather lake-effect snow CSI cold air damming

Mteor 532 Instrumentation and Measurements (Dual-listed with 432) (3-0) Cr 3 S *Prereq Credit or enrollment in Stat 105 Math 266 Phys 222* Measurement of meteorological variables and instruments used including surface upper air and remote sensors measurement errors signal processing recording and archiving quality assurance

Mteor 542 Physical Meteorology (3-0) Cr 3 Alt F offered 2003 *Prereq 342 Math 266 Phys 222* Planetary atmospheres radiative equilibrium models radiative transfer the upper atmosphere remote sounding from satellites

Mteor 543 Advanced Dynemic Meteorology I (3-0) *Cr 3 Alt F offered 2004 Prereq 455 The first half of* a two semester sequence Governing equations scale analysis simple types of wave motion in the atmosphere instability theory

Mteor 544 Advanced Dynamic Meteorology II (3 0) Cr 3 Alt S offered 2005 *Prereq 543* Continuation of 543 General circulation and dynamics of zonally symmetric circulations atmospheric energetics nonlinear dynamics of planetary waves

Mteor 555 General Circulation/Advanced Dynamics (Dual listed with 455) (3 0) Cr 3 S *Prereq 454* Numerical simulation of fundamental physical laws applied to weather and climate processes General circulation theory including energy water and momentum balances Forecast and analysis systems with emphasis on their utility to end users

Mteor 561 Geophysical Fluid Dynamics (3 0) Cr 3 Alt F offered 2003 *Prereq 455 or E M 378 or M E 335 or Phys 361* Basic concept of rotating fluid dynamics governing equations and boundary conditions dynamics of vorticity potential vorticity and geostrophic motion wave motion in a rotating system dynamics of Ekman and Stewartson layers ocean circulation

Mteor 590 Special Topics Cr 1 to 3 each time taken *Prereq Permission of instructor* Topics of current interest
A Boundary layer Meteorology
B Tropical Meteorology
C Mesoscale Meteorology
D Global Climate Systems
E Climate Modeling
F Numerical Weather Prediction
G Satellite Observations
H Statistical Methods in Meteorology
I Field Observations
J Low Frequency Modes
K Cloud Physics
L Atmospheric Radiation

Courses for Graduate Students

Mteor 605 Micrometeorology (3-0) Cr 3 Alt F offered 2003 *Prereq 443* Atmospheric boundary layer structure and dynamics Turbulence soil influences measurements and empirical relations for wind and temperature profiles near the ground Simulation of boundary layer structure and dynamics

Mteor 699 Research Cr var

Courses Offered at the Gulf Coast Research Laboratory (GCRL), Ocean Springs, Mississippi

The Gulf Coast Research Laboratory is affiliated with the University of Southern Mississippi Iowa State students may register for the following University of Southern Mississippi/GCRL courses and transfer them to their ISU degree programs Written permission of the ISU coordinator for the GCRL 201 Bessey is required for this arrangement Inquire at 201 Bessey for further information

MAR 300 Oceanography (3-4) Cr 5 SS *Prereq College algebra 8 semester hours of chemistry 8 semester hours of biology* An introduction to biological chemical geological and physical marine sciences For upper division science majors

Gerontology

(Interdepartmental Minor)

Advisory Committee P Martin Coordinator K Bermann C Cook M L Damhorst W Franke M Kohut N Meredith D Russell M Yearns

The gerontology program is designed for students desiring careers in aging related fields and for students interested in improving their understanding of aging persons in American society Students are expected to take courses to develop the necessary interdisciplinary breadth which in combination with other disciplinary training can prepare them to work with the aged

Graduates understand the ways in which individual and societal aging influence and are impacted by developments in their major field of study They have an appreciation and understanding of the cross-disciplinary aspects of human aging

Gerontology courses are offered in the interdepartmental gerontology program in the following participating departments and programs Anthropol ogy Architecture Biochemistry Biophysics and Molecular Biology Economics Educational Leadership and Policy Studies Apparel Educational Studies and Hospitality Management Family and Consumer Sciences Education and Studies Food Science and Human Nutrition Health and Human Performance Human Development and Family Studies Political Science Sociology and Textiles and Clothing

Undergraduate Study

Nancy Meredith Coordinator

Undergraduate study in this program provides the student with an opportunity to develop a minor in gerontology A balanced grouping of courses assists the student in developing both a sensitivity to the issues and the ability to synthesize ideas from the variety of disciplines important to the study of the aging process

Undergraduate students may minor in gerontology by taking 16 semester hours of gerontology related courses Nine of these credits must come from the following courses Geron 377 448 461 463 471 476 Students will participate in a prepracticum seminar Geron 466 and will complete a supervised field practicum after all gerontology coursework is completed (Geron 467) A minimum of 3 semester credits must be selected from a list of supportive gerontology related courses Supportive courses include units or topics related to aging and can be used to complement the student s major interests The student s minor program must be approved by the undergraduate gerontology coordinator

Graduate Study

Christine Cook, Coordinator

A declared graduate minor in gerontology consists of a minimum of 12 credits taken from a list of acceptable courses and from at least two depart ments Nine of the 12 credits must be in courses that are focused specifically on aging One 590 course (3 credits maximum) can be taken as part of the 12 credits Geron 510 is required for all minor students At least one member of the gerontology faculty will be on a student s advisory committee this person must be a member of the Graduate Faculty Contact

the coordinator to determine whether courses other than those listed below are available

Courses open for nonmajor graduate credit 448 471 476

Courses Primarily for Undergraduate Students

Geron 377 Aging and the Family (Same as HD FS 377) See *Human Development and Family Studies*

Geron 448 Economics of Aging (Same as HD FS 448) See *Human Development and Family Studies* Nonmajor graduate credit

Geron 461 Life Course Sociology (Same as Soc 461) See *Sociology*

Geron 463 Housing for the Aging (Dual listed with 563 same as HD FS 463) See *Human Development and Family Studies*

Geron 466 Gerontology Prepracticum Seminar (1 0) Cr 1 FS *Prereq 9 credits in core courses for the gerontology minor and approval of the gerontology undergraduate coordinator* Prepracticum training for students planning a gerontology practicum Exploration of possible agencies for the practicum in depth study of a selected agency and development of goals and objectives for the practicum

Geron 467 Gerontology Practicum Cr 3 to 6 each time taken FS *Prereq 466 advance reservation* Supervised field experience related to aging Offered on a satisfactory-fail grading basis only

Geron 471 Design for All People (Same as Arch 471) See *Architecture* Nonmajor graduate credit

Geron 476 The Aged in American Society (Same as Soc 476) See *Sociology* Nonmajor graduate credit

Geron 490 Independent Study Cr arr Consult program coordinator for procedure

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Geron 501 Seminar Cr arr Alt S offered 2004

Geron 510 Survey of Gerontology Cr 1-3 Alt S offered 2005 May be repeated At least 3 credit hours required Provides an overview of important gerontological issues

Geron 534 Adult Development (Same as HD FS 534) See *Human Development and Family Studies*

Geron 561 The Life Course (Same as Soc 561) See *Sociology*

Geron 563 Housing for the Aging (Dual listed with 463 same as HD FS 563) See *Human Development and Family Studies*

Geron 566 Housing for Specific Groups (Same as Arch 566) See *Architecture*

Geron 577 Aging and Intergenerational Relations (Same as HD FS 577) See *Human Development and Family Studies*

Geron 590 Special Topics Cr arr Consult program coordinator for procedure

Graduate Studies

No major is granted in Graduate Studies At the recommendation of the major professor and/or the department chair graduate students may enroll in the following graduate courses to fulfill certain enrollment requirements

Courses for Graduate Students

Gr St 585 Preparing Future Faculty Introductory Seminar Cr 1 *Prereq One year of graduate course work admission into PFF program* Introduction to faculty life issues such as hiring tenure teaching and service at a variety of higher education institutions Includes presentations from faculty at other institutions

Gr St 586 Preparing Future Faculty Intermediate Seminar Cr 1 3 *Prereq Admission into PFF program completion of 585 or permissions of instructor* Consideration of a wide range of faculty life issues Includes topics such as higher education trends diversity issues learning styles assessment grant and proposal writing and legal and ethical issues Written components include job and teaching portfolios

Gr St 600 Examination Only Cr R Reserved for graduate students the term they take the final oral examination Students must have completed all required coursework and not be registered for another course

Gr St 601 Required Enrollment Cr R Reserved for graduate students who must be registered for a particular term but are not required to take additional coursework

Gr St 680 Continuous Registration Cr R Course may be repeated Reserved for Ph D candidates only See the *Graduate College Handbook* for specific requirements

Health and Human Performance

(www edu iastate edu/hhp/homepage htm)

Jerry R Thomas, Chair of Department

Professors Anderson Bloedel King Sharp J Thomas

Distinguished Professors (Emeritus) Forker Toman

Professors (Emeritus) Frye Hutchison Schneider

Professors (Emeritus Adjunct) Beran

Associate Professors Conover Engelhorn Franke K Thomas

Associate Professors (Emeritus) Wood

Assistant Professors Baker Derrick Ekkekakis Gillette Kohut Kwon Murdoch Schabel Smiley-Oyen Trail Welk

Assistant Professors (Collaborators) Buck

Assistant Professors (Emeritus) McDonald

Instructors (Adjunct) Coberley Harklau Meier Miller Nespor Norris Pak Peel

Instructors (Collaborators) Deeter

Lecturers Atkinson Denton Lipsey Martin Power

Mission

The Department of Health and Human Performance promotes health and well being through discovery learning and engagement in the study of physical activity

Goals

The department has identified the following goals to support this mission

1 We seek to improve the lives of citizens of Iowa the United States and the world by the creation and dissemination of knowledge about physical activity and its relationship to health and well-being

2 We prepare scholars and professionals in the study of physical activity at the undergraduate and graduate levels

3 We educate the public and the University community in the scientific aspects of physical activity especially exercise sport and the role of movement throughout the lifespan

Overview of Programs

The Department of Health and Human Performance provides opportunities for matriculation leading to the degrees of Bachelor of Science Master of Science Master of Education and Doctor of Philosophy At both the undergraduate and graduate level there are opportunities for study in the department s two main areas the behavioral and biological bases of physical activity

Undergraduate Study

Dance Coursework in dance provides opportunities for students to develop an understanding and appreciation of dance as part of a liberal education Those interested in teaching dance and Physical Education in the public schools may major in health and human performance (teacher licensure option) and minor in dance

An interdisciplinary Performing Arts major with a dance emphasis is available through the College of Liberal Arts and Sciences For further information see *Index Theatre and Performing Arts*

The department offers a minor in dance that may be earned by completing the following Dance 220 222 270 320 360 384 385 or 386 and three additional credits selected from dance courses numbered 200 or above Participation in Orchesis I or II is recommended

Health and Human Performance The undergraduate curriculum in Health and Human Performance is comprised of four components general education the Basic Core the Advanced Core and the specialization (option) component The intent of the general education component is to promote intellectual and personal growth and to prepare students for success in the basic advanced and option components The Basic Core enables students to understand define and explore their own health and physical activity through the cognitive affective and psychomotor domains The Advanced Core extends this learning to include disciplinary concepts and tools of inquiry that comprise scientific literacy associated with health and physical activity Finally coursework within each specialization option builds upon this personal and scholarly learning by enabling students to master content and skills specific to career applications The specialization Options comprise a focused area of study within Health and Human Performance Options available are 1) Athletic Training 2) Community and Public Health 3) Exercise Science 4) Health/Fitness Management 5) Physical Education Licensure and 6) Sport Management Enrollment in the Athletic Training and Physical Education Licensure options is limited because of accreditation requirements and the provision of more individualized field experiences

Academic options within the undergraduate program Students in the CAAHEP accredited Athletic Training option are prepared for the National Athletic Training Association Board of Certification examination or for graduate work in athletic training Graduates of this option will effectively use their expertise to plan strategies aimed at the prevention treatment and rehabilitation of athletic injuries

Students in the Community and Public Health option are prepared for professional employment at local state or national health agencies medical centers and other public organizations that seek to promote health in the population The curriculum prepares students to take the Certified Health Education Specialist certification examination upon graduation

Students in the Exercise Science option utilize an interdisciplinary approach to the study of human movement In so doing they become prepared for graduate study in Health and Human Performance or advanced study leading to careers in medicine physical therapy or other allied health programs

Students in the Health/Fitness Management option are prepared for professional roles as health and fitness leaders or program managers Employment opportunities include work in corporate fitness programs health clubs cardiac rehabilitation programs or personal training Graduates are able to plan implement and supervise exercise programs which will improve fitness and health Graduates also have a basic understanding of economic and management issues related to business applications in the health and fitness field

Students in the Physical Education Licensure option are prepared to teach Physical Education in grades K 12 and to meet the State of Iowa learning outcomes for teachers Graduates can plan developmentally appropriate physical education and individualize instruction and assessment for diverse audiences

Students in the Sport Management option are prepared for entry level positions in sport related businesses or organizations Graduates will be able to critically analyze sport environments conduct feasibility studies develop marketing plans and communicate effectively with others in sport agencies

Learning outcomes for the undergraduate degree Despite the diversity in specialization Options the Learning Outcomes comprise a common framework for each student as they marticulate through Iowa State University

The learning outcomes emphasized in academic coursework in the Department of Health and Human Performance are

Content knowledge The student has a broad conceptual view of physical activity and health recognizes its scientific underpinnings (e g history content disciplinary concepts and tools of inquiry) and appreciates the interdisciplinary nature of the study of physical activity and health Literacy will be gained from the personal scholarly and professional perspectives

Discovery and critical thinking The student can use accepted techniques of discovery and apply critical thinking within and outside of the discipline area The student will be able to solve problems independently and evaluate opinions and outcomes at the personal scholarly and professional level

Communication The student uses knowledge of effective verbal nonverbal and media communication techniques to foster inquiry collaboration and engagement in physical activity and health related settings

Numeracy The student understands and uses *qualitative and quantitative analysis through formal* and informal assessment strategies

Technology The student understands and uses a variety of technological applications to improve personal understanding and to enhance scholarly pursuits and professional practice in their chosen area of study

Learning in the following domains occurs both in and outside the Iowa State University experience The department will foster development in these domains through its courses and other activities

Citizenship The student uses value and ethics based decision making to demonstrate personal profes sional and world citizenship through fostering relationships embracing leadership accepting social responsibility seeking and completing opportunities to improve the quality of life for others

Lifelong learning The student is a reflective professional who actively seeks to further self knowledge and seeks opportunities to grow professionally

Diversity The student understands how individuals differ in their approaches to initiating and maintaining a physically active healthy lifestyle and creates appropriate environments for diverse participants

The department offers a minor in athletic coaching The minor may be earned by completing the following Ex Sp 220 258 315 355 358 365 Zool 155 and Psych 230

Endorsement to Coach Interscholastic Athletics The State Department of Education has provided for the endorsement of licensed teachers for the coaching of athletic teams in schools The endorsement does not lead to licensure to teach physical education For requirements of the program leading to the coaching endorsement see *Teacher Education Requirements for Areas of Specialization*

Basic Activity Instruction Program The department offers a wide selection of beginning intermediate and advanced courses in the areas of aquatics dance and sports These courses are designed to serve general education purposes for all students

Graduate Study

The Department of HHP offers three graduate programs These programs seek to integrate discovery and learning by preparing graduate students at the master s and Ph D levels to understand and create basic and applied knowledge in the study of physical activity exercise and sport Learning outcomes for the Graduate program can be found on the departmental website

The department also participates in the Master of Education degree by offering specializations in behavioral basis of physical activity and biological basis of physical activity

The normal prerequisite to major graduate work is the satisfactory completion of a curriculum essentially equivalent to that required of undergraduate students *in health and human performance at this university* However it is possible for students to qualify for graduate study even though undergraduate preparation has been in a related area

Students in the M S and Ph D degrees are required to complete original research and write a thesis or dissertation The M Ed degree is a non-thesis degree requiring more coursework and an internship experience or other creative component Specific information about the requirements for these degree options is available from the department office or from the department web site (www educ iastate edu/hhp/grad/)

The department participates in the inter-departmental minor in gerontology (see *Index*)

Courses open for nonmajor graduate credit Ex Sp 355 358 465

Courses Primarily for Undergraduate Students

Athletics (Ath)

Ath 101 Intercollegiate Athletics Cr 1 in any one semester Limited to 1 credit per year to a maximum of 4 FS *Prereq Permission of head coach* Offered on a satisfactory fail grading basis only Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for Ex Sp 166 or any skill technique course in the same sport

B Basketball (men)
C Basketball (women)
D Cross Country (men)
E Cross Country (women)
F Football (men)
G Golf (men)
J Gymnastics (women)
K Softball (women)
M Swimming/Diving (women)
O Tennis (women)
P Track and Field (men)
Q Track and Field (women)
R Volleyball (women)
S Wrestling (men)
T Golf (women)
U Soccer (women)

Health Studies (H S)

H S 105 First Aid and Emergency Care (1 2) Cr 2 FS Discussion and application of the basic techniques of administering first aid and cardiopulmonary resuscitation ARC certification available

H S 110 Personal and Consumer Health (3-0) Cr 3 FS Physical mental and social aspects of health as a basis for understanding and preventing health problems False and misleading advertising and effects of cultists and fadists on consumer health Study of legislation and agencies concerned with consumer protection and health insurance

H S 215 Drug Education (3 0) Cr 3 *Prereq Psych 101 or 230* Use and abuse of mood modifying substances in contemporary society Includes study of tobacco alcohol and other drugs

H S 260 Foundations in Health Education (3-0) Cr 3 A review of the development of health education as a profession CHES foundational theory and skills in health education

H S 275 Health Education in the Elementary School (3 0) Cr 3 *Prereq HD FS 102 or 226* An overview of school health services healthful school living and health instruction for teachers at the elementary level Credit for both 275 and 375 may not be applied toward graduation

H S 292 Acquired Immune Deficiency Syndrome and Sexually Transmitted Diseases (3-0) Cr 3 An introductory non technical examination of the biological social psychological and ethical aspects of AIDS and sexually transmitted diseases

H S 294 Health Issues for Women (3-0) Cr 3 Examines health and health care issues related to women

H S 305 Instructor s First Aid and Cardio pulmonary Resuscitation (1 2) Cr 2 S *Prereq 105 current Standard First Aid and Community CPR Certification* Discussion and practice of skills needed to teach first aid and cardiopulmonary resuscitation ARC certification available

H S 310 Community and Public Health (3 0) Cr 3 *Prereq 110* Introduction to community health problems programs of prevention environmental health agencies and health services Study of local state and national community health agencies their purposes and functions

H S 350 Human Diseases (3-0) Cr 3 *Prereq 110* Discussion of disease process and ill health in the twentieth century Emphasis on epidemiology prevention treatment and the understanding of the etiology of communicable and noncommunicable diseases

H S 375 Teaching Learning Process in Health Education (3 0) Cr 3 *Prereq 105 110 215* Principles methods materials and resources involved *in the teaching of health* Includes organization and development of the health education curriculum (K 12) Credit for both 275 and 375 may not be applied toward graduation

H S 380 Worksite Health Promotion (3-0) Cr 3 *Prereq 258 366 FS HN 167* The design and implementation of worksite health promotion programs and the benefits these programs have for both employees and employers Review of various health risk appraisals and plan theory based incentive programs designed to promote positive lifestyles

H S 385 Search Strategies for Field Experience and Employment (Same as Ex Sp 385) (1 0) Cr R FS *Prereq Junior classification to be taken a minimum of two semesters prior to H S 485* Search techniques and preparation of materials utilized for acquisition of internship and jobs in HHP fields Internship procedures and policies will be covered Offered on a satisfactory fail grading basis only

H S 390 Administration of the School Health Program (3 0) Cr 3 F *Prereq 310* History and legal basis of school health programs Procedures for developing organizing administering and evaluating a modern program of health services healthful school living and health instruction Includes administration community and school relationships

H S 395 Substance Abuse Prevention Theories and Professional Practice (3-0) Cr 3 *Prereq 215* Current approaches to substance abuse prevention programs examination of risk and resiliency factors in school community and institutional contexts examination of legal and ethical concerns and consideration of career and professional opportunities in the substance abuse prevention field

H S 417 Supervised Teaching in Health Education in the Secondary School Cr 12 FS *Prereq 375* Advance registration required

H S 430 Community Health Program Develop ment (3 0) Cr 3 F *Prereq 380* Techniques of needs assessment program design administration and evaluation of community health education programs in various settings

H S 485 Directed Field Experience in Health Education Cr 1 16 *Prereq All required health studies*

courses and permission of coordinator Advance registration required Supervised experience in health education Offered on a satisfactory fail grading basis only

H S 490 Independent Study Cr 1 to 3 maximum of 6 *Prereq 6 credits in health studies and permission of coordinator*

Dance (Dance)

Dance 120 Modern Dance I (0 3) Cr 1 FS Introduction and practice of basic dance concepts including preparatory techniques and guided creativity problems No previous modern dance experience required Offered on a satisfactory fail grading basis only

Dance 130 Ballet I (0-3) Cr 1 FS Introduction to the basic skills vocabulary and tradition of ballet with concentration on control and proper alignment No previous ballet experience required Offered on a satisfactory fail grading basis only

Dance 140 Jazz I (0 3) Cr 1 FS Introduction to the modern jazz style with concentration on isolation and syncopation No previous jazz experience required Offered on a satisfactory fail grading basis only

Dance 150 Tap Dance I (0 3) Cr 1 Instruction and practice in basic tap technique and terminology No previous tap experience required Offered on a satisfactory fail grading basis only

Dance 160 Ballroom Dance I (0-2) Cr 1 FS Instruction and practice in foxtrot waltz swing cha cha rhumba tango and selected contemporary dances Offered on a satisfactory fail grading basis only

Dance 199 Dance Continuum Cr 0 5 to 2 each time taken maximum of 6 credits FS *Prereq Permission of instructor* Advance registration required Continued instruction and practice in either modern dance recreational dance ballet jazz and/or compositional skills Offered on a satisfactory fail grading basis only

Dance 210 Aspects of Rhythmic Movement and Dance (0 3) Cr 1 Survey and practice of the relation of rhythm to movement activities and basic dance concepts Emphasis on methods of teaching rhythm

Dance 211 Fundamentals and Methods of Social and World Dance (1 3) Cr 2 S *Prereq Eligible for admission to HHP Teacher Education Program* Skill enhancement teaching progressions with emphasis on world and social dance Designed for exercise and sport science majors open to others

Dance 220 Modern Dance Composition (1 3) Cr 2 *Prereq 120 or previous modern dance experience* Theory and practice of the creative skills involved in solo and small group composition

Dance 222 Modern Dance II (0 3) Cr 1 FS *Prereq 120 or previous modern dance experience* Dance techniques emphasizing strength balance endurance rhythmic activity and extended combinations

Dance 223 Modern Dance III (0 3) Cr 1 FS *Prereq 222* Continued experience in dance techniques and extended combinations Emphasis on maturation of skill and artistry Exposure to a variety of modern dance technical styles

Dance 224 Concert and Theatre Dance (Same as Thtre 224) (0 3) Cr 0 5 to 2 maximum of 6 credits FS *Prereq By audition only* Choreography rehearsal and performance in campus dance concerts and/or musical theatre productions Offered on a satisfactory fail grading basis only

Dance 232 Ballet II (0 3) Cr 1 *Prereq Previous ballet experience* Technical skills in the classical movement vocabulary Emphasis on alignment techniques sequence development and performing quality

Dance 233 Ballet III (0 3) Cr 1 *Prereq 232* Concentration on technical proficiency at the intermediate level Pointe work and partnering opportunities available

Dance 242 Jazz II (0 3) Cr 1 *Prereq Previous jazz dance experience* Dance concepts within the jazz idiom Instruction in extended movement sequences and artistic interpretation

Dance 243 Jazz III (0 3) Cr 1 *Prereq 242* Integration of the concepts of jazz dynamics phrasing and skills into performance situations Some repertory work of historical and contemporary pieces

Dance 262 Ballroom Dance II (0-2) Cr 1 *Prereq Previous ballroom dance experience* Practice in ballroom dance routines Emphasis on style posture and footwork Defining technique and execution Leading and following more defined

Dance 270 Dance Appreciation (3 0) Cr 3 FS Introduction to the many forms and functions of dance in world cultures Develops abilities to distinguish and analyze various dance styles No dance experience required

Dance 320 Sound and Movement (2 2) Cr 3 S offered odd numbered years *Prereq 220* Intermediate composition based on the relationship of movement to improvised sounds rhythmic scores and the musical works of composers from various periods

Dance 360 History and Philosophy of Dance (3-0) Cr 3 Alt S offered even numbered years *Prereq 270* Study of the history of dance from early to modern times with emphasis on the theories and philosophies of contemporary modern dance dancers and dance educators

Dance 370 Advanced Studies in Dance Cr 1 to 3 in any one semester to a maximum of 8 credits FS *Prereq 2 credits in dance* Advance registration required Designed to meet special interests and talents of students to include both group and independent study in various aspects of dance as a performing art including production choreography and performance

Dance 384 Teaching Children's Dance (1 3) Cr 2 S Content experiences and methods of a comprehen sive dance program at the elementary school level Theories and practice in guiding elementary school children in expressive movement experiences

Dance 385 Methods of Teaching Dance (1-3) Cr 2 F Methods and techniques of teaching social and world dance forms Introduction to teaching educational modern dance

Dance 386 Teaching Dance Technique and Composition (1 3) Cr 2 *Prereq 320* Teaching of dance as an expressive art form with emphasis on technique rhythm and the creative teaching process

Dance 490 Independent Study Cr 1 to 3 maximum of 6 *Prereq 6 credits in dance and permission of coordinator* Independent study of problems or areas of interest in dance

Exercise and Sport Science (Ex Sp)

Ex Sp 101 Swimming I (0-3) Cr 1 FS Basic course for nonswimmers Emphasis on two fundamental strokes and personal water safety skills Offered on a satisfactory fail grading basis only

Ex Sp 102 Swimming II (0 3) Cr 1 FS *Prereq 101 or equivalent skill* Intermediate course Emphasis on learning and improving five basic strokes and personal water safety skills Offered on a satisfactory fail grading basis only

Ex Sp 108 Aquatic Fitness (0-3) Cr 1 *Prereq 102 or equivalent skill* Water related exercises activities and swimming workouts to improve physical fitness Offered on a satisfactory fail grading basis only

Ex Sp 109 Basic Skin and Scuba Diving (1 3) Cr 2 FS *Prereq Swimming competence* Offered on a satisfactory-fail grading basis only

Ex Sp 113 Scuba Assistant Instructor Practicum (0 2) Cr 1 *Prereq 109 and permission of instructor* Supervised experience in conduct of basic scuba diving program Offered on a satisfactory fail grading basis only

Ex Sp 114 Lifeguard Training (0 3) Cr 1 FS *Prereq Ability to swim 500 yards continuously of front crawl sidestroke and breaststroke perform a standing and surface dive swim under water and tread water for one minute* Minimum age 16 Specific training for Red Cross Lifeguard certification First aid and CPR included Offered on a satisfactory fail grading basis only

Ex Sp 115 WSI and Lifeguard Training Instructor (0 5) Cr 2 FS *Prereq Minimum age 17 current lifeguard first aid and CPR certifications* Stroke analysis and methods of class organization and instruction of swimming water safety and rescue skills Red Cross Water Safety Instructor and Lifeguarding Instructor certifications Offered on a satisfactory fail grading basis only

Ex Sp 116 Water Safety Instructor Practicum (0 3) Cr 1 *Prereq 115 H S 105 CPR certification and permission of instructor* Supervised teaching experience in swimming aquatic fitness lifeguard training and WSI courses Offered on a satisfactory fail grading basis only

Ex Sp 119 Archery (0 2) Cr 1 FS Offered on a satisfactory fail grading basis only

Ex Sp 122 Badminton (0 2) Cr 1 FS Offered on a satisfactory fail grading basis only

Ex Sp 126 Pocket Billiards (0 2) Cr 1 FS Introduction to the basic strokes (stop draw follow) and contemporary game forms associated with pocket billiards Offered on a satisfactory fail grading basis only

Ex Sp 129 Bowling (0 2) Cr 1 FS Offered on a satisfactory fail grading basis only

Ex Sp 132 Fencing (0-2) Cr 1 Offered on a satisfactory fail grading basis only

Ex Sp 135 Golf I (0 2) Cr 1 FS Beginning skills only Offered on a satisfactory fail grading basis only

Ex Sp 136 Golf II (0 2) Cr 1 *Prereq 135 or equivalent skill* Offered on a satisfactory fail grading basis only

Ex Sp 139 Gymnastics (0 2) Cr 1 Offered on a satisfactory fail grading basis only

Ex Sp 144 Racquetball (0-2) Cr 1 FS Offered on a satisfactory fail grading basis only

Ex Sp 151 Cross Country Skiing (0 2) Cr 1 S Offered on a satisfactory fail grading basis only

Ex Sp 153 Ice Skating (0-2) Cr 1 Offered on a satisfactory fail grading basis only

Ex Sp 158 Tennis I (0 2) Cr 1 FS SS Introduction to basic skills (forehand backhand service) and basic knowledge of game play Offered on a satisfactory fail grading basis only

Ex Sp 159 Tennis II (0-2) Cr 1 *Prereq 158* Expansion of basic skills to include volley and spins Introduction to basic strategy Offered on a satisfac tory fail grading basis only

Ex Sp 162 Triathlon Training (0 3) Cr 1 FS *Prereq 102 or equivalent skill* Introduction to the sport of triathlon integrating the discipline(s) of running cycling and swimming Emphasis on cross training systems and skill enhancement Offered on a satisfactory fail grading basis only

Ex Sp 163 Physical Fitness (0 3) Cr 1 Evaluation of fitness status Exercises activities and programs to improve physical fitness Relationship between physical activity and weight control Offered on a satisfactory fail grading basis only Credit for only 163 or 258 may be applied toward graduation

Ex Sp 164 Walking for Fitness (0 3) Cr 1 FS Fitness walking as an activity to improve health and fitness values of this type of activity as a lifetime endeavor Offered on a satisfactory fail grading basis only

Ex Sp 165 Aerobics (0 3) Cr 1 Exercise class designed to improve fitness incorporating exercise to music along with various dance styles Offered on a satisfactory fail grading basis only

Ex Sp 166 Weight Training (0 3) Cr 1 FS Offered on a satisfactory fail grading basis only

Ex Sp 170 Tae Kwon Do/Karate I (0 2) Cr 1 FS Offered on a satisfactory fail grading basis only

Ex Sp 171 Tae Kwon Do/Karate II (0 2) Cr 1 *Prereq 170* Offered on a satisfactory fail grading basis only

Ex Sp 173 Hap Ki Do/Martial Self Defense (0 2) Cr 1 FS Offered on a satisfactory fail grading basis only

Ex Sp 178 Basketball (0-2) Cr 1 Offered on a satisfactory fail grading basis only

Ex Sp 179 Flag Football (0-2) Cr 1 Offered on a satisfactory fail grading basis only

Ex Sp 180 Softball (0 2) Cr 1 Offered on a satisfactory fail grading basis only

Ex Sp 182 Volleyball (0-2) Cr 1 Offered on a satisfactory fail grading basis only

Ex Sp 185 Soccer (0 2) Cr 1 Offered on a satisfactory-fail grading basis only

Ex Sp 220 Basic AthleticTraining (1 2) Cr 2 *Prereq Zool 155* Introduction to methods of prevention and immediate care of athletic injuries Basic information concerning health supervision of athletes and some basic wrapping and strapping techniques for common injuries

Ex Sp 221 AthleticTraining Practicum (0 3) Cr 1 *Prereq Credit or enrollment in 222 and permission of program director* Training room experience to accompany 222 Open to students in the athletic training option Offered on a satisfactory fail grading basis only

Ex Sp 222 Basic AthleticTraining for Athletic Trainers (2 2) Cr 3 S *Prereq Zool 255 255L* This course is intended to provide pre athletic training students with the knowledge of the profession of a certified athletic trainer factors associated with injury prevention treatment emergency care of athletic injuries protective equipment basic organization administrative and legal concepts in the athletic training setting Utilize knowledge to evaluate analyze and demonstrate appropriate taping wrapping and basic skill techniques To be taken with Ex Sp 221

Ex Sp 224 Evaluation of Athletic Injuries I (2-3) Cr 3 F *Prereq Zool 256 256L permission of program director* Sport injury assessment procedures and evaluation techniques for lower body injuries Includes an overview of mechanisms of injury general musculoskeletal disorders and dermatological conditions Designed for students in the athletic training option or preprofessional health programs

Ex Sp 225 AthleticTraining Practicum (0-3) Cr 1 *Prereq Credit or enrollment in 224 and permission of program director* Training room experience to accompany 224 Open to students in the athletic training option Offered on a satisfactory fail grading basis only

Ex Sp 226 Evaluation of Athletic Injuries II (2 3) Cr 3 *Prereq 224 permission of program director* Sport injury assessment procedures and evaluation techniques for upper body injuries Includes an overview of common illnesses of athletes and sport specific injuries Designed for students in the athletic training option or preprofessional health programs

Ex Sp 227 AthleticTraining Practicum (0 3) Cr 1 *Prereq Credit or enrollment in 226 and permission of program director* Training room experience to accompany 226 Open to students in the athletic training option Offered on a satisfactory fail grading basis only

Ex Sp 230 Fundamentals of Aquatics (0 3) Cr 1 S *Prereq 101 or equivalent Eligibility for admission to HHP teacher education program* Basic water safety and emergency water safety Skill enhancement understanding and progressions

Ex Sp 231 Fundamentals of Tumbling and Gymnastics (0 3) Cr 1 F *Prereq Eligibility for admission to HHP teacher education program* Fundamentals of tumbling and gymnastics apparatus Skill enhancement analysis understanding practice and the development of progressions

Ex Sp 232 Fundamentals of IndoorTeam Sports (0 3) Cr 1 S *Prereq Eligibility for admission to HHP teacher education program* Fundamentals of indoor team sports for example basketball volleyball team handball Skill enhancement analysis understanding practice and the development of progressions

Ex Sp 233 Fundamentals of OutdoorTeam Sports (0-3) Cr 1 F *Prereq Eligibility for admission to HHP teacher education program* Fundamentals of outdoor team sports for example flag football soccer softball Skill enhancement analysis understanding practice and the development of progressions

Ex Sp 235 Fundamentals of Racquet Sports (0 3) Cr 1 S *Prereq Eligibility for admission to HHP teacher education program* Fundamentals of racquet sports for example tennis badminton racquetball Skill enhancement analysis understanding practice and the development of progressions

Ex Sp 236 Fundamentals of Individual Sports (0 3) Cr 1 F *Prereq Eligibility for admission to HHP teacher education program* Fundamentals of individual sports for example track and field golf archery and bowling Skill enhancement analysis understanding practice and the development of progressions

Ex Sp 237 Fundamentals of Self Defense (0-3) Cr 1 S *Prereq Eligibility for admission to HHP teacher education program* Skill enhancement analysis understanding practice and the development of progressions

Ex Sp 238 Fundamentals of Outdoor and Adventure Activities (0 3) Cr 1 *Prereq Eligibility for admission to HHP teacher education program* Techniques of individual and group facilitation for initiatives involving outdoor adventure activity Topics include ropes/challenge course events activity presentation and sequencing safety techniques preparation principles and new games philosophy Participation is required in one weekend of fieldwork

Ex Sp 240 Introduction to Strength and Conditioning,Taping Equipment, and BracingTechniques (0-3) Cr 1 F *Prereq Ex Sp 221 222 Permission of program director* Basic information and laboratory instruction regarding strength and conditioning basic taping techniques athletic equipment fitting procedures and the use and proper fitting of prophylactic braces Open to students in the athletic training option Offered on a satisfactory fail basis only

Ex Sp 255 Disciplines and Professions in Health and Human Performance (3-0) Cr 3 FS The course will provide an overview of the various disciplines and professions that comprise the fields of health and kinesiology and help students determine the career option that best fits their interests

Ex Sp 258 Physical Fitness and Conditioning (1 3) Cr 2 FS *Prereq Health and human performance majors only* Development of personal fitness using a variety of conditioning and exercise techniques such as aerobics weight training and aquatic fitness Introduction to acute and chronic responses to exercise and the role of exercise in health promotion and weight management Credit for only one of the following courses may be applied toward graduation 163 258

Ex Sp 259 LeadershipTechniques for Fitness Programs (1 3) Cr 2 FS *Prereq 258* Development of exercise leadership skills for a variety of activities Includes planning promotion and teaching techniques for developing fitness in others using a variety of exercise modalities including aerobics weight training and aquatic fitness

Ex Sp 270 Principles of Sport Management (3 0) Cr 3 *Prereq Psych 101 Sp Cm 212 Soc 134* An overview of ethical decision making relative to organizational principles and management in the sport industry and the development implementation and evaluation of strategic plans for sport organizations Topics include fundamentals of leadership theory human resources organizational communication financial planning and law

Ex Sp 275 Movement Education in Elementary School Physical Education (2-3) Cr 3 *Prereq Concurrent enrollment in Ex Sp 280* Planning for management and instruction of developmentally appropriate physical education for children pre school through elementary grade 6 Laboratory experience required Credit for only one in the following courses can be applied toward graduation 275 284

Ex Sp 280 Directed Field Experience in Elementary Physical Education (0-3) Cr 0 5 1 S *Prereq Concurrent enrollment in 275* Observing planning and facilitating movement experiences of children in an elementary school setting

Ex Sp 281 Directed Field Experience in Physical Education (0-3) Cr 0 5 1 Observing planning and facilitating movement experiences of students in a public school setting

Ex Sp 284 Elementary and Pre school Movement Education (2-3) Cr 3 FS SS *Prereq 3 credits in human development and family studies* Approaches to teaching movement skills to pre school and elementary school age children Emphasis on planning and conducting developmentally appropriate movement experiences for preschool and elementary aged children based upon motor development research Practical experience provided Credit in only one of the following courses may be applied toward graduation 275 284

Ex Sp 315 CoachingTheory and Administrative Issues (2 3) Cr 3 Study in the theory ethics strategy and mechanics of coaching various interscholastic and/or intercollegiate sports Emphasis on formulating a philosophy identifying goals and psychological aspects teaching skills and developing strategies

Ex Sp 323 Therapeutic Modalities for Athletic Trainers (1 2) Cr 2 F *Prereq 226 permission of program director* Theory and technique of athletic modalities used in the management of athletic injuries

Ex Sp 324 AthleticTraining Practicum (0-3) Cr 1 *Prereq Credit or enrollment in 323 and permission of program director* Training room experience to accompany 323 Open to students in athletic training option Offered on a satisfactory fail grading basis only

Ex Sp 326 Rehabilitation of Athletic Injuries (2 2) Cr 3 S *Prereq 323* Theory and practical application of rehabilitation principles used in the management of athletic injuries

Ex Sp 327 AthleticTraining Practicum (0-3) Cr 1 *Prereq Credit or enrollment in 326 and permission of program director* Training room experience to accompany 326 Open to students in the athletic training option Offered on a satisfactory fail grading basis only

Ex Sp 345 Management of Health Fitness Programs and Facilities (3 0) Cr 3 Application of management concepts to the fitness industry e g understanding customers marketing program management financial management legal issues and evaluation and planning

Ex Sp 350 Sport Marketing (3-0) Cr 3 *Prereq 270 Mkt 340 Econ 101 Jl MC 220 or Advrt 230* Application of fundamental marketing concepts to the sport industry including marketing strategies/ research information management identification of target markets and the segmentation process Topics include sport consumer behavior corporate sponsorship and promotion and public relations in sport

Ex Sp 352 Sport Facility and Event Management (3 0) Cr 3 *Prereq 270 Jl MC 220 or Advrt 230* Factor related to planning managing and hosting a variety of events including major tournaments intramural and intercollegiate competitions and community recreational activities Examination of topics associated with sport facility operation to include financing new facilities generating capital and conducting feasibility studies

Ex Sp 355 Biomechanics (2 2) Cr 3 FS' *Prereq Ex Sp 255 258 H S 110 Phys 106 or 111* Mechanical basis of human performance application of mechanical principles to exercise sport and other physical activities Nonmajor graduate credit

Ex Sp 358 Physiology of Exercise (2 2) Cr 3 FS *Prereq Ex Sp 255 258 H S 110 Zool 255 255L 256 and 256L* Physiological basis of human performance effects of physical activity on body functions Nonmajor graduate credit

Ex Sp 360 Sociology of Sport and Exercise (3 0) Cr 3 FS *Prereq Ex Sp 255 258 H S 110 Soc 134 and one of Stat 101 104 or 227 or Ex Sp 470* Sport and exercise as social systems and as institutions related to other institutions such as the polity the economy mass media and education

Ex Sp 365 Sport Psychology (3 0) Cr 3 FS *Prereq Ex Sp 255 258 H S 110 Psych 101 or Psych 230* Psychological factors that influence performance in sport settings The influence of personality anxiety motivation social factors and psychological skills training

Ex Sp 366 Exercise Psychology (3 0) Cr 3 FS *Prereq Ex Sp 255 Ex Sp 258 H S 110 Psych 101 or Psych 230* Psychological theories for understanding and predicting health oriented exercise behavior Psychological and psychobiological responses to exercise Psychological interventions for increasing exercise participation and adherence rates

Ex Sp 372 Motor Control and Learning Across the Lifespan (2-2) Cr 3 FS *Prereq Ex Sp 255 Ex Sp 258 H S 110 Psych 101 or Psych 230 Zool 255* An introduction to major concepts of neuromotor control behavioral motor control from an information processing perspective and motor learning across the lifespan but emphasizing the adult system

Ex Sp 375 Teaching Physical Education (2 3) Cr 3 S *Prereq Ex Sp 275 and a minimum of 5 fundamentals classes admission to University Teacher Education Program one or more semesters prior to enrollment* Current theory practice and research on teaching focusing on management instructional and learning styles of students in secondary schools

Ex Sp 385 Search Strategies for Field Experiences and Employment (Same as H S 385) (1-0) Cr R FS *Prereq Junior classification to be taken minimum of two semesters prior to 485* Search techniques and preparation of materials utilized for acquisition of jobs and/or internships in health and human performance fields Internship process and policies/procedures will be covered

Ex Sp 395 Adapted Physical Education (Dual listed with 595) (2 3) Cr 3 F Specific disabling conditions in terms of etiology characteristics needs and potential for movement experiences Techniques of assessment prescription adaptation of activities methods and program planning Laboratory experience required

Ex Sp 417 Supervised Teaching in Physical Education in the Secondary School Cr 8 FS *Prereq 355 358 375 395 470 475* Students must be fully admitted to Teacher Education and must apply for approval to enroll at beginning of the semester prior to registering Supervised teaching in the secondary schools

Ex Sp 418 Supervised Teaching in Physical Education in the Elementary School Cr 8 FS *Prereq 275 280 355 358 375 395 470 475* Supervised teaching in the elementary schools Students must be fully admitted to Teacher Education and must apply for approval to enroll at the beginning of the semester prior to registering

Ex Sp 425 Organization and Administration of Athletic Training (3 0) Cr 3 F *Prereq 323 senior classification* Current administrative professional and legal issues pertaining to athletic training

Ex Sp 435 Sport Business and Finance (3 0) Cr 3 *Prereq Ex Sp 350 352 360 Econ 102 Mgmt 371 Math 104 Stat 101 Acct 284* Students will be able to explain financial expenses and detail sources of revenue for sport organizastions create and communicate a sponsorship proposal and organize and administer a fundraising program

Ex Sp 445 Legal Aspects of Sport (3 0) Cr 3 *Prereq Ex Sp 360* Students will understand legal concepts and terminology relevant to sport/activity identify strategies for limiting liability in sport/fitness programs and identify solutions for elimination of discriminatory practices in sport and physical activity

Ex Sp 450 Medical Concerns for the Athletic Trainer (3-0) Cr 3 S *Prereq Permission of program director* Current medical issues and concerns including pathology of illness and injury dermatological conditions exposure to allied health care professionals and pharmaological indications in relation to the profession of athletic training and in the care of an athletic population

Ex Sp 458 Principles of Fitness Assessment and Exercise Prescription (3 2) Cr 4 *Prereq 358* Physiological principles of physical fitness design and administration of fitness programs testing evaluation and prescription cardiac risk factor modification

Ex Sp 459 Internship in Exercise Leadership (0 3) Cr 1 *Prereq C or better in 259 CPR certification concurrent enrollment in 458* Observation and practice of exercise leadership techniques in an on campus adult fitness program

Ex Sp 462 Medical Aspects of Exercise (3 0) Cr 3 *Prereq 358* The role of exercise in preventive medicine Impact of exercise on various diseases and the effect of various medical conditions on the ability to participate in vigorous exercise and competitive sports Principles of exercise testing and prescription for individuals with these conditions Environmental and nutritional aspects of exercise

Ex Sp 465 Physical Activity and Aging (2 0) Cr 2 *Prereq Psych 230 Zool 155* The effect upon movement of physical changes occurring in healthy aging as well as chronic conditions associated with aging Methods of assessing fitness and teaching movement activities in relation to gerontological factors Nonmajor graduate credit

Ex Sp 470 Evaluation in Physical Education (2 3) Cr 3 *Prereq A minimum of 5 fundamentals classes and admission to University Teacher Education Program* Principles underlying process of evaluation Selected test and measurement procedures and tools within the field of physical education

Ex Sp 475 Physical Education Curriculum Design and Program Organization (3-0) Cr 3 F *Prereq A minimum of 5 fundamentals classes and admission to University Teacher Education Program* Current theory practices and principles applied to curriculum development for programs in physical education K 12 Organizing for teaching in a variety of school settings

Ex Sp 485 Internship in Sport and Exercise Science Cr 1-16 *Prereq Senior classification and advance registration* Observation and practice in selected sport and exercise science agencies Offered on a satisfactory fail grading basis only
A Exercise Science *Prereq C- or better in 458 and 459 health and human performance majors only Cumulative GPA 2 0*
B Sport and Physical Activity *Prereq Health and human performance majors only Cumulative GPA 2 0*
C Sport Management Completion of the Sport Management core classes (Ex Sp 350 352 435 & 445) *Cumulative GPA 2 0*

Ex Sp 486 Supervised Coaching in Interscholastic Athletics Cr 1 to 3 *Prereq 220 315 355 358 365 Psych 230 senior classification admission to teacher education program and permission of instructor* Advance registration required Open only to students in the coaching endorsement program Offered on a satisfactory-fail grading basis only

Ex Sp 488 Practicum in Athletic Training Cr 1 to 2 maximum of 4 *Prereq Permission of program director* Experience in application of athletic training techniques under supervision of certified athletic trainers Offered on a satisfactory fail grading basis only

Ex Sp 489 Review of Athletic Training Competencies (1 0) Cr R FS *Prereq Senior classification* Preparation for professional endorsement and certification by review of required conceptual and clinical competencies Offered on a satisfactory fail grading basis only Required for endorsement or approval to sit for National Athletic Trainers Association Board of Certification Exam

Ex Sp 490 Independent Study Cr 1 3 maximum of 6 *Prereq 6 credits in health and human performance and permission of coordinator* Independent study of problems of areas of interest in exercise and sport science and related areas
A Exercise and Sport Science
B Coaching
H Honors

Ex Sp 495 Seminar in Exercise and Sport Science Cr 0 5 to 1 *Prereq Senior classification* Offered on a satisfactory fail grading basis only

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Ex Sp 500 Research Methods in Physical Activity (3 0) Cr 3 *Prereq Graduate classification in exercise and sport science* Methods and techniques used in the design and interpretation of research involving physical activity Emphasis on styles of writing library use and computer applications

Ex Sp 505 Research Laboratory Techniques in Exercise Physiology (0-4) Cr 2 *Prereq 358 or equivalent course with basic laboratory experience* Application and use of laboratory research equipment in exercise physiology including operation calibration and use in selected situations

Ex Sp 510 Advanced Medical Aspects of Exercise (2 0) Cr 2 *Prereq 358* The role of exercise in preventive medicine Impact of exercise on various diseases and the effect of various medical conditions on the ability to participate in vigorous exercise and competitive sports Principles of exercise testing and prescription for individuals with these conditions

Ex Sp 515 Qualitative Analysis of Human Movement (2 3) Cr 3 *Prereq 355* The kinematic analysis of developmental movement tasks and sport skills

Ex Sp 516 Quantitative Analysis of Human Movement (3 1) Cr 3 *Prereq 355* Application of the principles of mechanics to the analysis of human motion Investigation of the effects of kinematics and kinetics on the human body with special emphasis on exercise and sport applications Includes consideration of two-dimensional and three dimensional imaging techniques and force measurements

Ex Sp 520 The Social Analysis of Sport (3 0) Cr 3 *Prereq 360* Sociological analysis of sport with emphasis on sociological theory sports structure and function in modern industrialized society the systems of sport in regard to their role structure formal organization and professionalization and its differentiation along social class age and sex

Ex Sp 521 Sport Psychology (3 0) Cr 3 *Prereq 365 3 courses in psychology* Aspects of psychology which form a basis for understanding and explaining behavior in a sport context Variables underlying individual as well as group performance will be analyzed A critical analysis of current research literature

Ex Sp 522 Social-Psychological Perspectives of Sport and Motor Performance (3 0) Cr 3 *Prereq 360* Analysis of social psychological dimensions that modify and facilitate motor behavior focuses on the individual and small group behavior in the sports context

Ex Sp 523 Gender Roles and Sport (Same as W S 523) (3-0) Cr 3 *Prereq 360 3 courses in sociology and/or psychology* Analysis of the influence of sport on male and female sex role development Survey of literature related to sport and sex role socialization stereotyping and conflict Discussion of future issues and alternative roles

Ex Sp 540 Administration of Sport Programs (3 0) Cr 3 *Prereq 270* Theory and practice of administration in physical education and sport development of concepts related to the process of administration types of administrative behavior tasks and responsibilities of the administrator evaluation of effectiveness of administration

Ex Sp 541 Sport Marketing and Promotion (3-0) Cr 3 *Prereq 350 or Mkt 340* Marketing of sport as a product and marketing of non sport related products through sport Includes market definition consumer analysis market research market segmentation product positioning pricing promotion marketing communication distribution and sponsorship applied to sport

Ex Sp 542 Sport Business (3 0) Cr 3 *Prereq 435 and Acct 215 or 284* Analysis of theoretical and applied principles of economics finance accounting and budgeting related to sport

Ex Sp 545 Sports Law (3 0) Cr 3 *Prereq Ex Sp 445* Analysis of the legal aspects of sport and athletics in contemporary society Includes use of the case study approach Designed for coaches athletic directors and others involved in sport management

Ex Sp 550 Advanced Physiology of Exercise I (2 3) Cr 3 *Prereq 505* Concepts and methods of assessing neurological muscular cardiovascular and respiratory adjustments to exercise

Ex Sp 551 Advanced Physiology of Exercise II (2 3) Cr 3 *Prereq 505* Analysis of factors affecting work capacity and performance Human energy metabolism concepts and measurement

Ex Sp 558 Physical Fitness—Principles, Programs and Evaluation (2 3) Cr 3 *Prereq 358* Physiological principles of physical fitness design and administration of fitness programs testing evaluation and prescription electrocardiogram interpretation

Ex Sp 560 Perceptual Motor Learning (2-3) Cr 3 *Prereq 372* Emphasis on theories of perceptual motor learning characteristics of the learner and the learning environment with implications for the design of learning settings and further research

Ex Sp 561 Motor Development (2 0) Cr 2 to 3 *Prereq 284 or 275 Psych 230* The physical development and characteristic reactions of children in relation to motor performance Identification of special psychomotor needs of various age groups of children All literature and theories applied to the physical education environment

Ex Sp 590 Special Topics Cr 1 to 3
A Physical Education
B Health and Exercise Promotion
C Sport Management
D Exercise Physiology
E Sport Sociology
F Sport Psychology
G Motor Learning
H Biomechanics

Ex Sp 591 Supervised Field Experience Cr 1 to 6 *Prereq 10 graduate credits in exercise and sport science and/or related areas* Supervised on the job field experience in special areas
A Physical Education
B Health and Exercise Promotion
C Sport Management
D Exercise Physiology

Ex Sp 593 Workshops Cr 1 to 3

Ex Sp 595 Adapted Physical Education (Dual listed with 395) (2-3) Cr 3 F *Prereq 375* Specific disabling conditions in terms of etiology characteristics needs and potential for movement experiences Techniques of assessment prescription adaptation of activities methods and program planning Laboratory experience required May not be taken by students who have previously earned credit in 395

Ex Sp 599 Creative Component Cr 1 to 3

Courses for Graduate Students

Ex Sp 615 Seminar Cr 1 to 3

Ex Sp 699 Research Cr 1 6

History

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Andrejs Plakans, Chair of Department

Professors Cravens Hurt Kottman Marcus *Plakans Wilson*

Professors (Adjunct) Dobbs

University Professors (Emeritus) Schwieder

Professors (Emeritus) Bennett Dobson Geiger Keller Lowitt McJimsey Rawson Schofield Wilt

Associate Professors Bix Liu Pope Riney Kehrberg Taylor

Associate Professors (Emeritus) Avraamides *Whitaker*

Assistant Professors Andrews Barr Melej Garcia Griffiths Hollander Monroe Rieger

Assistant Professors (Emeritus) Madison Osborn Zaring

Instructors (Adjunct) Hill

The department offers a variety of survey courses (200 series basically for first and second year students) designed to serve as either general education courses or as introductions to advanced courses in history or other subject areas The department also offers curricula leading to the B A and B S degrees in history the M A degree in history the M A and Ph D degrees in the history of technology and science and the Ph D degree in agricultural history and rural studies

In addition to the survey (200 level) courses advanced undergraduate courses are offered in the history of Europe Asia Latin America the United States technology and science agriculture and of some selected topics

Undergraduate Study

The History major For a description of the undergraduate curriculum with a major in History see *Liberal Arts and Sciences Curriculum* The History major may earn either a bachelor of arts or bachelor of science degree Candidates for the B A must complete two years of university level study in one *foreign language* or the *equivalent* The *minimum* required for a major in history is 30 credits of which at least 24 must be in courses numbered 300 or above A minimum of 12 credits numbered 300 or above must be taken in residence at Iowa State All History majors must complete two enrollments in Hist 495 (for R credit) or if qualified and willing one graduate level writing/research seminar The history major prepares a student with the ability to write and think clearly and to understand the nature of social organization It specifically prepares the student to think chronologically to understand past events in their relation to the present to carry out research with a variety of sources and to analyze and interpret past and present events History majors who choose minors in other departments usually select from such complementary disciplines as Political Science English Sociology Psychology Economics Philosophy or Foreign Languages and Literatures

English proficiency requirement History majors must receive a grade of C or better in each of Engl 104 and 105 (or 105H) and Hist 495 or any graduate seminar

For a description of the major in History as preparation for professional programs see *Preprofessional Study* Students majoring in History may also earn a second major in International Studies see *International Studies*

Although the department does not require specialization majors and nonmajors may elect to group their courses in one of several areas of emphasis The following short list shows the department s *undergraduate courses by such areas of emphasis* Qualified undergraduates may also take some 500-level graduate courses with permission of the instructor (see listing of graduate courses below) Consult the main listing of courses for full description

Europe 201 202 305 325 402 403 404 405 406 408 410 414 417 419 421 422 424 426 431

Asia Africa Latin America 207 310 311 336 337 340 341 441

United States 221 222 307 351 352 353 354 370 450 451 454 455 458 459 462 463 464 465 469 470 471 472

Technology and Science 280 281 284 285 323 380 387 388 482 483 484 488 489

Agriculture 365 366 460 461

Topical Courses 374 386 389 390 490 495

Courses dealing with the history of technology and science have been structured to offer a sequence leading from basic surveys through courses in the history of particular technologies and sciences In this area of emphasis it is recommended that students electing Hist 482 or 483 have taken a basic survey in the history of technology and science (either Hist 280 281 or 284 285) or have taken a college level course in an appropriate technology or science or seek permission of the instructor An undergraduate emphasis in the history of technology and science could include either Hist 281 282 or 284 285 and some combination from Hist 323 380 387 388 482 483 484 485 488 and 489

The department offers a minor in History which may be earned with 15 credits in History courses of which at least 9 must be in courses numbered 300 or above A minimum of 9 credits numbered 300 or above must be taken at Iowa State The History minor is most frequently chosen by students majoring in Political Science English Journalism Computer Science and Business

Graduate Study

Graduate students may take any 400 level history course except 490 and 495 for graduate credit No more than 12 credits of 400 level courses however may be used toward the minimum credits required for a graduate degree in history Additional work is required for graduate credit in 400 level courses

Most history graduate courses are either proseminars or seminars Proseminars acquaint students with the historical literature of a field and prepare them for careers in teaching and research Seminars require students to conduct original historical research and to write extensive research papers reporting the results

The M A in history For the M A in history students may elect a thesis or a nonthesis program See the departmental brochure on the M A in History for a full discussion of the options and requirements A student shall demonstrate proficiency in the use of a research tool such as a foreign language statistics computer programming or the like as prescribed by his or her advisory committee The M A in history program serves as the basis for continued study in history law or business preparation for teaching in high school or junior college preparation for government service or as part of a general education For international students a TOEFL score of 600 is required at the time of admission

The M A and Ph D in history of technology and science The graduate program in the history of technology and science examines the role of technology and science in the formation of modern societies and their attitudes toward people and the world The program is structured in a sequence of courses leading to the M A and Ph D degrees Since

these courses approach their subject in the context of social and cultural change they are also open to and appropriate for students in engineering the sciences science education and science journalism For a thorough description of the program require ments see the department s brochure on the history of technology and science program

The Ph D in agricultural history and rural studies The program is designed as a Ph D program but students without an M A in history will be expected to qualify for the departmental M A in history while progressing toward the doctorate In some cases the M A may be recommended as the terminal degree Thirty semester hours of graduate credit are required for the M A and 72 for the Ph D Students who continue beyond the M A are expected to pass a qualifying examination in their general field of study and preliminary examinations in three areas of specialization complete a dissertation and defend it orally in the Ph D final examination See the departmental brochure on the program for a full description of requirements

The following short list of the department s graduate courses is organized by areas of emphasis see the main listing for complete descriptions Courses at the 500 level are taken by graduate students (major or minor) and occasionally by qualified undergraduates those at the 600 level are taken by graduate students (major or minor) only

Europe 512 series 530 series 594 series

Asia Latin America 510 513 592 595

United States 511 series 572 593 series

Technology and Science 570 571 574 575 576 602 603 604 605 606 607

Agriculture and Rural Studies 550 552 series 556 608 610

Topical 580 583 series 590

Courses open for nonmajor graduate credit All courses numbered above 400 except 490 and 495

Courses Primarily for Undergraduate Students

Hist 201 Introduction to Western Civilization I (3-0) Cr 3 F Western civilization from ancient Mediterra nean world to 1500 Social and cultural developments economic and political ideas and institutions problems of historical change and continuity

Hist 202 Introduction to Western Civilization II (3-0) Cr 3 S Western civilization from 1500 to present Social and cultural developments economic and political ideas and institutions problems of historical change and continuity

Hist 207 Chinese Civilization (3 0) Cr 3 F Origins development decline and transformation of China from earliest times to present

Hist 221 Survey of United States History I (3 0) Cr 3 F Colonial foundations revolution confedera tion and constitution nationalism and democracy sectional disunity Civil War and reunion

Hist 222 Survey of United States History II (3-0) Cr 3 S Industrialization emergence as a great power boom and depression war internationalism and Cold War modern industrial society

Hist 240 Latina/o History (3 0) Cr 3 S *Prereq Sophomore classification* Historical and cultural heritage of Latinas/os in the United States The histories of Mexican Puerto Rican Cuban and other Latin American peoples in the U S emphasizing political and cultural convergence and congruencies

Hist 280 Introduction to History of Science I (Same as M E 280) (3 0) Cr 3 F Ideas of nature from ancient Greece to the seventeenth century scientific revolution

Hist 281 Introduction to History of Science II (Same as M E 281) (3 0) Cr 3 S Science from seventeenth century scientific revolution to Darwin and Einstein

Hist 284 Introduction to History of Technology and Engineering I (Same as M E 284) (3 0) Cr 3 F Technology in various civilizations from Sumer and Egypt to early 18th century Europe

Hist 285 Introduction to History ofTechnology and Engineering II (Same as M E 285) (3-0) Cr 3 S Technology in Western world in nineteenth and twentieth centuries

Hist 305 Cultural Heritage of the Modern World (3 0) Cr 3 *Prereq Sophomore classification* Marcus Examination of parallel formal and structural elements in scientific and social thinking technological design and composition in literature and the arts from the late medieval period to the 20th century

Hist 307 American Popular Culture (3 0) Cr 3 *Prereq Sophomore classification* Social practices beliefs and material traits of everyday life in America from the mid 19th century to the present Includes literature music theater and other entertainments Dime novels vaudeville rock and roll music Hollywood and establishment of professional athletic leagues are among the cultural artifacts and phenomena considered

Hist 323 Science and Religion (Same as Relig 323) (3 0) Cr 3 *Prereq Sophomore classification* Wilson History of changing interplay of science and religion in our understanding nature from the trial of Galileo to the reception of Darwin

Hist 325 Society and Politics in England, 1525 1700 (3 0) Cr 3 F *Prereq Sophomore classification* Social cultural demographic and economic experiences Religious Reformation Growth of the State (and Empire) and political institutions

Hist 336 History of Modern China I (3 0) Cr 3 F *Prereq Sophomore classification* China from 1644 to 1912 internal and external stimuli on traditional structure leading to reform and revolution

Hist 337 History of Modern China II (3 0) Cr 3 S *Prereq Sophomore classification* China from 1912 to present search for a new order and continuing Chinese revolution

Hist 340 History of Latin America I (3 0) Cr 3 F *Prereq Sophomore classification* Colonial Latin America from European discovery and colonization to wars for independence

Hist 341 History of Latin America II (3-0) Cr 3 S *Prereq Sophomore classification* Modern Latin America national origins from 1800 to present

Hist 345 U S Immigration History (3 0) Cr 3 S *Prereq Sophomore classification* Garcia Examination of historical factors and structural forces that affect arrival growth and redistribution of African Asian European native American and Latino populations

Hist 351 Social and Cultural History of American People I (3 0) Cr 3 F *Prereq Sophomore classifica tion* Cravens History of ordinary Americans since 1800 development of society dissemination of popular ideas living conditions work and play the arts music architectural styles material culture rural and urban lifestyles majority minority and gender relations religion mass culture corporations and technology in modern times from 1800

Hist 352 Social and Cultural History of American People II (3-0) Cr 3 S *Prereq Sophomore classification* Cravens History of ordinary Americans since 1900 development of society dissemination of popular ideas living conditions work and play the arts music architectural styles material culture rural and urban lifestyles majority minority and gender relations religion mass culture corporations and technology in modern times

Hist 353 History of African Americans I (Same as Af Am 353) (3-0) Cr 3 F *Prereq Sophomore classification* Pope African roots of Black culture slavery abolition Civil War Reconstruction

Hist 354 History of African Americans II (Same as Af Am 354) (3 0) Cr 3 S *Prereq Sophomore classification* Pope Institutionalization of segrega tion urban migration Harlem Renaissance Garvey movement Depression and world wars civil rights movement and Black Power

Hist 365 History of American Agriculture I (3 0) Cr 3 F *Prereq Sophomore classification* American agricultural development from colonial times European background colonial period to 1865

Hist 366 History of American Agriculture II (3 0) Cr 3 S *Prereq Sophomore classification* American agricultural development from 1865 to present

Hist 370 History of Iowa (3 0) Cr 3 *Prereq Sophomore classification* Survey of major social cultural and economic developments in Iowa from the late 1700s Emphasis on minority groups pioneer life early economic development industrial development educational and religious development and outstanding personalities

Hist 374 Women in the Ancient Mediterranean World (Same as Cl St 374) See *Classical Studies*

Hist 380 History of Women in Science, Technology, and Medicine (Same as W S 380) (3-0) Cr 3 *Prereq Sophomore classification* Bix History of women s relationship to the fields of science technology and medicine as students and professionals consumers subjects and patients family members workers and citizens Concentrates especially on 19th and 20th century United States concluding with an examina tion of current issues of special interest to women in science technology and medicine

Hist 386 History of Women in America (Same as W S 386) (3-0) Cr 3 *Prereq Sophomore classifica tion* A survey of social economic and political aspects of women s role from colonial era to present emphasis on employment education concepts of sexuality and changing nature of the home

Hist 388 History of Astronomy and Physics (3 0) Cr 3 *Prereq Sophomore classification* Wilson From the seventeenth-century triumph of Copernicanism to current ideas of an evolving universe Development of physical ideas and their increasing application to astronomy

Hist 389 Modern Military History I (3-0) Cr 3 F *Prereq Sophomore classification* Military History from wars of attrition to the modern age in light of the American military Relationships between war and society in America and Europe from 1750 to 1918

Hist 390 Modern Military History II (3 0) Cr 3 S *Prereq Sophomore classification* Military History from wars of attrition to the modern age given the past two centuries of global warfare Warfare during the twentieth century emphasis on World War II experience

Hist 402 Ancient Greece (Same as Cl St 402) (3 0) Cr 3 F *Prereq Sophomore classification* Ancient Greece from the Bronze Age to Hellenistic Kingdoms evolution of Greek polis and its cultural contributions Nonmajor graduate credit

Hist 403 Ancient Rome I (Same as Cl St 403) (3 0) Cr 3 *Prereq Sophomore classification* Political social and institutional history of ancient Rome and its cultural contributions studied through original sources Republican Era Punic Wars to the assassination of Julius Caesar Nonmajor graduate credit

Hist 404 Ancient Rome II (Same as Cl St 404) (3 0) Cr 3 *Prereq Sophomore classification* Political social and institutional history of ancient Rome and its cultural contributions studied through original sources Imperial Age Augustus to the rise of Constantine Nonmajor graduate credit

Hist 405 History of Medieval Western Europe I (3 0) Cr 3 F *Prereq Sophomore classification* Development of political economic and social institutions Early and Central Middle Ages 284 1050 Nonmajor graduate credit

Hist 406 History of Medieval Western Europe II (3 0) Cr 3 S *Prereq Sophomore classification* Development of political economic and social

institutions High and Late Middle Ages 1050-1500 Nonmajor graduate credit

Hist 408 Europe 1500 1648 (3-0) Cr 3 *Prereq Sophomore classification* Northern Renaissance Church and Luther Protestant reform and Roman Catholic counter reform social cultural and economic changes Spain in triumph and decline religious wars and emergence of France Nonmajor graduate credit

Hist 410 19th Century Europe (3-0) Cr 3 F *Prereq Sophomore classification* Nationalism revolution and war Nonmajor graduate credit

Hist 414 European Cultural and Intellectual History (3 0) Cr 3 *Prereq Sophomore classification* A study of perennial ideas nature man God society history and creativity from Dante to Sartre Nonmajor graduate credit

Hist 417 European Society and the Industrial Revolution (3 0) Cr 3 *Prereq Sophomore classification* Plakans England and the continent during industrialization (1750 1900) with emphasis on the relationship between industrial and social change Nonmajor graduate credit

Hist 419 History of Modern France (3 0) Cr 3 *Prereq Sophomore classification* From absolutism to revolution and the rise of modern democracy Nonmajor graduate credit

Hist 421 History of Russia I (3-0) Cr 3 F *Prereq Sophomore classification* Andrews Russia to 1850 Origins of Russian people Byzantine influences Mongol invasion rise of Moscow Westernization Nonmajor graduate credit

Hist 422 History of Russia II (3-0) Cr 3 S *Prereq Sophomore classification* Andrews Russia since 1850 Reform and revolution transformation of society USSR as a world power recent changes

Hist 424 History of Modern Germany I (3-0) Cr 3 *Prereq Sophomore classification* Political social and cultural history of Germany 1770 1918 Nonmajor graduate credit

Hist 425 History of Modern Germany II (3 0) Cr 3 *Prereq Sophomore classification* Political social and cultural history of Germany from the First World War to the present problems of unification Nonmajor graduate credit

Hist 426 Nationalism and Communism in Eastern Europe (3 0) Cr 3 F *Prereq Sophomore classification* Plakans A survey of nationalist movements nation building and communist revolutions in Eastern Europe in the nineteenth and twentieth centuries Nonmajor graduate credit

Hist 431 Modern England (3-0) Cr 3 *Prereq Sophomore classification* England since 1850 Parliamentary and constitutional development social reform and economic change imperial Britain welfare state Nonmajor graduate credit

Hist 441 History of Modern Mexico and Central America (3-0) Cr 3 S *Prereq Sophomore classification* Political economic and social development of Mexico and Central America in nineteenth and twentieth centuries Nonmajor graduate credit

Hist 450 Colonial America (3-0) Cr 3 *Prereq Sophomore classification* Exploration colonization and development of political economic social and cultural institutions of North American colonies before 1754 Nonmajor graduate credit

Hist 451 American Revolution (3-0) Cr 3 *Prereq Sophomore classification* Participants ideas and events leading to independence and the foundation of the American Republic 1754 to 1787 Nonmajor graduate credit

Hist 454 Prologue to the U S Civil War (3 0) Cr 3 F *Prereq Sophomore classification* Origins of second party system Social and economic forces that sustained the system and ultimately caused its collapse and sectional division 1815-1861 Nonmajor graduate credit

Hist 455 The U S Civil War and Reconstruction (3-0) Cr 3 S *Prereq Sophomore classification* Emphasis on military and political events of the Civil War and their influence on postwar America 1861 1877 Nonmajor graduate credit

Hist 458 U S World War I to 1945 (3 0) Cr 3 F *Prereq Sophomore classification* Kottman America in crisis World War I the twenties depression and World War II Nonmajor graduate credit

Hist 459 U S 1945 1969 (3 0) Cr 3 F *Prereq Sophomore classification* Kottman Liberal ascendency and Cold War Fair Deal modern republicanism the Great Society an assertive America culminating in Vietnam Nonmajor graduate credit

Hist 460 The Great Plains (3-0) Cr 3 *Prereq Sophomore classification* Hurt History of the Great Plains from prehistoric period Emphasis on agricultural and rural development Native Americans cattle ranching land policy agrarian reform movements and federal policy Nonmajor graduate credit

Hist 461 The Rural South (3-0) Cr 3 *Prereq Sophomore classification* Hurt Agricultural and rural history of the South from colonial period to present Emphasis on economic social and political change Slavery Populism New Deal and civil rights movement Nonmajor graduate credit

Hist 462 History of American Thought I (3-0) Cr 3 *Prereq Sophomore classification* Cravens American religious social and political thought development of democracy and nationalism and of the arts and sciences from colonial times to late nineteenth century Nonmajor graduate credit

Hist 463 History of American Thought II (3-0) Cr 3 *Prereq Sophomore classification* Cravens Religious social and political thought development of democracy and nationalism the arts and sciences from late nineteenth century to modern and post modern times Nonmajor graduate credit

Hist 464 Nineteenth Century American Social History (3-0) Cr 3 *Prereq Sophomore classification* Rise of modern industrial society in nineteenth century America family churches and other social institutions reform immigration social and geographical mobility impact of urbanization Nonmajor graduate credit

Hist 465 The American West (3-0) Cr 3 *Prereq Sophomore classification* Taylor History of Trans Missouri West from 1800s to present Emphasis on environment Native Americans minorities women the state and urbanization in settlement and regional identity Nonmajor graduate credit

Hist 466 North American Expansion (3-0) Cr 3 *Prereq Sophomore classification* Taylor Examines imperial contests to claim and settle North American continent from 1520s to 18880s Focuses on the interplay of American Apache British French Iroquois Russian Sioux and Spanish expansionist settlement Nonmajor graduate credit

Hist 468 History of Rural America (3 0) Cr 3 F *Prereq Sophomore classification* Riney Kehrberg History of rural America from the colonial period to the present Emphasizes immigration ethnicity religion social and cultural change and agriculture in relation to rural settlement institution building demographic change gender class and political and economic development Nonmajor graduate credit

Hist 469 Contemporary America (3-0) Cr 3 S *Prereq Sophomore classification* Kottman Major political economic and diplomatic developments since 1969 Nonmajor graduate credit

Hist 470 The United States and the Cold War I (3-0) Cr 3 F *Prereq Sophomore classification* Kottman Relationship between the U S and the Communist world from the Bolshevik revolution in 1917 to 1950 Nonmajor graduate credit

Hist 471 The United States and the Cold War II (3 0) Cr 3 S *Prereq Sophomore classification* Kottman Relationship between the U S and the Communist world from 1950 to the collapse of the Soviet system in 1991 Nonmajor graduate credit

Hist 472 American Environmental History (Same as Env S 472) (3-0) Cr 3 F *Prereq Sophomore classification* Taylor Conceptual approach to human history in North America by examining the impact of nature from precontact through the 20th century Explores material interactions intellectual modes aesthetic relationships and management strategies from aboriginal society through the environmental age Nonmajor graduate credit

Hist 473 Civil Rights and Black Power (3 0) Cr 3 S *Prereq Sophomore classification* Pope History of the Civil Rights movement in the U S and its transformation into the Black Power movement of the late sixties and seventies Nonmajor graduate credit

Hist 482 History of the Life Sciences and Medicine (3 0) Cr 3 *Prereq Sophomore classification* Marcus Emergence of human sciences and technologies—medicine physiology cytology public health and social sciences—in the social and cultural context of Western world Nonmajor graduate credit

Hist 483 History of Social and Behavioral Sciences (3 0) Cr 3 *Prereq Sophomore classification* Cravens History of the social and behavioral sciences in Europe and America since the 18th century Social and behavioral sciences and their applications in economics agriculture government social relations public health mental health the built environment foreign affairs military doctrine and public education Nonmajor graduate credit

Hist 484 Science,Technology, Medicine and Public Policy (3-0) Cr 3 *Prereq Sophomore classification* Bix History of public policy in the U S on issues relating to science technology and medicine from WWII Mechanics and politics of policy making case study approach to economic ethical environmental intellectual and social questions of policy from the A-bomb to genetic engineering and health care reform Nonmajor graduate credit

Hist 488 History of American Technology (Same as M E 488) (3 0) Cr 3 *Prereq Sophomore classification* Bix Technology in America from Industrial Revolution to present Themes include social contexts of technological change development of professional engineering ideas about technology and American life Nonmajor graduate credit

Hist 489 History of American Science (Same as M E 489) (3 0) Cr 3 *Prereq Sophomore classification* Cravens Science as a cultural and social activity in America from the eighteenth century to present Scientific discovery interaction of scientific and social ideas science and war science and health environment role of science as expertise in a nationalistic democracy Nonmajor graduate credit

Hist 490 Independant Study Cr 1 to 3 each time taken *Prereq 9 credits in history permission of department chair* No more than 9 credits of Hist 490 may be counted toward graduation Reading and reports on problems selected in conference with each student

Hist 495 Historiography and Research Writing (1 0) Cr R FS *Prereq Major in history* Taken in conjunction with 400 level courses Required of majors

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Hist 510 Proseminar in East Asian History (3-0) Cr 3 each time taken *Prereq Permission of instructor* Readings in East Asian history Topics vary each time offered

Hist 511 Proseminar in American History (3-0) Cr 3 each time taken *Prereq Permission of instructor* Readings in American history Topics vary each time offered

A Colonial Period
B Nineteenth Century
C Twentieth Century
D Environment

E 20th Century American West
F Social and Cultural

Hist 512 Proseminar in European History (3-0) Cr 3 each time taken *Prereq Permission of instructor* Readings in European history
A Ancient (Same as Cl St 512A)
B Medieval
C Modern

Hist 513 Proseminar in Latin American History (3 0) Cr 3 each time taken *Prereq Permission of instructor* Readings in Latin American history Topics vary each time offered

Hist 530 Proseminar in Modern Russian/Soviet History (3 0) Cr 3 each time taken *Prereq Hist 422* Andrews Readings in modern Russian history Topics in 530A and B vary each time offered
A State society and culture in Soviet Russia 1917 1991
B Social history of Modern Russian technology and science 1861 present

Hist 550 Proseminar in European Agricultural History and Rural Studies (3 0) Cr 3 each time taken *Prereq Permission of instructor*
A Modern European Rural Life
B Twentieth Century Europe

Hist 552 Proseminar in American Agricultural History and Rural Studies (3-0) Cr 3 each time taken *Prereq Permission of instructor*
A American Agriculture
C Midwestern Rural Society
D Migrant Labor History
F Agrarian Reform Movements
H Women in Rural Life

Hist 556 Proseminar in Asian Agricultural History and Rural Studies (3 0) Cr 3 each time taken *Prereq Permission of instructor*
A East Asian Agricultural Rural Patterns

Hist 570 Seminar in General History of Science I (3-0) Cr 3 *Prereq Permission of instructor* Wilson The history of science from pre-classical civilizations to the Age of Galileo with emphasis on the historical literature varying interpretations of the period and problems for continuing research

Hist 571 Seminar in General History of Science II (3 0) Cr 3 *Prereq Permission of instructor* The history of science from Galileo to modern times with emphasis on the historical literature varying interpretations of the period and problems for continuing research

Hist 572 Seminar in American Environmental History (3 0) Cr 3 S *Prereq 511D and permission of instructor* Taylor History of human interaction with nature from aboriginal settlement through the 20th century Emphasis on individual research

Hist 574 Seminar in General History ofTechnology I (3 0) Cr 3 *Prereq Permission of instructor* Bix The history of technology from pre-classical civilizations to the eve of the Industrial Revolution with emphasis on the historical literature varying interpretations of the period and problems for continuing research

Hist 575 Seminar in General History ofTechnology II (3 0) Cr 3 *Prereq Permission of instructor* Marcus The history of technology from the Industrial Revolution to modern times with emphasis on the historical literature varying interpretations of the period and problems for continuing research

Hist 576 Colloquium in Historiography of Technology and Science (1 0) Cr R F Topical lectures reports and discussion of methodology and research in history of technology and science Required of all graduate students in history of technology and science program

Hist 580 Museum Internship Cr varies each time taken *Prereq 15 graduate credits in history and permission of instructor*

Hist 583 Historical Methods (3 0) Cr 3 Study of evidence theory and methods
B Statistical Evidence and Analysis

Hist 585 Teaching Methods Cr 1 to 2 each time taken *Prereq Permission of instructor* Topics vary each time offered
B Curriculum Development in History
C Implementing Teaching Techniques

Hist 586 Proseminar in Women's History and Feminist Theory (Same as W S 586) (3-0) Cr 3 *Prereq Permission of instructor* Pope Feminist theory from the 1960s to the present as it relates to the writing of women s history Analysis of interpretations of U S women s history from patriarchal to postmodernist perspectives

Hist 590 Special Topics Cr 1 to 3 each time taken *Prereq Permission of instructor*

Hist 592 Seminar in East Asian History (3 0) Cr 3 S *Prereq Permission of instructor* Topics vary each time offered

Hist 593 Seminar in American History (3 0) Cr 3 each time taken *Prereq Permission of instructor* Topics vary each time offered
A Colonial Period
B Nineteenth Century
C Twentieth Century

Hist 594 Seminar in European History (3 0) Cr 3 each time taken *Prereq Permission of instructor* Topics vary each time offered
A Ancient (Same as Cl St 594A)
B Medieval
C Modern

Hist 595 Seminar in Latin American History (3-0) Cr 3 each time taken *Prereq Permission of instructor* Topics vary each time offered

Courses for Graduate Students

Hist 602 Seminar in Nineteenth Century Science (3-0) Cr 3 Prereq Permission of instructor Wilson Emphasis varies each time offered

Hist 603 Seminar in Nineteenth CenturyTechnology (3 0) Cr 3 Alt S *Prereq Permission of instructor* Marcus Bix Emphasis varies each time offered

Hist 606 Seminar in EarlyTwentieth Century Science (3 0) Cr 3 Alt F *Prereq Permission of instructor* Wilson Cravens Marcus Emphasis varies each time offered

Hist 607 Seminar in EarlyTwentieth Century Technology (3-0) Cr 3 Alt S *Prereq Permission of instructor* Bix Marcus Emphasis varies each time offered

Hist 610 Seminar on American Rural Life (3 0) Cr 3 S *Prereq Permission of instructor* Hurt

Hist 699 Research

Honors Program

Don Beitz, Chair University Honors Program Committee

The Honors Program provides a vehicle for highly motivated and able students to pursue an innovative and challenging undergraduate education Oversight of students progress toward this goal is primarily the responsibility of the undergraduate colleges each of which operates its own Honors Program The college Honors Program committees admit students into the Program approve programs of study and are responsible for the administration of their college Honors Program The University Honors Program Committee which includes the chairs of the college Programs is responsible for the general coordination of the college Honors Programs and the Freshman Honors Program

Students in the Honors Program are offered a variety of academic opportunities designed to help them derive the fullest benefit from their undergraduate education To enhance their individualized programs of study students are offered numerous Honors courses seminars and independent research opportunities

Honors courses and Honors sections of regular courses are offered by several departments and programs These courses open only to Honors Program members have limited enrollment and are taught by specially selected instructors Most of these courses are listed by department or program (See *Economics Engineering English Mathematics Physics Psychology and Speech Communication*)

In addition to established Honors courses Honors students may designate any course as an Honors course by making appropriate arrangements with the course instructor and obtaining approval of the Honors Program Director Most departments offer opportunities for independent study and research under 290 and 490 when designated by an H these courses also carry Honors credit

Research grants are available to support Honors research

Listed below are those courses that are offered directly by the University Honors Program Specific information about the full range of Honors courses and seminars for the current academic year including the Honors courses offered by individual departments and programs may be obtained from the Honors Program Office in Jischke Honors Building

Hon 121 Freshman Honors Seminar (0 2) Cr 1 F *Prereq Membership in the Freshman Honors Program* Orientation to Iowa State University and to the University Honors Program Offered on a satisfactory fail grading basis only

Hon 290 Special Problems Cr var *Prereq Permission of the vice provost for undergraduate programs* Independent study on topics of an interdisciplinary nature Offered on a satisfactory fail grading basis only Intended primarily for freshmen and sophomores
H Honors
U Undergraduate Research

Hon 302 Honors Leadership Seminar (1-2) Cr 2 F *Prereq Selection as a leader of a Freshman Honors Seminar* For students serving as leaders of Freshman Honors Seminars under faculty supervision Development of teaching and leadership skills within the context of an Honors education experience Offered on a satisfactory fail grading basis only

Hon 321 322, 323 324 University Honors Seminars (1-0) Cr 1 or (2 0) Cr 2 FS SS *Prereq Membership in the University Honors Program* Interdisciplinary seminars on topics to be announced in advance Offered on a satisfactory-fail grading basis only

Hon 490 Independent Study Cr var *Prereq Membership in the University Honors Program and permission of the vice provost for undergraduate programs* Independent study on topics of an interdisciplinary nature Intended primarily for juniors and seniors

Horticulture

www hort iastate edu

Jeffery K Iles, Chair of Department

University Professors Christians

Professors Chaplin Domoto Gleason Graves Nonnecke Taber

Professors (Emeritus) Bauske Hall Hodges

Associate Professors Arora Gladon Hannapel Iles Minner Stephens

Assistant Professors Delate Fei Haynes Lashbrook

Assistant Professors (Collaborators) Widrlechner

Instructors (Adjunct) Dilley Gaul Osborn

Undergraduate Study

For undergraduate curriculum in horticulture leading to the bachelor of science degree see *Horticulture Curriculum*

The horticulture curriculum is designed to permit commodity emphasis in general horticulture landscape horticulture greenhouse management fruit production vegetable production nursery management turfgrass science and management or horticultural communications and public education Students considering graduate degrees should participate in the science option Specialization options complete the educational goal by combining one of the above interest areas with those skills required in environmental horticulture greenhouse management fruit and vegetable production and management nursery crop production and management science option or science and turfgrass management

Graduates possess the technical knowledge and skills to be a professional horticulturist They understand plant growth and development and the culture and management of horticultural crops They are able to communicate clearly and work effectively with others in the many disciplines of horticulture Graduates understand the ethical and environmental dimensions of problems and issues facing horticultural professionals

The rapidly expanding field of horticulture provides employment opportunities in nurseries seed companies interior landscaping firms greenhouses garden centers conservatories public gardens and arboreta orchards and vineyards food processing companies or vegetable farms The allied industries associated with horticulture provide employment in the areas of sales management and communications Turf managers are needed for golf courses athletic fields sod production parks and the lawn care industry Further opportunities exist in sod production landscape development and maintenance and botanical gardens

Opportunities also exist for further education in graduate school to prepare for a career in research teaching and business

Students have the option of selecting a secondary major in interdepartmental programs pest management seed science agricultural extension education environmental studies or international agriculture (see *Index*)

The department offers a minor in horticulture that may be earned by taking Hort 221 plus at least 12 credits in horticulture at the 200 level or above

Visit our departmental website at www.hort.iastate.edu

Graduate Study

The department offers master of science and doctor of philosophy degrees with a major in horticulture and minor work for students in other departments Under special circumstances a nonthesis master's degree is available through the master of agriculture program

Prerequisite to major graduate study is the completion of courses covering horticulture botany and the underlying sciences

Students majoring in horticulture usually will take minor work in agronomy botany (cytology morphology or physiology) biochemistry chemistry entomology food science and human nutrition genetics plant pathology or statistics

There is no uniform foreign language requirement for either the master of science or the doctor of philosophy degree

The department also cooperates in the interdepartmental majors of genetics water resources molecular cellular and developmental biology and plant physiology (see *Index*)

Graduates possess a broad understanding of horticulture and the underlying plant sciences They are able to communicate effectively with members of the scientific community industry groups and the general public They are experienced in conducting and writing the results of research They are capable of addressing and solving complex problems associated with the agricultural and plant science professions They understand the ethical legal social and environmental issues associated with modern agricultural practices

Courses open for nonmajor graduate credit 320 320L 351 351L 422 434 435 436 437 442 451 453 461 471 472 493

Courses Primarily for Undergraduate Students

Hort 110 Orientation in Horticulture (1 0) Cr 1 F Introduction to the field of horticulture

Hort 121 Home Horticulture (2 0) Cr 2 FS Growing plants in and around the home including requirements for growing house plants plant propagation designing and maintaining flower fruit and vegetable gardens lawn tree and shrub maintenance

Hort 221 Principles of Horticulture (2 2) Cr 3 FS *Prereq Biol 201* Biological principles of growing horticultural crops including anatomy reproduction light temperature water nutrition and growth and development Laboratory exercises emphasize environmental factors and permit detailed observation of plant growth

Hort 282 EducatingYouthThrough Horticulture (Same as AgEds 282) (2 3) Cr 3 S Planning developing and implementing science-based educational programs in a public garden setting Through hands-on experiences at Reiman Gardens students will learn about horticulture learning theory and the application of science principles as they pertain to educating youth

Hort 283 Pesticide Application Certification (Same as Ent 283) See *Entomology*

Hort 320 Horticultural Plant Nutrition (Same as PI HP 320) (2 0) Cr 2 S *Prereq 221 or Agron 114 or Biol 201 and Agron 154 or 155* Factors influencing nutrient absorption and composition criteria of essentiality and roles of the elements nutrient status and plant analysis techniques deficiency and toxicity symptoms Nonmajor graduate credit

Hort 320L Horticultural Plant Nutrition Laboratory (0-2) Cr 1 S *Prereq 221 or Agron 114 or Biol 201 and Agron 154 or 155* The laboratory emphasizes techniques for determining plant nutritional status water quality and crop monitoring Students will utilize hands-on equipment for field measurement Nonmajor graduate credit

Hort 321 Horticulture Physiology (2 0) Cr 2 F *Prereq 221 or Biol 201* Principles of plant physiology relating to problems in horticulture including photosynthesis respiration metabolisms water relations and developmental processes

Hort 322 Plant Propagation (2 2) Cr 3 S *Prereq 221 or Biol 202* Fundamental principles underlying sexual and asexual propagation of plants practice in reproducing plants by use of seeds leaves stems and roots

Hort 330 Herbaceous Ornamental Plants (2 2) Cr 3 F *Prereq 221* Identification botanical characteristics origins propagation uses and general culture of herbaceous annual and perennial plants

Hort 332 Greenhouse Operation and Management (3-3) Cr 4 S *Prereq 221* Principles of greenhouse and other controlled environment operation and management Methods of monitoring and manipulating environmental factors such as light temperature fertility production media etc to maximize production rate and quality and minimize production costs and time Field trips(s) outside of scheduled class time required Weekend/overnight field trips may be required

Hort 338 Seed Science andTechnology (Same as Agron 338) See *Agronomy*

Hort 340 Woody Landscape Plants (3 6) Cr 5 F Identification botanical characteristics landscape values and culture of native and introduced woody plants Emphasis on plants used in managed landscapes in the Middle West Field trip(s) outside of scheduled class time required Weekend/overnight field trips may be required

Hort 341 Woody Plant Cultivars ShadeTrees (1 1) Cr 1 Alt F offered 2003 *Prereq 241* Nine week course beginning first week of semester Students will learn how to identify and care for the most horticulturally important shade tree taxa suitable for the Midwest Cultivars of the most prevalent species also will be taught Each class period will feature indoor and outdoor sessions

Hort 342 Landscape Plant Establishment and Maintenance (2 3) Cr 3 F *Prereq 241 or L A 321* Principles and practices involved with establishment and maintenance of woody ornamental plants in the landscape Laboratory work involves site evaluation installation techniques post-plant care and maintenance of established landscape plants

Hort 344 Landscape Horticulture (2-6) Cr 4 S *Prereq 241 or Hort 233 recommended* Development of residential public and commercial landscape designs using design principles and the process of design Projects encompass site analysis program development concept development preliminary design final design and graphic and presentation techniques Students develop master plans for residential sites public gardens and commercial properties

Hort 345 History and Development of Public Gardens (2 0) Cr 2 Alt S offered 2004 *Prereq 221* In-depth presentation of the history establishment development and use of public gardens nationally and internationally Emphasis on relationship of gardening to local national and international quality of life of society

Hort 346 North American Public Gardens (2 0) Cr 1 to 2 SS *Prereq 221* Recitation about and field trips to North American public gardens No more than two (2) credits of Hort 346 may be counted toward graduation Tour/field trip expenses paid by students

Hort 351 Turfgrass Establishment and Management (Same as Agron 351) (3 0) Cr 3 F *Prereq 221 or Agron 114 or Biol 201* Principles and practices of turfgrass propagation and management Specialized practices relative to professional lawn care golf courses athletic fields highway roadsides and seed and sod production The biology and control of turfgrass pests Nonmajor graduate credit

Hort 351L Turfgrass Establishment and Management Laboratory (Same as Agron 351L) (0-3) Cr 1 F *Prereq Credit or enrollment in 351* Those enrolled in the horticulture curriculum are required to take 351L in conjunction with 351 except by permission of the instructor Nonmajor graduate credit

Hort 391 Horticultural Management Experience Cr arr maximum of 2 FS SS *Prereq 221 permission of instructor* A structured work experience for the student to gain insight into management operations associated with production of horticultural crops A report of 10 or more pages describing the student's experience is required One credit is given for each term the student is enrolled in the course A maximum of two credits may be used toward the horticultural sciences course requirements and two additional credits may be used toward the 128 credits required for graduation

Hort 422 PostharvestTechnology (3 3) Cr 4 Alt F offered 2003 *Prereq 221 junior or senior classification* Principles methods and techniques related to postharvest maintenance of quality of horticultural commodities Emphasis on the effects of handling storage facilities and techniques and quality evaluation Field trips outside of scheduled class time required Weekend/overnight field trips may be required Nonmajor graduate credit

Hort 423 PlantTissue Cell, and Protoplast Culture (Dual listed with 523) (1 2) Cr 2 Alt F offered 2003 *Prereq Biol 301 and Hort 321 or Bot 320* Theory and techniques of plant tissue culture including organogenesis somatic embryogenesis micropropagation anther and embryo culture

protoplast isolation and culture and transformation Applications to agriculture

Hort 424 Sustainable and Environmental Horticulture Systems (Dual listed with 524 same as Env S 424) (2 0) Cr 2 F Inquiry into ethical issues and environmental consequences of horticultural cropping systems and production practices Emphasis on production systems that are resource efficient environmentally sound socially acceptable and profitable

Hort 425 Horticultural Plant Breeding (Dual listed with 525) (2 0) Cr 2 Alt F offered 2004 *Prereq Biol 301 or Gen 320* Breeding techniques and methods required for the improvement of horticultural plants

Hort 433 Tropical and Foliage Plant Production and Interiorscapes (2-2) Cr 3 Alt S offered 2005 *Prereq 221 332* Identification nomenclature production culture and use of tropical and foliage plants for interior landscapes Understanding plant needs in interior environments such as malls offices atria and lobbies Planning designing installation maintenance and selection of plants for interiorscapes Field trips outside of scheduled class time required Weekend/overnight field trips may be required Nonmajor graduate credit

Hort 434 Greenhouse Crop Production I (3 3) Cr 4 Alt F offered 2003 *Prereq 330 and 332* Principles and practices of greenhouse crop production Emphasis is placed on production of common bulbous cut flower and containerized flowering species produced in greenhouses and other controlled environments Field trips outside of scheduled class time required Weekend/overnight field trips may be required Nonmajor graduate credit

Hort 435 Greenhouse Crop Production II (2 3) Cr 3 Alt S offered 2004 *Prereq 330 and 332* Principles and practices of greenhouse crop production Emphasis is placed on production of common flowering containerized and bulbous crops and flowering annual and perennial crops Field trips outside of scheduled class time required Weekend/overnight field trips may be required Nonmajor graduate credit

Hort 436 Greenhouse Crop Production III (1 3) Cr 2 Alt F offered 2004 *Prereq 221 and 332* Principles and practices of greenhouse food crop production Emphasis is placed on production of vegetable herb and fruit species in green houses and other controlled plant environments Field trips outside of scheduled class time required Weekend/overnight field trips may be required Nonmajor graduate credit

Hort 442 Nursery Production and Management (2-2) Cr 3 Alt F offered 2003 *Prereq 221 340* Cultural and management practices involved with a production nursery container vs field nursery nursery site and plant selection propagation and planting methods soil and nutrient management growth modification overwintering financial and personnel management marketing shipping Field trip(s) outside of scheduled class time including weekend/overnight trips may be required Nonmajor graduate credit

Hort 444 Landscape Construction (2 3) Cr 3 F *Prereq Junior or senior classification* Theory and practice of landscape construction including estimation methods contract administration construction materials installation of retaining walls paving edging irrigation and site lighting Students take field trips to view various types of landscape installations and use of building materials at area design/build firms Encompasses construction projects using various landscape materials and techniques

Hort 445 Public Horticulture Management and Administration (2-0) Cr 2 F *Prereq 221 345 and 391* In depth presentation and discussion of techniques and requirements for the management and administration of a public horticultural facility Topics include oral and written presentation skills proposal development public relations budgeting fundraising dealing with governing boards interpersonal relationships and managing horticultural operations

Hort 451 Professional Turfgrass Management (2 0) Cr 2 Alt S offered 2005 *Prereq 351* Turfgrass science including the study of (1) specific information on soil chemistry and soil modification as they relate to the development and maintenance of turfgrass areas (2) specialized management practices used in athletic field care professional lawn care and golf course industries and (3) construction methods for golf courses and athletic fields Nonmajor graduate credit

Hort 452 Integrated Management of Diseases and Insect Pests of Turfgrasses (Dual listed with 552 same as Pl P 452 Ent 452) See *Plant Pathology or Entomology*

Hort 453 SportsTurf Management (2 0) Cr 2 *Prereq 351* Management techniques for today s specialized athletic fields The horticultural and budgetary aspects of football soccer baseball and softball fields will be presented Field trips and laboratory exercises will develop a practical understanding of actual principles in field development construction and management Nonmajor graduate credit

Hort 461 Fruit and Nut Crop Production (2-2) Cr 3 Alt S offered 2005 *Prereq 221* Principles and practices of small fruit tree fruit and nut culture and production Morphology physiology of growth and development plant establishment pest management pruning training harvesting storage and marketing Nonmajor graduate credit

Hort 471 Vegetable Production and Management (3-0) Cr 3 Alt S offered 2004 Principles and practices of vegetable production Methods of maximizing yield and quality of vegetables Harvesting storage and marketing Nonmajor graduate credit

Hort 475 CommunityTree Management (Same as For 475) See *Forestry*

Hort 490 Independent Study Cr arr *Prereq Senior classification in horticulture permission of instructor* A maximum of 4 credits of 490 may be used toward the total of 128 credits required for graduation Investigation of topic holding special interest to the student Comprehensive report required Election of course and topic must be approved by department head

A Greenhouse Crops
B Nursery Crops
C Turfgrass
D Fruit Crops
E Vegetable Crops
F Cross Commodity
H Honors

Hort 491 Seed Science Internship Experience (Same as Agron 491 AST 491) Cr 1 2 May be repeated once FS SS *Prereq 338 advanced approval and participation of employer and instructor* Staff A professional work experience and creative project for seed science secondary majors The project requires prior approval and participation of the employer and instructor The student must submit a written report

Hort 493 Workshop in Horticulture Cr arr Off campus Offered as demand warrants Workshops in horticulture Nonmajor graduate credit

Hort 495 AgricultureTravel Course Preparation (0 1) Cr R May be repeated FS SS *Prereq Permission of instructor Limited enrollment Students enrolled in this course also intend to register for Hort 496 the following term* Topics include preparation for international travel the horticultural/agricultural industries climate crops economics geography history marketing soils culture traditions and horticultural/agricultural development of the country to be visited Students enroll in this course the term immediately before travel to the foreign country

Hort 496 HorticultureTravel Course Cr 1 3 May be repeated FS SS *Prereq Permission of instructor* Limited enrollment Study and tour of production methods in major horticultural regions of the world Influence of climate economics geography soils landscapes markets cultures and history of horticultural crops Location and duration of tours will vary Tour expenses paid by students

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Hort 511 Integrated Management ofTropical Crops (Same as Pl P 511) See *Plant Pathology*

Hort 523 PlantTissue, Cell and Protoplast Culture (Dual listed with 423) (1 2) Cr 2 Alt F offered 2003 *Prereq Biol 301 and Hort 321 or Bot 320* Theory and techniques of plant tissue culture including organogenesis somatic embryogenesis micropropagation anther and embryo culture protoplast isolation and culture and transformation Applications to agriculture

Hort 524 Sustainable and Environmental Horticulture Systems (Dual listed with 424) (2 0) Cr 2 F Inquiry into ethical issues and environmental consequences of horticultural cropping systems and production practices Emphasis on production systems that are resource efficient environmentally sound socially acceptable and profitable

Hort 525 Horticultural Plant Breeding (Dual-listed with 425) (2-0) Cr 2 Alt F offered 2004 *Prereq Biol 301* or *Gen 320* Breeding techniques and methods required for the improvement of horticultural plants

Hort 529 Publishing in Plant Science Journals (2 0) Cr 2 S *Prereq Permission of instructor evidence of a publishable unit of the student s research data* Process of preparing a manuscript for submission to a refereed journal in the plant sciences Emphasis on publishing self generated data from thesis or dissertation research

Hort 530 Research Orientation (2 0) Cr 1 F Instruction in scientific methods and communication skills

Hort 537 Environmental Stress Physiology (Same as Agron 537 Bot 537) (3 0) Cr 3 S *Prereq Bot 320 or equivalent* Physiology and molecular biology of plant responses to environmental stress Emphasis on the role of hormones and hormone interations in governing stress reponses Lectures are prepared from journal papers that elucidate key mechanisms controlling reponses to drought flooding salt nutrient deficiencies freezing pathogens and herbivores Plants studied include genetic model systems and crops of horticultural and agronomic value

Hort 542 Introduction to Molecular Biology Techniques (Same as Zool 542) See *Zoology and Genetics*

Hort 546 Organizational Strategies for Diversified Farming Systems (Same as Agron 546 Soc 546 SusAg 546) (3 0) Cr 3 Alt S offered 2004 *Prereq SusAg 509* Bell Liebman Organization and operation of complex diversified farming systems Topics include systems analysis ecological diversity agronomic diversity economic diversity social diversity analytical frames for evaluating farming system sustainability and problem solving Participation in several field trips to Iowa farms is required

Hort 551 Growth and Development of Perennial Grasses (Same as Agron 551) (2-0) Cr 2 Alt S offered 2004 The grass plant Selected topics on anatomy morphology and physiology relative to growth and development of perennial grasses Emphasis on growth and development characteristics peculiar to grasses and variations of such characteristics under natural and managed conditions

Hort 552 Integrated Management of Diseases and Insect Pests of Turfgrasses (Dual listed with 452 same as Ent 452 Pl P 552) See *Plant Pathology or Entomology*

Hort 565 Professional Practice in the Life Sciences (Same as Pl P 565) See *Plant Pathology*

Hort 590 Special Topics Cr arr *Prereq A major or minor in horticulture*

Hort 593 Workshop in Horticulture Cr arr Workshops in horticulture with emphasis on off campus instruction
A Greenhouse Crops
B Nursery Crops
C Turfgrass
D Fruit Crops
E Vegetable Crops
F Cross Commodity

Hort 599 Creative Component Cr arr

Courses for Graduate Students

Hort 610 Graduate Seminar Cr 1 each time elected FS

Hort 615 Liquid Chromatography (2 3) Cr 1 Second 5 weeks Alt F offered 2003 *Prereq Permission of instructor graduate classification* Theory and application of analytical liquid chromatography Considerations in methods development column packing particle size solvent selection isocratic vs gradient separation solvent flow rate detector choice qualitative component analysis and data handling

Hort 690 Advanced Topics Cr var

Hort 696 Seminar in Plant Physiology and Molecular Biology (Same as Bot 696) See *Botany*

Hort 699 Thesis and Dissertation Research Cr var
A Greenhouse Crops
B Nursery Crops
C Turfgrass
D Fruit Crops
E Vegetable Crops
F Cross-Commodity

Hotel, Restaurant, and Institution Management

(Administered by the Department of Apparel, Educational Studies and Hospitality Management)

Mary B Gregoire Chair of Department

Professors Gilmore Gregoire

Associate Professors Baltzer Oh Sneed

Associate Professors (Emeritus) Brown Huss Walsh

Assistant Professors Jeong Sharma

Assistant Professors (Adjunct) Dana Strohbehn

Instructors (Adjunct) Burger Henroid

Instructors (Collaborator) Thorius

Lecturers Moser Nervig Oliver

The Hotel Restaurant and Institutional Management program aspires to excellence in foodservice and lodging education research and outreach with a mission of developing leaders for the foodservice and lodging professions Educational experiences are planned to contribute to the graduate s effectiveness as a career professional and as a person family member and citizen Research and extension efforts are conducted with the purpose of improving management effectiveness and quality of services within lodging and foodservice organizations Finally the program is committed to serving the respective missions of Iowa State University and the College of Family and Consumer Sciences and to serving the needs of the state of Iowa

Undergraduate Study

The program offers work for the degree bachelor of science in hotel restaurant and institution management Coursework is planned to provide students with a general education plus professional preparation for supervisory and executive positions in hospitality organizations Principles of business management are presented as well as fundamentals of hospitality operations

Graduates understand the principles necessary to successfully practice hospitality management in an ethical manner They are able to determine accept and implement management responsibilities They can identify and evaluate environmental trends and adapt operating practices to meet these changing forces They are able to make a positive contribution to the growth and improvement of the hospitality industry

Learning experiences are provided in the quantity food production and service facility of the HRIM program and other approved establishments Field trips and guest speakers are scheduled to introduce students to the diversity of career opportunities in the hospitality industry These opportunities apply course content to specific work settings Students are required to have 400 hours of relevant work experience prior to graduation

The HRIM program offers a minor that may be earned by successfully completing at least 15 credits of HRIM courses in consultation with the undergraduate coordinator

A hotel restaurant and institution management area of concentration can be combined with a major in advertising or journalism and mass communication in the College of Liberal Arts and Sciences See the HRIM undergraduate coordinator for details

The program requires a grade of C or better in both Engl 104 and 105 or equivalent transfer courses A student who does not get a C or better in these classes is required to get a C or better in Engl 302

Graduate Study

The HRIM program offers work for the master of science and doctor of philosophy degrees in foodservice and lodging management (FLM) Graduates of the program are able to interpret trends and adapt operating practices of hospitality organizations to changing economic social political technological and environmental conditions They can manage a food or lodging enterprise successfully to achieve objectives of the operation or at the doctoral level successfully carry out responsibilities of a hospitality educator Graduates will make positive contributions to the growth and improvement of the hospitality industry using current research in the decision making process

A degree in hotel restaurant and institution management is the usual background for graduate study however applicants with preparation in dietetics business or closely related fields are encouraged to apply Prior to admission students must have completed most prerequisite courses These include basic principles courses in financial accounting managerial accounting business law computer science economics human resources management and marketing In addition basic principles courses in nutrition food preparation and quantity food production are required

The master of science degree requires either a thesis or non thesis (creative component) project Students also are required to take one HRIM course in three of four core areas (human resources financial management marketing and strategic management)

The program participates in the Master of Family and Consumer Sciences degree by offering a specialization in FLM The program also participates in the Master of Family and Consumer Sciences degree with specialization in Dietetics offered in cooperation with the Food Science and Human Nutrition Department

A graduate minor in HRIM at the MS level requires a minimum of 9 credits of HRIM coursework 6 credits must be at the 500 or 600 level

The PhD program required 72 credits 30 of which may be applied from the master s degree Required courses include seminars strategic management marketing human resource management research methods statistics and college teaching All students take a minimum of 15 research/dissertation credits

Courses open for nonmajor graduate credit 352 437 438 452 460

Courses Primarily for Undergraduate Students

HRI 101 Introduction to the Hospitality Industry (3 0) Cr 3 F Introduction to the foodservice lodging and tourism components of the hospitality industry Background information current issues resume writing and future challenges in various segments of the industry

HRI 233 Hospitality Sanitation and Safety (3 0) Cr 3 FS Sanitation and safety principles and issues in food service and lodging operations Discussion of issues impacting consumers Application of HACCP Preparation for national foodservice sanitation certification examination Characteristics of food supplies and equipment as related to sanitation and safety

HRI 260 Global Tourism Management (3 0) Cr 3 S Overview of the global tourism industry hospitality and related services destination/ attractions and transportation Introduction to travel behavior tourism planning and research and economic and social impacts of tourism development

HRI 287 Principles of Hospitality Management (3-0) Cr 3 FS Introduction to management concepts and principles with application to the hospitality industry Includes service quality management professionalism and social responsibility

HRI 289 Private Club Operations (2 0) Cr 2 S *Prereq 101* The organization and management of various types of private clubs including city country and other recreational and social clubs Field trip required

HRI 333 Foodservice Operations Controls (3 0) Cr 3 F *Prereq Credit or enrollment in 380 380L Math 104 140 or 150 Com S 103* Introduction to revenue and cost control in foodservice and hotel operations systems for controlling sales and food beverage labor and other costs Application of principles related to procurement production and inventory controls Specifications for food and equipment *Field trip required*

HRI 352 Lodging Operations Management I (3-0) Cr 3 F *Prereq 101* Introduction to functional department activities of lodging organizations including front office housekeeping purchasing accounting human resources and food and beverage Introduction to property management systems Principles of management applied to lodging operations Nonmajor graduate credit

HRI 380 Quantity Food Production Management (3 0) Cr 3 FS *Prereq 233 or 2 cr Micro FS HN 111 or 214 Junior classification enrollment in 380L* Principles of and procedures used in quantity food production management including quality control food costing work methods menu planning sanitation safety and service

HRI 380L Quantity Food Production and Service Management Experience (0 6) Cr 2 FS *Prereq 233 or 2 cr Micro FS HN 111 or 214 Junior classification enrollment in 380 reservation with program required* Application of quantity food production and service management principles and procedures in the departmental foodservice operation

HRI 381 International Study in Hospitality Cr 1 3 SS *Prereq Permission by application* Limited

enrollment Supervised study abroad of tourism and its impact on hospitality operations Experiences include hospitality related tourist attractions and opportunities related to different cultures Required pre study sessions arranged Expenses paid by student

HRI 382 Field Study Cr 1 3 FS SS *Prereq Permission by application* Supervised study opportunity for students to observe and apply classroom theory to actual hospitality operations across the US Hospitality operations may include hotels restaurants resorts wineries theme parks clubs hospitals and tourism operations Required pre-study sessions may be arranged Expenses paid by student

HRI 383 Introduction to Beverages (2 0) Cr 2 F *Prereq Must be at least 21 years old and permission of the instructor* Introduction to history and methods of production for a variety of wines spirits and other beverages Product knowledge and service techniques related to sales

HRI 391 Foodservice Systems Management I (3 0) Cr 3 F *Prereq 380 380L* Principles and techniques related to basic management organizational leadership and human resource management of foodservices in health care and other institutional settings Not accepted for credit toward a major in HRIM

HRI 392 Foodservice Systems Management II (3 0) Cr 3 S *Prereq 391* Introduction to cost control in foodservice departments procedures for controlling food labor and other variable costs Application of principles related to food product selection specification purchase and storage in health care and other institutions Not accepted for credit toward a major in HRIM

HRI 393 Hospitality Work Experience Cr 1 *Prereq Adviser approval* Approved work experience for HRIM majors in food lodging or related operations Experience in at least two different entry level positions or management responsibilities after high school graduation required A minimum of 400 hours required Offered on a satisfactory fail grading basis only

HRI 433 Hospitality Managerial Accounting (Dual-listed with 533) (3 0) Cr 3 S *Prereq 333 Acct 284 Econ 101 credit or enrollment in Stat 101* Use of common financial statements accounting ratios and financial techniques to impact management decisions

HRI 437 Hospitality Management Information Systems (3 0) Cr 3 F *Prereq 333 352 Com S 103* Introduction to hospitality management information systems Property management interfaces Managerial decision making and problem solving using computers Selecting and purchasing computer equipment Managing internal and external communication networks Nonmajor graduate credit

HRI 438 Hospitality Human Resource Management (3 0) Cr 3 S *Prereq 287 work experience junior classification* Principles and practices of human resource management relevant to hospitality organizations Emphasis on the entry level manager s role in hospitality organizations

HRI 439 Advanced Hospitality Human Resource Management (Dual listed with 539) (3 0) Cr 3 F *Prereq 438* Emphasis on development of manage ment personnel in hospitality organizations Case studies

HRI 440 Hospitality Marketing Strategies (Dual listed with 540) (3 0) Cr 3 F *Prereq 287 Stat 101 Mkt 340* Application of marketing theories to the hospitality industry Emphasis on consumer behavior market opportunities marketing research and strategies and marketing plans

HRI 452 Lodging Operations Management II (3-0) Cr 3 S *Prereq 352 and Com S 103* Advanced topics in lodging operations including international project development operations and contracts Property management systems including computer exercises Principles of yield management Nonmajor graduate credit

HRI 455 Hospitality Strategic Management (Dual-listed with 555) (3 0) Cr 3 F *Prereq Credit or enrollment in 433 438 and 440 senior classification* Introduction to the strategic management process as a planning and decision making framework in hospitality organizations Integration of human resources operations marketing and financial management concepts Use of case studies and group projects to facilitate development of conceptual and analytical skills

HRI 460 Hospitality Law (3 0) Cr 3 S *Prereq Acct 215* Laws relating to ownership and operation of hospitality organizations The responsibility of management and employees to customers and society Nonmajor graduate credit

HRI 474 Entrepreneurship in Family and Consumer Sciences (Same as HD FS 474 T C 474) (3 0) Cr 3 S *Prereq 6 credits in HRIM at 300-level or above* Explores entrepreneurship for family and consumer sciences related business Includes family home based rural and women owned businesses Development of a feasibility analysis Guest speakers

HRI 480 Quantity Recipe Development (1 3) Cr 2 Alt S offered 2005 *Prereq 380L or FS HN 214* Experimental approach to the development of quantity recipes Emphasis on sensory evaluation parameters of time equipment ingredients and reporting results

HRI 485 Catering (Dual listed with 585) (2-0) Cr 2 Alt S offered 2004 *Prereq 380 380L* Application of management principles in a catering business Starting a catering business and developing a business plan

HRI 487 Fine Dining Management (Dual-listed with 587) (2 3) Cr 3 F *Prereq 380 380L credit or enrollment in 333* Creative experiences with U S regional and international foods appropriate for fine dining Application of management principles in food preparation and service in fine dining operations Exploration of the historical and cultural development of the world food table

HRI 489 Issues in Food Safety (Same as An S 489 FS HN 489 VDPAM 489) (1 0) Cr 1 Alt S offered 2005 *Prereq Credit or enrollment in FS HN 101 or 272 or HRI 233 FS HN 419 or 420 FS HN 403* Capstone seminar for the food safety minor Case discussions and independent projects about safety issues in the food system from a multidisciplinary perspective

HRI 490 Independent Study Cr arr *Prereq Sections B E Program approval Section H Full membership in Honors Program*
B Hospitality Management
D Lodging Operations
E Foodservice Operations
H Honors

HRI 491 Internship Cr 2 *Prereq Advisor approval* Offered on a satisfactory fail grading basis only
A Foodservice Operations
B Lodging Operations

HRI 498 Cooperative Education Cr R FS *Prereq Permission of department executive officer* Required of all cooperative education students Students must register for this course prior to commencing each work period

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

HRI 504 Seminar (0 2) Cr 1 F(A) S (B) 504B may be taken more than once for credit
A Hospitality Research
B Current Issues

HRI 533 Hospitality Managerial Accounting (Dual listed with 433) (3-0) Cr 3 S *Prereq 333 Acct 284 Econ 101 credit or enrollment in Stat 101* Use of common financial statements accounting ratios and financial techniques to impact management decisions

HRI 539 Advanced Hospitality Human Resource Management (Dual-listed with 439) (3 0) Cr 3 F *Prereq 438* Emphasis on development of manage ment personnel in hospitality organizations Case studies

HRI 540 Hospitality Marketing Strategies (Dual listed with 440) (3 0) Cr 3 F *Prereq 3 credits in principles of marketing and statistics* Application of marketing theories to the hospitality industry Emphasis on consumer behavior market opportuni ties marketing research and strategies and marketing plans

HRI 555 Hospitality Strategic Management (Dual listed with 455) (3 0) Cr 3 F *Prereq Credit or enrollment in 433 438 and 440* Introduction to the strategic management process as a planning and decision making framework in hospitality organiza tions Integration of human resources operations marketing and financial management concepts Use of case studies and group projects to facilitate development of conceptual and analytical skills

HRI 575 Professional Management Experience in the Hospitality Industry Cr 2 4 FS SS *Prereq 9 credits in hotel restaurant and institution management at 400 level or above and permission of instructor* Analysis and interpretation of professional functions and data in a hospitality organization Design and implementation of a management project

HRI 585 Catering (Dual listed with 485) (2-0) Cr 2 Alt S offered 2004 *Prereq 380 380L* Application of management principles in a catering business Starting a catering business and developing a business plan

HRI 587 Fine Dining Management (Dual listed with 487) (2 3) Cr 3 F *Prereq 380 380L credit or enrollment in 333* Creative experiences with U S regional and international foods appropriate for fine dining Application of management principles in food preparation and service in fine dining operation Exploration of the historical and cultural development of the world food table

HRI 590 Special Topics Cr arr Credit maximum of 3 per topic *Prereq 9 credits in hotel restaurant and institution management at 400 level or above and permission of instructor*
B Hospitality Management
D Lodging Operations
E Foodservice Operations

HRI 599 Creative Component

Courses for Graduate Students

HRI 601 Hospitality Financial Management (3 0) Cr 3 Alt S offered 2005 *Prereq 3 credits in business finance* Financial management in foodservice and lodging operations Emphasis on financial performance risk and value evaluation cash flow analysis and investment and financing decisions

HRI 608 Administrative Problems Cr arr May take up to 4 cr *Prereq 9 credits in hotel restaurant and institution management at 400 level or above and permission of instructor* Consideration of advanced administrative problems Case studies in foodservice lodging or other approved establishments

HRI 611 Advanced Hospitality Marketing (3 0) Cr 3 Alt S offered 2004 *Prereq 540 Stat 401 or above* Conceptual and theoretical development of hospitality marketing strategies Analytical and critical review of hospitality marketing research and industry practices

HRI 639 Management of Professionals in Profit and Non-profit Organizations (3 0) Cr 3 Alt F offered 2004 *Prereq 439 or 539 or 3 years in supervisory position* Theories of leadership and management applied to selected profit or non profit organizations Principles and practices related to recruitment selection and development of professional personnel in hospitality health care and similar service related work settings

HRI 675 HRIM Teaching Experience Cr 2 FS *Prereq 9 credits in hotel restaurant and institution management at 400 level or above and permission of instructor* Development of objectives teaching methods and materials and test items for selected topics Implementation in an HRIM course

HRI 699 Research

Human Development and Family Studies

Maurice M MacDonald, Chair of Department

Professors Brooke Brotherson Crase Draper Fletcher Hira Lempers MacDonald Martin Meeks Russell Winter

Professors (Adjunct) Phillips

Professors (Collaborators) Bruner

Distinguished Professors (Emeritus) Bivens Meixner

Professors (Emeritus) Coulson Deacon Engel *Joanning Mercier Petersen* Pickett Schwieder

Associate Professors Allen Bryant Cook Crull Garasky Hegland Herwig N Miller Peterson Torrie Wickrama Yearns

Associate Professors (Adjunct) Melby

Associate Professors (Collaborators) Sellers

Associate Professors (Emeritus) Dail K Miller Strong Volker

Assistant Professors Garcia Godfrey Graham Greder Luze Michaels Murphy Oleson Thieman Werner Wilson

Assistant Professors (Adjunct) *Colbert*

Assistant Professors (Emeritus) Glass

Instructors (Adjunct) Enloe Jolly Krogh Oesterreich Thom Walsh

Undergraduate Study

For undergraduate curricula in human development and family studies leading to the degree bachelor of science see *Family and Consumer Sciences Curricula*

The Department of Human Development and Family Studies offers courses that focus on the interactions among individuals families their resources and their environments throughout the life span The department offers work for the bachelor of science degree in four curricula child adult and family services family resource management and consumer sciences housing and the near environment and early childhood education

At the completion of undergraduate study in Human Development and Family Studies undergraduates will demonstrate knowledge and understanding of a) family systems including special populations and their relationships to environments and institutions b) life span development including special populations c) professionalism ethics and public policy issues for working with individuals and families including special populations d) personal and professional communication with children and families including special populations e) management of human and material resources for children and families including special populations

The child adult and family services curriculum leads to work in the helping services with employment opportunities in public and private agencies including Head Start and schools Opportunities exist to observe and work with infants preschoolers school age children adolescents the elderly and families Graduates of the program are prepared for employment in agencies and organizations serving children youth families and the elderly as program development specialists coordinators directors teachers and administrators This flexible program provides a broad emphasis in theory research and application in child adult and family services including attention to community issues and public policy A student may seek a double major or preprofessional preparation

The family resource management and consumer sciences curriculum focuses on the behavior of families as they allocate and manage their resources and function as consumers The curriculum leads to employment with agencies and organizations concerned with family financial management financial counseling consumer economics and analysis and implementation of public policies that affect family resource management

The curriculum in housing and the near environment focuses on housing needs issues and trends such as housing alternatives for families and children housing for the elderly and persons with disabilities housing finance residential property management and public policy Graduates of this curriculum are prepared for employment in public and private (profit and not for profit) agencies and organizations real estate and lending institutions housing management and administration the housing and furnishings industries and housing advocacy

The curriculum in early childhood education is planned for students preparing to teach young children and work with their families This program leads to careers in working with young children who are typically developing and those with special needs from birth through age eight Graduates in this curriculum may teach in early childhood (preschool and primary) classrooms or home based programs with emphasis on inclusive services graduates may be employed by either public or private agencies or schools This curriculum has been approved by the Iowa Department of Education and meets requirements for the early childhood education unified teacher license which permits individuals to teach general and special education for children from birth through age eight The program is administered jointly by the Department of Curriculum and Instruction within the College of Education and the Department of Human Development and Family Studies within the College of Family and Consumer Sciences

The department offers minors in family resource management and consumer sciences child adult and family services and housing and the near environment The department also offers journalism areas of concentration in child adult and family services housing and the near environment and family resource management and consumer sciences see department for details

The family resource management and consumer sciences minor may be earned by completing 15 credits in the following courses 102 283 395 448 483 488 489

The child adult and family services minor may be earned by completing 102 449 selecting 3 credits from 220 221 226 227 or 377 selecting 3 credits from 276 349 360 370 or 373 and selecting 3 credits from 340 343 345 395 460 or 479

The housing and the near environment minor may be earned by completing 15 credits from the following courses 239 317K 341 360 416 460 463 490B

English proficiency requirement A student must achieve a grade of C or higher in English 104 and 105 A student achieving a grade of C- or lower in 104 and/or 105 must either repeat the course(s) earning a minimum grade of C or in consultation with the adviser and the coordinator of freshman English complete another appropriate English writing course with a minimum grade of C

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with the major in human development and family studies and minor work for students taking major work in other departments Graduates of M S and Ph D programs in the department will understand and apply relevant theories to educational research and/or intervention programs It is intended that they will produce and disseminate research results and provide leadership in human development and family studies professions

Within the major of human development and family studies students may choose from different specializations Specializations are available for both M S and Ph D candidates in child development early childhood education early childhood special education family policy family studies life span studies and marriage and family therapy The marriage and family therapy specialization is accredited by the Commission on Accreditation for Marriage and Family Therapy Education The Department of Human Development and Family Studies offers coursework and experiences leading to National Council of Family Relations certification as a family life educator

The department also participates in the Master of Family and Consumer Sciences degree by offering a specialization with that program

The department cooperates in the interdepartmental minor in gerontology

Prerequisite to work in the major is the completion of a related undergraduate program with basic courses in one or more of the following areas architecture child/human development community and regional planning economics education family studies interior design psychology or sociology Additional coursework or prerequisites may be required depending on the undergraduate program and graduate area of specialization

Guidelines for graduate programs of study in human development and family studies have been developed However the student s program of study committee has the major responsibility for determining requirements for an individual program

Courses open for nonmajor graduate credit 448 449 455 456 479 483 488 489

Courses Primarily for Undergraduate Students.

HD FS 102 Individual and Family Life Development (3 0) Cr 3 FS SS Development of individuals families and their reciprocal relationships as affected by external factors examined within a framework of life span developmental tasks

HD FS 218 Study Tour and Service Learning Cr 2 FS *Prereq 102* Restricted to HD FS majors The process of professional development and the scope of professional responsibilities and career exploration in child adult and family services Study of and visits to programs that serve children adults and families with diverse needs Participation in service learning project required Offered on a satisfactory fail grading basis only

HD FS 220 Development and Guidance Ages Birth through 2 Years (2-2) Cr 3 FS Alt SS offered 2005 *Prereq 102* Typical and atypical development from birth through two years of age Development and guidance within the contexts of family program and society Guided observation of physical motor cognitive communication social and emotional development participation in an infant care center

HD FS 221 Development and Guidance Ages 3 through 8 Years (2 2) Cr 3 FS Alt SS offered 2004 *Prereq 102* Typical and atypical development from three through eight years of age Development and guidance within the contexts of family program and society Guided observation of physical motor cognitive communication social and emotional development participation in an accredited preprimary program

HD FS 226 Development and Guidance in Middle Childhood (2-2) Cr 3 FS SS *Prereq 102 or Psych 230* Developmental characteristics of children from 5 to 12 years of age Development in the contexts of family school and society Guidance of children in family and group settings Directed observation and participation with children

HD FS 227 Adolescent Development (3 0) Cr 3 F *Prereq 102 or Psych 101 or 230* Physical cognitive

and socioemotional development of adolescents and young adults in the context of family relationships and culture

HD FS 239 Housing and Consumer Issues (3 0) Cr 3 FS Classroom enhanced www Alt S offered 2004 www only Introduction to factors affecting housing consumption of individuals and families including current housing consumer issues related to housing choices housing context of neighborhoods and communities housing structure types and credit and housing finance Issues such as homelessness housing discrimination indoor air quality accessible design

HD FS 240 Literature for Children (3 0) Cr 3 FS *Prereq 102 or Psych 230* Evaluation of literature for children Roles of literature in the total development of children Literature selection and use

HD FS 269 Research in Human Development and Family Studies (3-0) Cr 3 FS SS *Prereq 102 or Psych 230* Understanding and evaluating research Use of primary and secondary data to identify and study problems related to human development and family issues including finance and housing An introduction to statistical concepts and computer analysis Research participation

HD FS 270 Family Diversity Across Cultures (3-0) Cr 3 S *Prereq 102 Psych 101 or Soc 134* Current psychosocial theories methods research findings and applications to the understanding of families and cultures among diverse human populations Includes field work on various cultures

HD FS 276 Human Sexuality (3-0) Cr 3 FS Behavioral biological and psychological aspects of human sexuality within the social context of family culture and society Role of sexuality in human development Critical analysis of media and research Communication and decision making skills relating to sexuality issues and relationships

HD FS 283 Family Financial Management (3 0) Cr 3 FS SS Basic principles of money management Budgeting record keeping checking and savings accounts consumer credit insurance investment taxes

HD FS 317 Field Experiences Cr arr FS SS Consult department office for procedure Supervised field experience in human development and family studies programs May be repeated Offered on a satisfac tory fail grading basis only
A Early Childhood Education Programs *Prereq 343 permission of instructor*
B Family Services Programs *Prereq 9 credits in HD FS permission of instructor*
C Early Childhood Special Education Programs *Prereq 220 221 permission of instructor*
D School Age Child Care Programs *Prereq 226 permission of instructor*
E Infant/Toddler Programs *Prereq 340 permission of instructor*
F Research *Prereq 269* permission of instructor
G Family Resource Management Programs *Prereq 283 permission of instructor*
K Housing Programs *Prereq Permission of instructor*

HD FS 340 Assessment and Curricula Ages Birth through 2 Years (3 3) Cr 4 FS Alt SS offered 2004 *Prereq 220* Assessment strategies for infants and toddlers including those with special needs Curricula learning environments teaching strategies health and nutritional practices and schedules that are developmentally individually and culturally appropriate Using assessment to plan implement and evaluate activities to promote physical motor cognitive communication and social emotional development

HD FS 341 Housing Finance and Policy (3 0) Cr 3 F *Prereq 6 credits in social sciences* Personal and family financial considerations in home ownership rental and home improvements The social economic and governmental contexts of financial decision making at the household level Financial considerations for residential property management

HD FS 343 Assessment and Programming Ages 3 through 6 Years (3 3) Cr 4 FS Alt SS offered 2005 *Prereq 221 240 269 or Psych 333* Assess ment strategies for preschool and kindergarten children including those with special needs Learning environments schedules activities nutritional practices and teaching strategies that are developmentally individually and culturally appropriate Using assessment to plan implement and evaluate activities to promote physical motor cognitive communication and social emotional development

HD FS 345 Adapting Programming in Inclusive Settings (3 0) Cr 3 FS *Prereq Credit or concurrent enrollment in 343 Sp Ed 250* Adapting materials and equipment to meet social cognitive nutritional physical motor communication and medical needs of children birth through 8 with diverse learning needs and multiple disabilities in inclusive settings for young children Appraisal and management of specialized health care needs Designing and evaluating individual education plans supervising paraprofessionals in educational settings

HD FS 349 Parenting and Family Diversity Issues (3 0) Cr 3 FS *Prereq Sophomore classification* Diversity issues as they affect families Parenting practices and family relationships across cultures Topics include gender differences disabilities adoption and diverse family composition Under standing of the family system and the relationship of that system to societal systems

HD FS 360 Housing and Services for Families with Special Needs (3 0) Cr 3 S *Prereq 6 credits in social sciences* Housing and service alternatives that assist families and individuals with special needs including the disabled the homeless low income and single parents Residential property management considerations for families with special needs Experimental and innovative approaches to housing and services

HD FS 367 Abuse in Families (3 0) Cr 3 FS Alt SS offered 2004 *Prereq 9 credits in social sciences* Causes and consequences of physical sexual and emotional abuse in families across the life cycle Interplay between victims offenders and the treatment system

HD FS 370 Communication in Human and Family Development (3-0) Cr 3 FS Alt SS offered 2005 *Prereq 3 credits in social sciences* Application of communication processes in human and family development Development maintenance enrich ment and change in family personal and profes sional relationships through the life span

HD FS 373 Death as a Part of Living (3 0) Cr 3 FS Alt SS offered 2004 *Prereq 102* Consideration of death in the life span of the individual and the family with opportunity for exploration of personal and societal attitudes

HD FS 377 Aging and the Family (Same as Geron 377) (3 0) Cr 3 F Alt SS offered 2005 *Prereq 102* Interchanges of the aged and their families Emphasis on role changes social interaction and independence as influenced by health finances life styles and community development

HD FS 380 Family Law (3 0) Cr 3 S Alt SS offered 2004 *Prereq Junior classification* Family relationships rights and duties as prescribed by law Investigation of sources and interpretations of law

HD FS 381 International Study in Human Develop ment and Family Studies (Dual listed with 581) Cr Arr May be repeated FS SS *Prereq Permission by application* Limited enrollment Supervised international study experiences in Human Develop ment and Family Studies Countries vary
A Practicum
B Exchange
C Group Study

HD FS 395 Children, Families and Public Policy (3 0) Cr 3 FS *Prereq 6 credits in social sciences* Public policy and politics as they affect children and families Examination of how individuals and groups can influence policy Investigation of current issues and programs influencing the well being and welfare of children and families

HD FS 416 Human Development and Family Studies Seminar Cr var May be repeated FS SS *Prereq 8 credits in human development and family studies* Intensive study of a selected topic in human development and family studies

HD FS 417 Supervised Student Teaching Cr 8 May be repeated Reservation required
A Kindergarten Programs FS *Prereq GPA 2 5 full admission to teacher education program 455* Teaching experience with young children in kindergarten settings
B Preschool Programs FS *Prereq GPA 2 5 full admission to teacher education program 455 456* Teaching experience with young children from birth to 5 in group settings
C Early Childhood Special Education Programs FS *Prereq GPA 2 5 full admission to teacher education program 455 456 enrollment in C I 416* Teaching experience with preschool children with disabilities

HD FS 437 Characteristics of Giftedness (Dual listed with 537 same as Psych 437) (3 0) Cr 3 Alt S offered 2005 *Prereq 9 credits in human development and family studies or psychology including Psych 230 or HD FS 102 junior classification* Understanding of giftedness and talent from cognitive developmental and social perspectives using a life-span approach Current conceptualizations and research regarding gifted children and adults Implications for education and guidance

HD FS 445 Administration of Programs for Children (3 0) Cr 3 S *Prereq 340 or 343* Management principles and techniques including an introduction to financial management involved in programs for children with diverse needs and their families Staff development supervision and evaluation in programs for children and families Government regulations concerning child and family programs community relations and advocacy for children and families

HD FS 448 Economics of Aging (Same as Geron 448) (3 0) Cr 3 Alt S offered 2004 *Prereq 3 credits in principles of economics 3 credits in human development and family studies* Economic status of the aging retirement planning and the retirement decision role of Social Security public transfer programs for the elderly intrafamily transfers to/from the elderly private pensions financing medical care and housing for the elderly prospects and issues for the future Nonmajor graduate credit

HD FS 449 Linking Families and Communities (3 0) Cr 3 FS *Prereq 269 or Psych 333* Assessing family needs and community resources across the lifespan Characteristics of successful community based family intervention and support programs Strategies and skills needed by community based professionals including educators Linking families to community resources Nonmajor graduate credit

HD FS 455 Curricula for Ages 3 through 6 Years (3 3) Cr 4 FS *Prereq 343 345* Program models and methods leading to development and organization of appropriate curricula in preschool and kindergarten programs for young children with diverse learning needs Government regulations and professional standards for child programming Teaming with parents colleagues and paraprofessionals to plan implement and evaluate developmentally and culturally appropriate individualized education plans in inclusive settings Integrated practicum setting Nonmajor graduate credit

HD FS 456 Family Focused Interventions for Young Children (3 1) Cr 3 FS *Prereq 340 345* Application of family systems theory in family focused service delivery models Teaming with parents and interdisciplinary colleagues to plan implement and evaluate individualized family service plans Focus on home based in natural environments family support and linking families to community

resources Field experience in home based programs Nonmajor graduate credit

HD FS 460 Housing and Environments for Children (Dual listed with 560) (3-0) Cr 3 F *Prereq 6 credits in architecture art and design education interior design human development and family studies psychology* Assessment of environments for children including home child care school and community settings Emphasis on design of developmentally appropriate settings that foster independence for children with and without disabilities

HD FS 463 Housing for the Aging (Dual listed with 563 same as ArtID 463 Geron 463) (3 0) Cr 3 S *Prereq 360 or 3 credits in housing architecture interior design rehabilitation psychology or human development and family studies* Emphasis on independent living within residential settings including specialized shelter supportive services and housing management Application of criteria appropriate for accessibility and functional performance of activities universal design principles Creative project provides service learning opportunities

HD FS 474 Enterpreneurship in Family and Consumer Sciences (Same as HRI 474 T C 474) (3 0) Cr 3 S *Prereq 6 credits in HD FS at 300 level or above* Explores enterpreneurship for family and consumer sciences related businesses Includes family home based rural and women-owned businesses Development of a feasibility analysis Guest speakers

HD FS 479 Family Interaction Dynamics (3 0) Cr 3 F *Prereq 102* Analysis of family interaction processes and patterns with emphasis on relationship dynamics across the family life span Nonmajor graduate credit

HD FS 483 Advanced Family Financial Management (3-0) Cr 3 S *Prereq 283* Managerial approaches to achievement of short- or long term financial goals for households Investigation of different forms of investments and investment risks management in financing current and future consumption Analyses of tax estate and retirement planning needs of the family Nonmajor graduate credit

HD FS 486 Administration of Programs for Families (3 0) Cr 3 F *Prereq Junior classification 6 credits in HD FS at 300 level and above* An examination of purposes staffing operation and clientele of organizations and agencies serving families Analysis of issues in coordination and delivery of services

HD FS 488 Family in the Economy (3 0) Cr 3 S *Prereq Econ 101* Analysis of the family as an economic unit in society Structure and composition of the family Patterns of resource use and activities pursued by the family Family economic transitions such as marriage divorce and childbirth Nonmajor graduate credit

HD FS 489 Family Financial Counseling (Dual listed with 589) (3-0) Cr 3 F *Prereq 283* Personal social/psychological and legal climates affecting family financial decisions A life-cycle approach to financial decision making Development of financial counseling and planning skills to assist families and individuals to become self sufficient in family financial management Nonmajor graduate credit

HD FS 489L Laboratory in Family Financial Counseling (0-2 or 0 4) Cr 1 2 May be repeated FS *Prereq 489* Experience in remedial preventive and productive financial counseling

HD FS 490 Independent Study Cr arr *Prereq 6 credits in human development and family studies* Consult department office for procedure
A Child and Family Studies
B Housing
C Family Resource Management
F Early Childhood Education
G Early Childhood Special Education
H Honors
I Human Development and Family Studies
R Research

HD FS 491 Practicum Cr 4 or 8 May be repeated FS SS *Prereq 449 permission of instructor* Reservation required one semester before placement minimum 2 0 GPA Supervised work experience off campus related to the student s curriculum Offered on a satisfactory fail grading basis only

HD FS 493 Workshop (Dual-listed with 593) Cr arr May be repeated FS SS *Prereq Senior classification*

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

HD FS 500 Short Course Cr arr May be repeated *Prereq Permission of instructor* Concentrated group study of various developmental and educational issues in the field of human development and family studies

HD FS 501 Graduate Study Orientation (1-0) Cr R F Orientation to graduate study and current research in the department

HD FS 503 Research Methods in Human Development and Family Studies (3-3) Cr 4 S *Prereq Stat 401 or ResEv 553* Concepts methods and strategies for research in human development and family studies Topics include the nature of scientific research measurement types of research in human development and family studies validity of research designs methods of data gathering and strategies for and issues in the study of change Coding entry and manipulation of research data Practical applications with interactive statistical software

HD FS 510 Theories of Human Development (3-0) *Cr 3* FSS *Prereq 6 credits of social sciences* Theoretical approaches and current research in child adolescent and adult development Individual life span perspectives Policy implications

HD FS 511 FamilyTheory (3-0) Cr 3 FSS *Prereq 9 credits in social sciences* Theoretical approaches and current research in family development Review the nature and value of theory to the study of the family and evaluate the use of theory in empirical research Policy implications

HD FS 521 Housing and the Social Environment (3 0) Cr 3 Alt S offered 2005 *Prereq Graduate classification 511 or 6 credits in social sciences* Housing adjustment behavior of individuals and families in the context of the social and cultural framework of society Analysis of conceptual frameworks methodological approaches and current research in housing Impact of housing on the family

HD FS 523 Household Resource Development and Allocation (3 0) Cr 3 Alt S offered 2004 *Prereq 6 credits in sociology or economics* Theories and research in goal oriented behavior Emphasis on the fit between household behavior in resource allocation and policies designed to foster or inhibit such behavior

HD FS 525 Theories and Research in Early Childhood Education (3-0) Cr 3 Alt F offered 2003 *Prereq 510 or 6 credits in social sciences* Analysis of contemporary and historical models including early intervention programs The effect of variables such as programming physical environment and teacher effectiveness on children Research on teacher-child and teacher parent interactions in early childhood education programs

HD FS 534 *Adult Development* *(Same as Geron* 534) (3-0) Cr 3 S *Prereq 510 or 511* Adult development of cognition personal characteristics and cultural aspects of human relationships Emphasis on development and psychosocial health in young middle and later adulthood

HD FS 537 Characteristics of Giftedness (Dual listed with 437 same as Psych 537) (3-0) Cr 3 Alt S offered 2005 *Prereq 9 credits in human development and family studies or psychology including Psych 230 or HD FS 102 junior classification* Understanding of giftedness and talent from cognitive developmental and social perspectives using a life span approach Current conceptualizations and research regarding gifted children and adults Implications for education and guidance

HD FS 538 Developmental Disabilities in Children (Same as Psych 538) (3 0) Cr 3 Alt S offered 2005 *Prereq 9 credits in human development and family studies or psychology* Theories research and current issues regarding development in children with disabilities Investigation of interventions with children and families

HD FS 541 Housing and Real Estate in Family Financial Planning (Same as FFP 541) (3-0) Cr 3 Alt SS offered 2004 www only The role of housing and real estate in the family financial planning process including taxation mortgages financial calculations legal concerns and ethical issues related to home ownership and real estate invest ments Emphasis on emerging issues in the context of housing and real estate

HD FS 547 Parent Child Relations (3 0) Cr 3 Alt F offered 2004 *Prereq 510 or 511 or 6 credits in social sciences* Analysis of theories and research related to parent-child interactions examination of parenting as a developmental process Current issues in child rearing

HD FS 548 Parent Education (3 0) Cr 3 Alt S offered 2004 *Prereq 510 or 511 or 6 credits in social sciences* Needs assessments models delivery systems and evaluation procedures used in parent education programs for families with diverse needs including single parents adolescent parents and parents of children with developmental disabilities Developmental aspects of parenting Effects of values family structures family goals and parenting styles on parent education

HD FS 555 Advanced Issues and Program Planning in ECSE (3 1) Cr 3 Alt F offered 2003 *Prereq 9 credits in social sciences* Curriculum issues in early childhood special education including inclusion activity based intervention and developmentally appropriate programming Emphasis on continuum of strategies to promote peer interactions Lab participation in integrated classroom

HD FS 556 Families and Disability (3 0) Cr 3 Alt S offered 2005 *Prereq 9 credits in social sciences* Review of research policy and practice regarding families with children who are disabled Educational environmental economic and social issues faced by families Communication and consultation skills to work collaboratively with interdisciplinary profession als and families to implement individualized family and educational programs

HD FS 560 Housing and Environments for Children (Dual listed with 460) (3-0) Cr 3 F *Prereq 6 credits in architecture art and design education interior design human development and family studies or psychology* Assessment of environments for children including home child care school and community settings Emphasis on design of developmentally appropriate settings that foster independence for children with and without disabilities

HD FS 563 Housing for the Aging (Dual listed with 463 same as Geron 563) (3 0) Cr 3 S *Prereq 360 or 3 credits in housing architecture interior design rehabilitation psychology or human development and family studies* Emphasis on independent living within residential settings including specialized shelter supportive services and housing management Application of criteria appropriate for accessibility and functional performance of activities universal design principles Creative project provides service learning opportunities

HD FS 566 Impact of Public Policy on the Family (3-0) Cr 3 S *Prereq 9 credits in social sciences* The effect of legislative policy on families and children especially those at risk Explicit and implicit family policies in the U S compared to such policies in other nations Historical basis and theoretical perspectives emphasized Analysis of current legislation

HD FS 567 Family Violence (3-0) Cr 3 F *Prereq 9 credits in social sciences* Contemporary theory and research in family violence including child sibling partner and elder maltreatment Emphasis is on

physical sexual emotional and financial abuse implications for prevention intervention and policy

HD FS 568 Developmental Assessment (3-0) Cr 3 Alt F offered 2004 *Prereq 510* Procedures and issues related to developmental assessment of young children Emphasis on developing and implementing play based processes for assessing development of young children Focus on collaboration with families and using assessment information for planning interventions

HD FS 570 Families Across the Life Span (3 0) Cr 3 F *Prereq 9 credits in social sciences* Theory and research in development and change in family systems and in their reciprocal relationships with the individual and the environment across the family life span

HD FS 571 MaritalTherapy and Assessment (3 0) Cr 3 S *Prereq 9 credits in social sciences* Theories and techniques of couple therapy across the life cycle

HD FS 572 Family, Stress and Community Resources (3-0) Cr 3 Alt F offered 2004 *Prereq 9 credits in social sciences* Examination of strengths and challenges of marginalized families Identification of barriers to services and support and exploration of approaches to assist families in overcoming these barriers

HD FS 573 Ethics and Professional Studies in Marriage and FamilyTherapy (3 0) Cr 3 Alt S offered 2005 *Prereq 571* Professional ethics and legal responsibilities relevant to family therapy Professional socialization and the role of professional organizations and state licensure/certification

HD FS 574 History of FamilyTherapyTheory (3 0) Cr 3 F *Prereq 9 credits in social sciences* A review of the development of family therapy theory from 1945 to 1985 Emphasis on the emergence of cybernetic theory second order cybernetics and theoretical underpinnings of practice models

HD FS 575 Cross cultural Perspectives on Families and Children (3 0) Cr 3 Alt S offered 2004 *Prereq 6 credits in social sciences* Review of methods and findings on cultural influences on the development of children and youth and on family life Comparison of child rearing practices family roles values and traditions in different cultures

HD FS 576 Marriage Across the Life Course (3 0) Cr 3 Alt S offered 2005 *Prereq 511* A develop mental approach to exploring predictors of the formation maintenance and dissolution of intimate relationships across the life course Understanding how intimate relationships develop and change over time beginning with the development of early adolescent relationships and continuing through later life

HD FS 577 Aging and Intergenerational Relations (Same as Geron 577) (3 0) Cr 3 Alt S offered 2004 *Prereq 9 credits in social sciences* Theories and research related to personal and family adjustments in later life affecting older persons and their intergenerational relationships Related issues including demographics are also examined through the use of current literature

HD FS 578 Models of Marriage and FamilyTherapy (3 0) Cr 3 F *Prereq 9 credit in social sciences* Major models of marriage couple and family therapy Includes clinical assessment intervention and evaluation

HD FS 579 Family Interaction Dynamics (3-0) Cr 3 S *Prereq 9 credits in social sciences* Current research and theory in family interaction with emphasis on family dynamics and family change across the life course

HD FS 580 The Family and the Law (3 0) Cr 3 Alt SS offered 2004 *Prereq 6 credits in social science* The effects of selected legislation and cases on individuals and families The legal processes involved in the activities of individuals and families Implications for effective functioning within the limits of the legal environment Legal and quasi legal services available in the community

HD FS 581 International Study in Human Develop ment and Family Studies (Dual-listed with 381) Cr Arr May be repeated FS SS *Prereq Permission by application* Limited enrollment Supervised international study experiences in Human Develop ment and Family Studies Countries vary
A Practicum
B Exchange
C Group Study

HD FS 583 Investing for the Family s Future (Same as FFP 583) (3 0) Cr 3 F www only *Prereq 483* Evaluation of investment markets for the household Analysis of how families choose where to put their savings Emphasis is on using the family s overall financial and economic goals to help inform decisions about which investments to choose

HD FS 585 Family Policy Analysis (3-0) Cr 3 Alt F offered 2003 *Prereq 6 credits in graduate level social sciences* Theoretical and practical issues related to family policy program evaluation Assessment of programs success in meeting goals Examination of concepts related to family policy development in the United States Examination of how individuals and groups can influence family policy and evaluation

HD FS 586 SexTherapy (3 0) Cr 3 Alt SS offered 2005 *Prereq 578 or 571* The course reviews gender orientation and sexual functioning as well as assessment and treatment of sexual problems Research regarding effectiveness of treatment is reviewed

HD FS 587 Diversity Issues in Marriage and Family Therapy (3-0) Cr 3 Alt S offered 2004 Review treatment implications associated with topics such as gender and power race/ethnicity family structure and socioeconomic status Discuss treatment implications of social oppression and discrimination on families

HD FS 588 Family Economics and Public Policy (3 0) Cr 3 Alt F offered 2004 *Prereq 6 credits in sociology or economics* Analysis of family income wealth and economic well-being Emphasis on effects of family behavior and public policies on the adequacy and security of income across the family life cycle Implications of resource allocation within the family for adult and child well being

HD FS 589 Family Financial Counseling (Dual listed with 489) (3 0) Cr 3 F *Prereq Graduate classifica tion* Personal social/psychological and legal climates affecting family financial decisions A life cycle approach to financial decision making Development of financial counseling and planning skills to assist families and individuals to become self sufficient in family financial management

HD FS 590 SpecialTopics Cr arr *Prereq Permission of instructor* Consult department office on procedure for filing a written plan of study
A Family Studies
B Housing
C Family Resource Management
D Human Development
E Child Development
F Early Childhood Education
G Early Childhood Special Education
I Human Development and Family Studies
M Marriage and Family Therapy
N Family Policy

HD FS 591 Practicum Cr arr May be repeated FS SS *Prereq 10 graduate credits* Supervised experience in an area of human development and family studies
A Family Studies
B Housing
C Family Resource Management
D Human Development
E Child Development
F Early Childhood Education
G Early Childhood Special Education
I Human Development and Family Studies
M Marriage and Family Therapy
N Family Policy

HD FS 593 Workshop (Dual listed with 493) Cr arr May be repeated FS SS *Prereq Senior classification*

Courses for Graduate Students

HD FS 603 Advanced Quantitative Methods (3 0) Cr 3 S *Prereq 503 Stat 402 403 or 404* Methodological and analytical issues in research in human development and family studies Advanced research design and measurement selection of statistical techniques and issues in the interpretation of findings

HD FS 604 Advanced Qualitative Research (3 0) Cr 3 F *Prereq 503* Qualitative methods and related theory in human development and family studies Research procedures including phenomenology grounded theory ethnography and case studies Methods of data collection and analysis

HD FS 605 Multi-level Modeling for Social and Behavioral Sciences (3-0) Cr 3 Alt F offered 2003 *Prereq Stat 404* Rationale for and interpreta tion of random coefficient models Strategies for the analysis of multi level and panel data including models for random intercepts random slopes and growth curves Applications including HLM SAS PROCMIX and MPLUS

HD FS 616 Seminar Cr arr May be repeated FS SS

HD FS 631 Learning and Cognitive Development in Children (3-0) Cr 3 Alt F offered 2004 *Prereq 510* Theory and research emphasizing constructivist Vygotskian and information processing approaches to cognitive development Concept memory and problem solving development Sources of individual differences in cognitive functioning of children and adolescents

HD FS 632 Language and Perceptual Development in Children (3 0) Cr 3 Alt S offered 2004 *Prereq 510* Models of perceptual development Research methods and findings Theories and research on language development Role of perceptual strategies in the language learning process

HD FS 633 Social and Emotional Development in Children (3 0) Cr 3 Alt S offered 2004 *Prereq 510* Theory and research related to social and emotional development of infants children and adolescents Dynamic socialization processes involving children adolescents parents peers and society

HD FS 634 Adolescent Development (3 0) Cr 3 Alt F offered 2003 *Prereq 510 or 511* Theory and research on physical motor intellectual-cognitive and social personality development from early to late adolescence Sources of developmental and individual differences in identity formation and attainment

HD FS 650 Advanced Family PolicyTheory (3-0) Cr 3 Alt S offered 2005 *Prereq 588* Analysis of theories research and current issues related to family and household economics and policy Emphasis on theory development and empirical analyses of macro and micro family economic problems Future policy economic and social trends and their meaning for the family as an economic institution

HD FS 660 Measurement Issues in Family Research (3 0) Cr 3 Alt S offered 2004 *Prereq 503 511* Selection of appropriate reliable and valid research instruments for families attention to technical issues associated with collecting and interpreting data from multiple family members sensitivity to diversity issues (e g ethnic and gender bias)

HD FS 672 ClassicTheories in Marriage and Family Therapy (3-0) Cr 3 Alt S offered 2005 *Prereq 571 574* Intergenerational and experiential theories and techniques of therapy Emphasis on research practice and supervision issues in marriage and family therapy

HD FS 673 Evidence Based Therapies (3-0) Cr 3 Alt F offered 2004 *Prereq 571 574* Examination of evidence based therapies (EBTs) in the treatment of mental health problems Emphasis on EBTs is based on systemic/contextual theories in the treatment of individuals couples and families

HD FS 675 Preventive Intervention Research (3 0) Cr 3 Alt F offered 2005 *Prereq 571 574* Theory methodology and ethical issues in prevention research Emphasis on program design evaluation dissemination and funding for preventive interventions to eliminate or minimize mental health disorders in children and adolescents

HD FS 679 Postmodern Family Therapy Theories (3-0) Cr 3 Alt F offered 2004 *Prereq 571 574* Examination of postmodern theories such as social constructionism and postmodern feminism as a foundation for understanding postmodern marriage and family therapies

HD FS 690 Advanced Topics Cr arr *Prereq Permission of instructor and enrollment in Ph D program*
A Family Studies
B Housing
C Family Resource Management
D Human Development
E Child Development
F Early Childhood Education
G Early Childhood Special Education
I Human Development and Family Studies
M Marriage and Family Therapy
N Family Policy

HD FS 691 Internship Cr arr May be repeated FS SS *Prereq Permission of instructor* Offered on a satisfactory fail grading basis only Supervised practice and experience in the following specified areas
A College Teaching
B Research
C Marriage and Family Therapy

HD FS 692 Family Therapy Supervision (3 0) Cr 3 Alt F offered 2004 *Prereq 691C* Preparation of marriage and family therapy supervisors Emphasis on research practice and ethical issues in marriage and family therapy supervision

HD FS 699 Research Cr arr Offered on a satisfactory-fail grading basis only
A Family Studies
B Housing
C Family Resource Management
D Human Development
E Child Development
F Early Childhood Education
G Early Childhood Special Education
I Human Development and Family Studies
M Marriage and Family Therapy
N Family Policy

Immunobiology

(Interdepartmental Graduate Major)

Supervisory Committee R Rosenbusch Chair C Andreasen D Jones R Sacco E Thacker

The Graduate Faculty Mark Ackerman Claire Andreasen Amy Andreotti Jan Buss Susan Carpenter Nancy Cornick Joan Cunnick Ronald Griffith James Harp Hank Harris Jesse Hostettter Julie Jarvinen Doug Jones Marian Kohut Susan Lamont F Chris Minion Harley Moon Marit Nilsen Hamilton Andy Norris Brian Nonnecke Evelyn Nystrom Ken Platt Don Reynolds Ricardo Rosenbusch Richard Ross James Roth Max Rothschild Randy Sacco Mary Schmerr Judy Stabel Louisa Tabatabai Eileen Thacker Charles Thoen Mike Wannemuehler En-Min Zhou

Graduate Study

Work is offered for the master of science and doctor of philosophy degrees with a major in Immunobiology Faculty are drawn from seven departments Animal Science Biochemistry Biophysics and Molecular Biology Health and Human Performance Microbiology Veterinary Diagnostic and Production Animal Medicine Veterinary Microbiology & Preventive Medicine and Veterinary Pathology The diversity of faculty expertise ensures a broad education while offering flexibility in choice of specialization Ongoing research projects include areas such as antibody and cell mediated immunity immunochemistry immunogenetics immunomodulation mucosal immunity and nutritional immunology

Students may enter the Immunobiology major in one of two ways they may apply to and be directly accepted into the major or they may be admitted to a participating department followed by formal admission to the major Students directly admitted into the Interdepartmental Immunobiology Major will take Imbio 697 (graduate research rotation) in their first two semesters and by the end of the second semester enter a department by choosing a major professor from the participating faculty Students first admitted to a department will choose a major professor from the participating faculty in that department

Students should have a strong background in the biological sciences including work in immunology genetics and biochemistry Prior research experience is highly encouraged Submission of scores of the GRE General Test is required

Immunobiology students should include in their program of study a core of courses which will provide a broad coverage of the basic program in immunobiology Formal courses should include immunology biochemistry and statistics Additional coursework may be selected to satisfy individual interests or departmental requirements The foreign language and teaching requirements are determined by the student s department All students will take a minimum of one seminar course per year

Graduates have a broad understanding of the interdisciplinary field of immunobiology and can effectively integrate the principles of immunology with related disciplines They are able to effectively communicate with scientific colleagues and the general public in both formal and informal settings Graduates are able to integrate theory and research to address complex problems facing scientific professionals studying animal and human health taking into account related ethical social legal and environmental issues They are skilled at carrying out research communicating research results and writing persuasive grant proposals

Courses for Graduate Students

Imbio 602 Current Topics Workshop in Immunology (1 0) Cr 1 each time taken Lectures provided by off campus experts Students are required to participate in discussion sessions with lecturers

Imbio 604 Seminar in Immunobiology (1 0) Cr 1 each time taken Student and faculty presentation

Imbio 690 Special Topics Cr var each time taken Advanced study of specific topics in specialized field of immunobiology

Imbio 697 Graduate Research Rotation Cr Var each time taken Graduate research projects performed under the supervision of selected faculty members in the Interdepartmental Immunobiology major

Imbio 699 Research

Industrial Engineering

(Administered by the Department of Industrial and Manufacturing Systems Engineering)

Patrick E Patterson Chair of Department

Professors Barta Heising Morris Sannier Vardeman

Professors (Collaborators) Dittmar Egbelu

Distinguished Professors (Emeritus) Cowles

University Professors (Emeritus) David

Professors (Emeritus) Berger Even Griffen Hempstead Kleinschmidt Mohr Montag Moore C Smith G Smith Squires Tamashunas Vaughn

Associate Professors Adams Cruz-Neira Gemmill Jackman Meeks Min Patterson Peters Ryan

Associate Professors (Emeritus) Love

Assistant Professors Narayanaswami Olafsson Van Voorhis

Undergraduate Study

For the undergraduate curriculum in industrial engineering leading to the degree bachelor of science see *College of Engineering Curricula* This curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology

Industrial engineers are employed to design analyze and improve systems and processes found in manufacturing consulting and service industries Professional responsibilities are typically in design management analysis optimization and modeling of industrial systems An industrial engineer is focused on human factors operations research enterprise computing engineering management manufacturing engineering and quality Industrial engineers are typically found in organizations responsible for operations management process engineering automation logistics supply chain management scheduling plant engineering quality control and technical sales

The goal of the industrial engineering undergraduate curriculum is to produce technically qualified industrial engineers who are capable of successful professional practice in the field Graduates of the program will be able to work effectively with other members of the work force to accomplish engineering advances in their assigned areas The program also provides graduates with the necessary educational foundation to pursue advanced studies in industrial engineering or related fields

Graduates of the program must demonstrate the ability to design develop implement and improve systems that include people materials information equipment and energy The program includes in depth instruction to accomplish the integration of systems using appropriate analytical computational and engineering practices

In addition to the College of Engineering goals the industrial engineering curriculum has the following goals for each student

1 Students should be able to design analyze and manage effective production distribution and service systems
2 Students should be able to bridge the engineering and business functions of an organization
3 Students should be able to integrate functions involving people material equipment information and control
4 Students should have a global perspective of enterprise
5 Students should be able to provide leadership in multi functional teams

The industrial engineering undergraduate curriculum provides students with fundamental knowledge in mathematics and science engineering science social science and humanities as well as professional industrial engineering course work Management electives provide students with an opportunity to become familiar with modern business practices that they will encounter in their career A senior capstone design course provides students with an opportunity to solve open ended industrial problems with an industrial partner The cooperative education program provides students with real world experience in the profession and a good perspective on career choices Students are encouraged to participate in international experiences through exchange programs and industrial internships

Graduate Study

The department offers work leading to the degrees of master of science and doctor of philosophy with a

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Graduate Study

The department offers work leading to the degrees of master of science and doctor of philosophy with a

major in industrial engineering A formal minor is available to doctor of philosophy students having a major in another department Graduate study is designed to improve the student s capability in the professional practice of industrial engineering and to develop research ability

The prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in engineering at this institution

With the help of a program of study committee a graduate student develops an educational program in areas within industrial engineering Typical areas of concentration include engineering economy human factors systems analysis and control manufacturing systems analysis manufacturing processes production systems analysis and design life cycle analysis and depreciation operations research and optimization enterprise modeling and integration information management and the human machine interface A major in operations research leading to a master of science degree is co-offered with the Department of Statistics

Courses open for nonmajor graduate credit 305 312 341 348 361 375 408 409 413 419 439 441 448 465 471 483

Courses Primarily for Undergraduate Students

I E 101 Orientation (1 0) Cr R S Introduce students to the industrial engineering profession its scope industrial engineering tools and future trends

I E 148 Information Engineering (2-2) Cr 3 F *Prereq Credit or enrollment in Math 142* Development of information solutions for engineering problems Fundamentals of the software development process Engineering computations and the human/computer interface Data models and database development Program connectivity and network applications

I E 248 Engineering System Design Manufacturing Processes and Specifications (2-2) Cr 3 F *Prereq Credit or enrollment in Mat E 272* Introduction to metrology engineering drawings and specifications Engineering methods for designing and improving systems Theory applications and quality issues related to machining processes

I E 271 Applied Ergonomics and Work Design (3 0) Cr 3 S *Prereq Phys 221* Basic concepts of ergonomics and work design Their impact on worker and work place productivity and cost Investigations of work physiology biomechanics anthropometry work methods and their measurement as they relate to the design of human machine systems

I E 298 Cooperative Education Cr R FS SS *Prereq* Permission of department First professional work period in the cooperative education program Students must register for this course before commencing work

I E 305 Engineering Economic Analysis (3-0) Cr 3 FS *Prereq Math 166* Economic analysis of engineering decisions under uncertainty Financial engineering basics including time value of money cash flow estimation and asset evaluation Comparison of project alternatives accounting for taxation depreciation inflation and risk Nonmajor graduate credit

I E 312 Optimization (3 0) Cr 3 F *Prereq Math 266* Concepts optimization and analysis techniques and applications of operations research Formulation of mathematical models for systems concepts and methods of improving search linear programming and sensitivity analysis network models and integer programming Nonmajor graduate credit

I E 341 Production Systems (3 0) Cr 3 S *Prereq Stat 231* Introduction of key concepts in the design and analysis of production systems Topics include inventory control forecasting material requirement planning project planning and scheduling operations scheduling and other production systems such as Just In Time (JIT) warehousing and supply chains Nonmajor graduate credit

I E 348 Solidification Processes (2 2) Cr 3 S *Prereq I E 248* Theory applications and quality issues related to metal casting welding polymer processing powder metallurgy electronic assembly and semi-conductor manufacturing Nonmajor graduate credit

I E 361 Statistical Quality Assurance (Same as Stat 361) (3-0) Cr 3 FS *Prereq Stat 231 or 401* Statistical methods for process improvement Simple quality assurance principles and tools modern quality culture including TQM 6 Sigma ISO 9000 and Baldrige Measurement system precision and accuracy assessment Control charts Process capability assessment Experimental design and analysis for process improvement Significant external project in process improvement Nonmajor graduate credit

I E 375 Introductory Production Systems (3 0) Cr 3 S *Prereq Junior classification Math 160 or 166* Principles and concepts in the design and control of production systems including demand forecasting fixed and variable capacity planning master production scheduling inventory control types of production and work flow systems quality control and project management Not available for degrees in industrial engineering Nonmajor graduate credit

I E 396 Summer Internship Cr R SS *Prereq Permission of department* Summer professional work period

I E 397 Engineering Internship Cr R FS *Prereq Permission of department* Professional work period for a maximum of one semester per academic year

I E 398 Cooperative Education Cr R FS SS *Prereq 298 permission of department* Second professional work period in the cooperative education program Students must register for this course before commencing work

I E 408 Interdisciplinary Problem Solving (Same as E E 408 I Tec 408) (3-0) Cr 3 FS *Prereq Junior or senior classification* Use the Theory of Constraints as a way of approaching problem solving win win negotiation project planning and effective delegation in the context of engineering/business systems Team projects aimed at improving design outcomes Nonmajor graduate credit

I E 409 Interdisciplinary Systems Effectiveness (Same as E E 409 I Tec 409) (3 0) Cr 3 SS *Prereq Junior or senior classification* Focus on functions that determine the effectiveness of an entire organization Generic Theory of Constraints solutions to production distribution and project management are compared to traditional solutions Strategy for improvements discovered using simulations Nonmajor graduate credit

I E 413 Stochastic Modeling Analysis and Simulation (4 0) Cr 4 F *Prereq Math 266 Stat 231* Development and analysis of simulation models using a simulation language Application to various areas of manufacturing and service systems such as assembly material handling and customer queues Utilizing model output to make important business decisions Fitting of data to statistical distributions Introduction to Markov processes and other queuing models Nonmajor graduate credit

I E 419 Manufacturing Systems Modeling (3-0) Cr 3 F *Prereq Stat 231* Modeling material handling systems inventory systems and production systems for performance analysis Introduction to analysis simulation and physical models of manufacturing systems Simulation languages such as ARENA AweSim and ProModel Not available for degrees in industrial engineering Nonmajor graduate credit

I E 439 Industrial Automation (2 3) Cr 3 S *Prereq E E 441* Principles and practices of automating production and distribution systems Sensors actuators controllers and control algorithms Computer control and interfaces Integration of automated systems with enterprise wide computing systems networks and communication between devices Nonmajor graduate credit

I E 441 Industrial Engineering Design (1 6) Cr 3 FS *Prereq 271 305 312 348 413* A large open ended design project related to an enterprise Application of engineering design principles including problem definition analysis synthesis and evaluation Nonmajor graduate credit

I E 448 Manufacturing Systems Engineering (3 0) Cr 3 F *Prereq 248* Fixturing and tooling requirements for manufacturing process planning geometric dimensioning and tolerancing computer aided inspection make versus buy decisions cellular and flexible manufacturing and facility layout The role of these topics in supporting lean manufacturing will be integrated throughout the course Nonmajor graduate credit

I E 449 Computer Aided Design and Manufacturing (Dual listed with 549) (3 0) Cr 3 F *Prereq 248 some experience with theory of matrices and C programming* Representation and interpretation of curves surfaces and solids Parametric curves and surfaces and solid modeling Use of CAD software and graphics programming techniques for CAD/CAM integration Application of computer technologies in planning and controlling manufacturing processes Computer numerical control CNC programming languages and process planning

I E 466 Multidisciplinary Engineering Design (Same as E E 466) See *Electrical Engineering*

I E 471 Safety and Reliability in the Design of Work Systems (3 0) Cr 3 Alt S offered 2004 *Prereq 271* The quantitative study of work systems through the methods of engineering analysis and design human reliability analysis and the use of simulation to predict model and reduce or eliminate workplace hazards Nonmajor graduate credit

I E 481 e Commerce Systems Engineering (Dual listed with 581) (3 0) Cr 3 Alt F offered 2003 *Prereq 148* Design analysis and implementation of e commerce systems Information infrastructure enterprise models enterprise processes enterprise views Data structures and algorithms used in e commerce systems SQL exchange protocols client/server model web-based views

I E 483 Knowledge Discovery and Data Mining (Dual listed with 583) (3 0) Cr 3 F *Prereq 148 312 and Stat 231* Introduction to data warehouses and knowledge discovery Techniques for data mining including probabilistic and statistical methods genetic algorithms and neural networks visualization techniques and mathematical programming Relationship to enterprise computing Advanced topics include web-mining and mining of multimedia data Case studies from both manufacturing and service industries A computing project is required Nonmajor graduate credit

I E 490 Independent Study Cr 1 to 5 each time elected *Prereq Senior classification permission of instructor* Independent study and work in the areas of industrial engineering design practice or research
A Manufacturing
B Human Factors
C Operations Research
D Enterprise Computing and Information Management
E Engineering Management
H Honors

I E 498 Cooperative Education Cr R FS SS *Prereq 298 permission of department* Third and subsequent professional work periods in the cooperative education program Students must register for this course before commencing work

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

(An undergraduate student must have an academic standing in the upper one half of his/her class to enroll in any 500 level industrial engineering course)

I E 508 Design and Analysis of Allocation Mechanisms (3-0) Cr 3 S *Prereq 312 or Math 307* Market based allocation mechanisms from quantitative economic systems perspective Pricing and costing models designed and analyzed with respect to decentralized decision processes information requirements and coordination Case studies and examples from industries such as regulated utilities semiconductor manufacturers and financial engineering services

I E 510 Network Analysis (3 0) Cr 3 Alt F offered 2004 *Prereq 312* Formulation and solution of deterministic network flow problems including shortest path minimum cost flow and maximum flow Network and graph formulations of combinatorial problems including assignment matching and spanning trees Introduction to deterministic and stochastic dynamic programming

I E 513 Analysis of Stochastic Systems (3-0) Cr 3 Alt S offered 2003 *Prereq Stat 231* Introduction to modeling and analysis of manufacturing and service systems subject to uncertainty Topics include the Poisson process renewal processes Markov chains and Brownian motion Applications to inventory systems production system design production scheduling reliability and capacity planning

I E 514 Production Scheduling (3-0) Cr 3 S *Prereq 312 341* Introduction to the theory of machine shop systems Complexity results for various systems such as job flow and open shops Applications of linear programming integer programming network analysis Enumerative methods for machine sequencing Introduction to stochastic scheduling

I E 519 Simulation Modeling and Analysis (3-0) Cr 3 S *Prereq Com S 311 Stat 401* Event scheduling process interaction and continuous modeling techniques Probability and statistics related to simulation parameters including run length inference design of experiments variance reduction and stopping rules Aspects of simulation languages

I E 531 Quality Control and Engineering Statistics (Same as Stat 531) See *Statistics*

I E 533 Reliability (Same as Stat 533) See *Statistics*

I E 534 Linear Programming (3 0) Cr 3 S *Prereq 312* Develop linear models Theory and computational aspects of the simplex method Duality theory and sensitivity analysis Introduction to interior point methods and column generation Multiobjective linear programs

I E 537 Reliability and Safety Engineering (3 0) Cr 3 F *Prereq Graduate classification in engineering* Mathematical basics for dealing with reliability data theory and analysis Bayesian reliability analysis *Engineering ethics in safety evaluations Case studies* of accidents in large technological systems Fault and event tree analysis

I E 541 Inventory Control and Production Planning (3 0) Cr 3 F *Prereq 341* Economic Order Quantity dynamic lot sizing newsboy base stock and (Q r) models Material Requirements Planning Just In Time (JIT) variability in production systems push and pull production systems aggregate and workforce planning and capacity management

I E 544 Geometric Modeling in CAD/CAM (3 0) Cr 3 Alt S offered 2004 *Prereq Math 267 knowledge of C language* Representation and manipulation of curves surfaces and solids Non uniform B splines parametric and tricubic solids and constructive solid geometry Geometric algorithms in the context of computer aided design computer aided manufacturing and computer aided inspection Topology of curves and surfaces for design verification and process planning

I E 549 Computer Aided Design and Manufacturing (Dual-listed with 449) (3 0) Cr 3 F *Prereq 248 some experience with theory of matrices and C programming* Representation and interpretation of curves surfaces and solids Parametric curves and surfaces and solid modeling Use of CAD software and graphics programming techniques for CAD/CAM integration Application of computer technologies in planning and controlling manufacturing processes Computer numerical control CNC programming languages and process planning

I E 557 Computer Graphics and Geometric Modeling (Same as M E 557) (3-0) Cr 3 F *Prereq M E 421 programming experience in C* Fundamentals of computer graphics technology Data structures Parametric curve and surface modeling Solid model representations Applications in engineering design analysis and manufacturing

I E 561 Continuous Quality Improvement of Process (3 0) Cr 3 S *Prereq 361* Methods for continuous quality improvement in process analysis The systems analysis for process improvement model based on W Edwards Deming Quality function deployment methods Case studies of applications to manufacturing and other heavy industries Use of process analysis computerized programs and tools for design analysis

I E 565 Systems Engineering and Analysis (Same as Aer E 565 E E 565) (3 0) Cr 3 F *Prereq Graduate classification in engineering* Introduction to organized multidisciplinary approach to designing and developing systems Concepts principles and practice of systems engineering as applied to large integrated systems Life cycle costing scheduling risk management functional analysis conceptual and detail design test and evaluation and systems engineering planning and organization Not available for degrees in industrial engineering

I E 566 Applied Systems Engineering (3-0) Cr 3 S *Prereq E E/Aer E/I E 565* Design for reliability maintainability usability supportability producibility disposability and life cycle costs in the context of the systems engineering process Students will be required to apply the principles of systems engineering to a project including proposal program plan systems engineering management plan and test and evaluation plan Not available for degrees in industrial engineering

I E 570 Systems Engineering and Project Management (3 0) Cr 3 Alt SS offered 2005 *Prereq Graduate classification or permission of instructor* Systems view of projects and the processes by which they are implemented Focuses on qualitative and quantitative tools and techniques of project management Specific systems concepts methodologies and tools for effective management of both simple and complex projects Introduction of important performance parameters for planning cost control scheduling and productivity including discussions of traditional and state of the art tools and systems

I E 572 Design and Evaluation of Human Computer Interaction (3-0) Cr 3 Alt F offered 2004 *Prereq Graduate classification or permission of instructor* Human factors methods applied to interface design prototyping and evaluation Concepts related to understanding user characteristics usability analysis methods and techniques for design and evaluation of the interface The evaluation and design of the information presentation characteristics of a wide variety of interfaces web sites (e-commerce) computer games information presentation systems (cockpits instrumentation etc) and desktop virtual reality

I E 576 Human Factors in Product Design (3 0) Cr 3 Alt F offered 2003 *Prereq Graduate classification or permission of instructor* Investigation of the human interface to consumer and industrial systems and products providing a basis for their design and evaluation Discussions of human factors in the product design process modeling the human during product use usability human factors methods in product design evaluation user-device interface safety warnings and instructions for products considerations for human factors in the design of products for international use

I E 577 Human Factors (3-0) Cr 3 Alt F offered 2004 *Prereq 271 Stat 231 or 401* Physical and psychological factors affecting human performance in systems Signal detection theory human reliability modeling information theory and performance shaping applied to safety reliability productivity stress reduction training and human/equipment interface design Laboratory assignments related to system design and operation

I E 581 e Commerce Systems Engineering (Dual-listed with 481) (3-0) Cr 3 Alt F offered 2003 *Prereq 148* Design analysis and implementation of e-commerce systems Information infrastructure enterprise models enterprise processes enterprise views Data structures and algorithms used in e commerce systems SQL exchange protocols client/server model web based views

I E 583 Knowledge Discovery and Data Mining (Dual listed with 483) (3 0) Cr 3 F *Prereq 148 312 and Stat 231* Introduction to data warehouses and knowledge discovery Techniques for data mining including probabilistic and statistical methods genetic algorithms and neural networks visualization techniques and mathematical programming Relationship to enterprise computing Advanced topics include web mining and mining of multimedia data Case studies from both manufacturing and service industries A computing project and an additional project with more theoretical content are required

I E 588 Information Systems for Manufacturing (3 0) Cr 3 F *Prereq 148 448* Design and implementation of systems for the collection maintenance and usage of information needed for manufacturing operations such as process control quality process definition production definitions inventory and plant maintenance Topics include interfacing with multiple data sources methods to utilize the information to improve the process system architectures and maintaining adequate and accurate data for entities internal and external to the enterprise to achieve best manufacturing practices

I E 590 Special Topics Cr 1 to 5 each time elected Independent study and work to explore recent advances and innovative approaches to industrial engineering design practice and research
A Manufacturing
B Human Factors
C Operations Research
D Enterprise Computing and Information Management
E Engineering Management

I E 599 Creative Component Cr var
A Major in Industrial Engineering
C Major in Operations Research

Courses for Graduate Students

I E 613 Stochastic Production Systems (3-0) Cr 3 Alt S offered 2004 *Prereq 513* Modeling techniques to evaluate performance and address issues in design control and operation of systems Markov models of single-stage make to-order and make-to-stock systems Approximations for non Markovian systems Impact of variability on flow lines Open and closed queuing networks

I E 631 Nonlinear Programming (3-0) Cr 3 Alt S offered 2004 *Prereq 534* Develop nonlinear models convex sets and functions optimality conditions Lagrangian duality unconstrained minimization techniques Constrained minimization techniques covering penalty and barrier functions sequential quadratic programming the reduced gradient method

I E 632 Integer Programming (3-0) Cr 3 Alt S offered 2005 *Prereq 534* Integer programming including cutting planes branch and bound and Lagrangian relaxation Introduction to complexity issues and search based heuristics

I E 642 Simultaneous Engineering in Manufacturing Systems (3 0) Cr 3 Alt F offered 2004 *Prereq 549 or M E 415* Current engineering methods for the product life cycle process Feature based design computer aided process planning and data-driven product engineering

I E 690 Advanced Topics Cr var

I E 697 Engineering Internship Cr R FS SS *Prereq Permission of department* Professional work period for a maximum of one semester per academic year

I E 699 Research Cr var
A Industrial Engineering
C Operations Research

Industrial Relations

(Interdepartmental Graduate Program)

Supervisory Committee Peter F Orazem (Chair) Affiliated Faculty Accounting (Ravensroft) Economics (Mattila Orazem) Finance (Power) Management (Chacko Johnson McElroy Morrow Schrader Werbel Wortman) Organizational Learning and Human Resource Development (Mullen) Political Science (Lee) Psychology (Hanisch) Sociology (Anderson Besser Bird Jones Johnson Woodman)

Work is offered for the degree master of science with a major in industrial relations Work toward this multidisciplinary degree is offered by faculty drawn from the departments of Economics Management Political Science Psychology Sociology and the program in Organizational Learning and Human Resource Development Admission is not restricted to students from these majors However students entering industrial relations ideally should have a broad background in the social sciences

Graduates understand and know how to manage human resources in business and nonprofit organizations They possess the analytical and interpersonal skills necessary to function as human resource professionals They understand various aspects of the employment relationship and the techniques for improving the quality of work life in an increasingly diverse global and technologically oriented labor force Graduates demonstrate strong oral and written communication skills as well as the ability to lead groups and teams

The program in industrial relations is regarded as education for both professional practice and scientific inquiry Through the Industrial Relations Center and its interdisciplinary faculty facilities and opportunities exist for research of both a fundamental and applied nature on a variety of problems concerned with the world of people at work

A student majoring in industrial relations will choose a major professor from the graduate faculty of the cooperating departments The student s program of study will be developed with the guidance of an advisory committee selected by the student and the major professor and approved by the chair of the Industrial Relations Supervisory Committee Students may elect the thesis option (consisting of 30 semester hour credits) or the nonthesis option (consisting of 36 semester hour credits)

Regardless of which option is taken all students must take the following core courses Econ 320 Econ 322 Mgmt 570 Mgmt 571 and Stat 401 For students enrolled in the nonthesis option the research component of their degree program will be satisfied via the completion of a 3-credit creative component For students enrolled in the thesis option the research component of their degree program will be satisfied via the completion of a 6 credit thesis The balance of the program of study for students in either option will consist of electives from the recommended courses in the industrial relations curriculum with a maximum of four courses in any one department A minimum of 12 semester credits must be taken from 500 level (or above) courses In general the degree program in industrial relations is designed to be as flexible as possible to support the student s own professional interest Satisfactory completion of a final comprehensive oral examination is required of all students As part of their graduate education students enrolled in the nonthesis program have the option of enrolling in an off campus internship program

Courses appropriate for the master of science degree are determined by the student s program of study committee Sample recommended courses for graduate students majoring in industrial relations include Econ 320 322 590 Fin 555 I Tec 504 506 Mgmt 501 507 511 512 570 571 573 575 590 MIS 503 Pol S 547 571 572 573 574 575 576 590 Psych 440 450 550 590 623 Soc 420 511 528 529 530 532 590B 642 Stat 401 402 See departmental listings for course descriptions and credits

Courses for Graduate Students

I R 598 Internship Cr 1 to 6 each time taken maximum of 6 *Prereq Graduate enrollment in industrial relations* Internship designed for work exposure in a human resources or labor relations department of a private or public employer Not recommended for students already having had such work experience Offered on a satisfactory fail grading basis only

I R 599 Creative Component Cr 3 or 4 Preparation and writing of creative component Offered on a satisfactory fail grading basis only

I R 699 Research Cr 1 to 6 each time taken maximum of 6 Offered on a satisfactory fail grading basis only

Industrial Technology

(Administered by the Department of Industrial Education and Technology)

Patrick E Patterson Interim Chair of Department

Professors Chen R Smith

Professors (Emeritus) Miller Riley

Associate Professors (Emeritus) Weber

Assistant Professors Bradshaw Chang Field Freeman S Smith

Instructors (Adjunct) Mitchell Withers

Mission and Vision

Mission. The undergraduate program prepares technically oriented professionals to provide leadership in manufacturing technology and occupational safety The master s program prepares advanced practice professionals for industrial technology positions in industry business and public service It also provides a sound foundation for further graduate study The doctoral program prepares exemplary industrial technology professionals for learning discovery engagement and leadership roles in post secondary institutions and other organizational settings

Vision. The vision of the Department is to be the premier program advancing the discipline of industrial technology through excellence in learning discovery and engagement

Undergraduate Study

For the undergraduate curriculum in industrial technology leading to the degree bachelor of science see *College of Education Curricula*

Degrees The Department of Industrial Education and Technology offers work toward a bachelor of science degree in Industrial Technology

Emphasis Options in Manufacturing and Occupational Safety A minor in Industrial Technology with an occupational safety focus is available

Jobs The industrial technology curriculum provides preparation for employment in industry or business in manufacturing (quality production supervision process planning tooling etc) and occupational safety (safety engineer loss control specialist safety director etc)

Outcomes Graduates of both options understand the properties of basic manufacturing materials the commonly used manufacturing processes and the legislative and regulatory issues affecting manufactur ing They are skilled in establishing and utilizing groups for problem solving activities At the junior and senior levels manufacturing option students focus on technical and managerial competencies that enable advanced globally competitive production Occupational safety students focus on safety' s management development implementation and evaluation of safety programs and hazard identification evaluation and mitigation in a variety of industrial settings

Graduate Study

Degrees The Department of Industrial Education and Technology offers work for the master of science and doctor of philosophy degrees with a major in industrial education and technology and minor work for students taking major work in other departments Within the industrial education and technology major a student may emphasize technology education industrial technology training in industrial settings or occupational safety

Prerequisites Preparation equivalent to the completion of the undergraduate curriculum in industrial technology at Iowa State University and adequate evidence that the student ranks above average in scholastic ability The department stipulates no foreign language requirement for either the master of science or doctor of philosophy degree

Learning Opportunities and Jobs Graduates have a broad understanding of industrial technologies and are able to communicate effectively with colleagues industry leaders career and technology educators and the general public in both formal and informal settings They are prepared to carry out research communicate research results prepare grant proposals and address complex problems facing manufacturing safety and health and training professionals in industry and education

Outcomes Graduates are committed to life long learning and the pursuit of excellence in their chosen field

Students not electing the thesis option at the master s degree level will be required to complete a minimum of 3 credits of a creative component project

Industrial Technology Minor

All minors require at least 15 credits including at least 6 credits taken at Iowa State University in courses numbered 300 or above The minor must include at least 9 credits that are not used to meet any other department college or university requirement Courses taken for a minor may not be taken on a pass/not pass basis

Cr	
15	Total
8	Required I Tec courses - 270 272 392
7	Electives Select from I Tec courses 296 390 394 470 471 475

Courses open for nonmajor graduate credit 392 402 408 409

Industrial Technology (I Tec) Courses Primarily for Undergraduate Students

ITec 110 Introduction to Industrial Technology (1-0) Cr 1 Qualifications strategies assessment and expectations for students in the major Academic and degree requirements leading to the degree of bachelor of science in industrial technology along with an orientation to industrial technology as a field of study Strategies for working together with faculty and industrial personnel in a learning community Development of awareness of individual potential Career and employment opportunities for graduates

ITec 120 Introduction to Design in Industrial Technology (1-4) Cr 3 2D projections and 3D representations of objects national and international standards for documentation manufacturing processes design for manufacturability design projects and teamwork Free hand sketching techniques and solid modeling using contemporary CAD tools will be covered

ITec 130 Introduction to Non metallic Manufacturing Materials and Processes (1 4) Cr 3 An introduction to selected non-metallic materials used in manufacturing and the related processes Laboratory

and lecture activities focus on the understanding of thermal chemical electrical and mechanical properties of non metallic materials and related industrial processes

ITec 140 Electrical Fundamentals (1-4) Cr 3 *Prereq Math 160* Electrical phenomena theory will include but not be limited to Ohm s Kirchhoff s and Power Laws Thevenin and Superposition Theorems will be presented Students will become familiar with concepts of frequency various wave forms and various loads Concepts of phase angle transient timing and step up/step down of voltages and current will be introduced Safety issues concerning the use of electricity and electrical equipment will also be introduced

ITec 202 Introduction to Training and Development in Industry and Business (3 0) Cr 3 *Prereq Engl 105* A systemic overview of the training and development function and its essential role in today s organizations Systems theory needs assessment learning objectives learning theories training program development delivery transfer and evaluation are introduced

ITec 216 Computer Applications in Industrial Technology (2-2) Cr 3 Provides a working knowledge of microcomputers and their application in industrial technology Emphasis on computer languages useful in manufacturing

ITec 224 Advanced Technical Graphics Interpretation and CAD (1-4) Cr 3 *Prereq 120* Advanced design systems incorporating 2D and 3D design and productivity tools for use in manufacturing settings Topics include Geometric Tolerancing 3D models welding symbols gears/cams advanced visualization solid modeling feature based design assemblies Use of AutoCAD and ProEngineer software

ITec 231 Introduction to Metallic Materials and Processes (1-4) Cr 3 A study of selected metallic materials and related processes used in manufacturing Lecture and laboratory activities focus on metallic materials properties and processes Field trip

I Tec 240 Analog Manufacturing Applications (1-4) Cr 3 *Prereq 140* Amplification fundamentals for voltage current and power Amplification techniques by means of Bipolar Junction Field Effect transistors Operational amplifiers and Darlington configurations applied to impedance matching of sensors and relays and for motor control Split Power supplies will be introduced for powering Op-amp circuitry

ITec 244 Integrated/Mechanical Fluid Systems (1-4) Cr 3 *Prereq 140* Modern mechanical/fluid power systems Includes laws of mechanics components circuits and instrumentation Emphasis on control and utilization

ITec 270 Principles of Injury Prevention (3-0) Cr 3 Basic foundations of injury causation and prevention in home motor vehicle public and work environments

ITec 272 Introduction to Occupational Safety (2 0) Cr 2 Introduction to occupational safety and health administration and management Includes accident investigation and response

ITec 296 Fire Protection and Prevention (3 0) Cr 3 An overview of the current problems and technology in the fields of fire protection and fire prevention with emphasis on industrial needs focusing on the individual with industrial safety responsibilities

ITec 330 Polymer and Composite Processing (1 4) Cr 3 *Prereq 130 or equivalent* Design and production of plastic parts including thermoplastics and thermoset/composites A study of plastic properties and their relationships to processing parameters and control techniques Applying advanced CAE technology to check process feasibility determine optimal process conditions evaluate part and mold designs and estimate the cost of plastic injection processes

ITec 336 Automated Manufacturing Processes (2-2) Cr 3 *Prereq 224 231* NC programming operations for CNC mills and lathes The transfer of parts descriptions into detailed process plans tool selection and NC machine codes Computer assisted CAD/CAM NC programming for 2D machining is emphasized Verification is accomplished through laboratory work

ITec 340 Digital Manufacturing Applications (1 2) Cr 2 *Prereq 240* Experience preparing logic gates truth tables and applications for hardwired industrial controls digitally controlled stepper motors combinational and sequential logic circuits A/D D/A conversion decoding and multiplexing

ITec 360 Total Quality Improvement (3 0) Cr 3 *Prereq Stat 101 junior classification* Application of the Deming methodology to establish a defect prevention system for any type of work activity Focus on customer participative management through teamwork emphasis on continuous improvement application of SPC methods using problem solving models

ITec 390 Construction Safety (2 0) Cr 2 Identifies the hazards to life and property particularly to the workers in the construction industry Includes the use of equipment fall protection and excavation for both construction and demolition

ITec 392 Safety in Manufacturing (3 0) Cr 3 *Prereq 270 junior standing* Identifies safety and health risks in industrial work environments particularly to workers in manufacturing industries Includes the prevention of workplace exposures and the safe use of equipment for materials handling and production operations Nonmajor graduate credit

ITec 394 Legal Aspects of Occupational Safety and Health (3-0) Cr 3 Legal implications of legislation as it applies to health and safety in the workplace

ITec 395 Seminar in Industrial Technology (1 0) Cr 1 *Prereq Junior classification* Contemporary trends and issues in industrial technology Career opportunities requirements benefits and procedures involved in seeking internships and employment Development of the professional portfolio

ITec 402 Facilitation of Workplace Learning (3 0) Cr 3 Application of theories of learning and motivation effective participative learning facilitation and delivery techniques analysis and maximization of learning styles learner goal setting and feedback and the incorporation of learning to learn skills are explored and practiced for the purpose of preparing workplace learning facilitators Nonmajor graduate credit

ITec 408 Interdisciplinary Problem Solving (Same as I E 408 E E 408) See *Industrial Engineering* or *Electrical Engineering* Nonmajor graduate credit

ITec 409 Interdisciplinary Systems Effectiveness (Same as I E 409 E E 409) See *Industrial Engineering* or *Electrical Engineering* Nonmajor graduate credit

ITec 410 Facility Planning (3 0) Cr 3 *Prereq 120 or equivalent Stat 101* Principles and practices in designing evaluating and organizing existing facilities or creating new facilities Includes flow analysis layout development material handling and office design Field trip

ITec 423 Statics and Strength of Materials for Industrial Technology (1-4) Cr 3 *Prereq 224 Phys 111* Application of the standard analytic techniques of solving problems related to force and moments The properties of materials and how to select appropriate materials for a particular design Stress strain torsion bending of beams

ITec 433 Materials Testing and Processing (2 2) Cr 3 *Prereq 130 231 Stat 101* Materials testing and analysis relating to manufacturing processes and quality systems Materials tested include metallics and non metallics ASTM standards followed

ITec 435 Computer Automated Manufacturing Systems (2 2) Cr 3 *Prereq 336* Reviews principles and concepts required for implementation of automated production techniques and for design of manufacturing systems Includes sensors and sensing systems numerical control robotics CAD/CAM simulation manufacturing economics Emphasis on computer technology as tools to improve production and control needs

ITec 440 Electrical Outputs for Manufacturing (1-2) Cr 2 *Prereq 240* Control of machine speed direction and timing by circuitry and/or programming Distribution of electrical power in factories Common motors sensors logic and switches distribution of power A C and D C motors electrical/mechanical relays and solid state relays

ITec 446 Automation Systems (2 2) Cr 3 *Prereq 340* Theory and applications of automation systems technology Emphasizes features capabilities programming and evaluation of sensors program mable logic controllers and robots

ITec 470 Industrial Hygiene Chemical and Biological Hazards (3-0) Cr 3 *Prereq 272 Chem 163 163L* A consideration of health related problems found in the industrial setting with emphasis on toxic chemicals ventilation and noise

ITec 471 Industrial Hygiene Physical Hazards (2-2) Cr 3 *Prereq 272 Chem 163 163L* The use and calibration of instruments designed to measure the quality and quantity of contaminants in the work environment

ITec 475 Safety Analysis and Design (1 2) Cr 2 *Prereq Instructor approval* Students review the use of systems safety as a management technique to control risk Individual or small group research/design projects are completed in conjunction with faculty or a business/industry partner

ITec 481 Supervised Industrial Internship Experience Cr 2 May be repeated for credit *Prereq 395 and permission of internship coordinator* Supervised learning activity consisting of one work period in industry Offered on a satisfactory fail grading basis only

ITec 490 Independent Study in Industrial Technology Cr 1 to 5 *Prereq Quality-point average of 2 5 or more for two preceding semesters and completion of an independent study contract*
H Honors
M Manufacturing
O Occupational Safety

ITec 493 Workshop in Industrial Technology Cr 1 to 4 each enrollment *Prereq 15 credits in industrial technology* Extension of technical competence in emerging technologies

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Prior to registration for graduate level courses the student shall be classified as a senior or have an earned bachelor s degree and be required to complete additional assigned readings term papers and graduate projects

ITec 502 Advanced Design and Manufacturing (3-0) Cr 3 *Prereq Permission of instructor* An integrated study of entrepreneurship the development of new products organization of production production control and business planning in contemporary manufacturing settings Topics include market analysis design prototyping quality functional deployment in process and product design benchmarking Kaizen cost estimation marketing strategies documentation for productivity and quality strategies

ITec 504 Principles of Training and Development (3-0) Cr 3 *Prereq Permission of instructor* An examination of the training and development function in organizations industry and business and the advancement of competencies in analysis design development implementation and evaluation of training in conjunction with analysis and synthesis of theoretical perspectives

ITec 506 Facilitating Change Through Training and Development (3-0) Cr 3 *Prereq Permission of*

instructor Change and the change process diagnosing and defining planned change investigating various transformation theories and methodologies and team development Opportunities to apply knowledge in experiential learning environment

ITec 525 Parametric and Feature Based Design and Manufacturing (3-0) Cr 3 *Prereq Permission of instructor* Covers fundamental and advanced feature based CAD concepts Topics include geometric modeling feature concepts applications of features in design and manufacturing and feature recognition Pro/Engineering software is used as the design and modeling tool Hands-on design projects are major components of this course

ITec 531 Manufacturability of Plastics (2-2) Cr 3 *Prereq Permission of instructor* Overview of current business environment and issues related to design for manufacturability of plastic products Provide understanding of available materials and processes in manufacturing plastic parts Utilize injection molding for an in depth study of five elements for making successful plastic products consumer input part design mold design material selection and manufacturing process Computer aided engineering exercises and laboratory practices included

ITec 535 Comprehensive Modern Manufacturing Systems (3 0) Cr 3 *Prereq Permission of instructor* The study design and implementation of PULL manufacturing systems and their integration with functions of the production system for the manufacture of superior quality low cost products Topics include cellular manufacturing system group technology cost estimation/justification dynamic cost control JIT manufacturing integrated quality inventory control automation and CAD/CAM

ITec 549 Internship in Industrial Technology (arr) Cr 1 to 4 each enrollment *Prereq 10 hours in industrial technology* Emphasis on full experience in Industrial Technology Training and Development and Technical Education as it relates to administration supervision special needs curriculum-instruction and evaluation research

ITec 554 The Historical and Philosophical Foundations of Industrial Technology (3 0) Cr 3 Historical evolution and philosophical foundations of industrial and technological studies

ITec 575 Safety and Public Health Issues in Modern Society (2-0) Cr 2 Exploration and analysis of current safety and public health issues impacting society The focus will be on topics that impact individuals in work public and home environments

ITec 580 Applied Techniques in AutoCAD (2 2) Cr 3 *Prereq Graduate classification* Exploration of computer graphics design and drawing applications using AutoCAD Complete two dimensional concepts of data entry editing screen display layering libraries dimensions and plotting Three dimensional coordinate systems 3D entity creation editing and solid modeling will be introduced

ITec 590 Special Topics in Industrial Education and Technology Cr 1 to 4 *Prereq Graduate classification in industrial technology*
M Manufacturing
O Occupational Safety
T Training and Development

ITec 593 Workshop in Industrial Technology Cr 1 to 3 each enrollment *Prereq Graduate classification*

ITec 599 Creative Component Cr 1 to 3 A discipline related problem to be identified and completed under the direction of the program adviser Three credits required for all nonthesis master s degree students

Courses for Graduate Students

ITec 615 Seminar Cr 1 each enrollment Process of selecting developing and writing a research proposal Forum for dealing with professional and academic needs and issues

ITec 652 Program and Learner Evaluation (3 0) Cr 3 *Prereq Stat 401 or equivalent* Techniques for evaluating learners facilities programs and staff utilizing theories for developing measurement instruments Outcomes assessment is emphasized

ITec 655 Academic Leadership in Technology (3 0) Cr 3 *Prereq Permission of instructor* A definition of the faculty role in the development of technology as a discipline including strategies for dealing with programs personnel and constituencies are presented Leadership skills involving team formation team operation and conflict resolution are addressed

ITec 657 Curriculum Development in Industrial Technology (3 0) Cr 3 *Prereq Permission of instructor* Basic concepts trends practices and factors influencing curriculum development techniques organization and procedures Emphasis will be given to program/course of study and training plan development

ITec 699 Research Cr arr

Information Assurance

(Interdepartmental Graduate Major)

Supervisory Committee D Jacobson (Chair) C Bergman J Davis A Ho J McCormick P Premkumar J Wong

Work is offered for the degree Master of Science with a major in Information Assurance under a cooperative arrangement with various departments including Electrical and Computer Engineering Computer Science Political Science Logistics Operations and Management Information Systems Mathematics Industrial and Manufacturing Systems Engineering Students graduating from the major will help to fill the need for well educated system security specialists in the government private sector and academia The program objectives identified as being critical to the accomplishment of this mission are (1) Impart and enhance knowledge about information infrastructure security (2) Expand and develop ability to engineer complex systems (3) Instill and nurture social awareness and the ability to function in a team (4) Instill and nurture a sense of ethics and (5) Develop an understanding of strategic and policy issues

Students interested in the interdepartmental major apply and are admitted to both a home department (the department that is most closely aligned with the student s research interest and background) and to the program The home department sets the admission standards course requirements and thesis standards

The program is broadly based and uses courses in the various departments The program will consist of 24 course credits with 6 credits of research work for a Master of Science with thesis A non thesis Master of Science will consist of 27 credits of courses and 3 credits of creative component The courses are divided into three categories core electives and thesis research

A student s Program of Study Committee in consultation with the student determines the elective courses to be taken and the acceptability of transfer credits The major professor will be selected from the discipline where the student is admitted (home department)

The basic prerequisite for admission to this program is a baccalaureate degree in engineering mathematics computer science management information systems political science or closely related field The GRE or GMAT examination may be required based on the standards of the home department If the GRE or GMAT is not required it will be considered in admissions decisions if offered Potential students with baccalaureate degrees in the physical sciences statistics or other related fields will be considered on an individual basis possibly with provisional admission The degree awarded is a Master of Science in Information Assurance

For additional information students should contact the chair of the Supervisory Committee 2419 Coover Hall ISU Ames Iowa 50011 or www.issl.iastate.edu/infas.html

Courses Primarily for Undergraduate Students

InfAs 396 Information Assurance Summer Internship Cr R SS *Prereq Permission of department* Summer professional work period Offered on a satisfactory-fail grading basis only

Courses Primarily for Graduate Students

InfAs 530 Advanced Protocols and Network Security (Same as Cpr E 530) See *Computer Engineering*

InfAs 531 Information System Security (Same as Cpr E 531) See *Computer Engineering*

InfAs 532 Information Warfare (Same as Cpr E 532) See *Computer Engineering*

InfAs 533 Cryptography (Same as Math 533) See *Mathematics*

InfAs 534 Legal and Ethical Issues in Information Assurance (Same as Cpr E 534) See *Computer Engineering*

InfAs 538 Leadership Team and Community (1 0) Cr R *Prereq Permission of Instructor* Building community within the Information Assurance program and making connections to the field of study and to the university Structured support in networking with faculty peers mentors practicing professionals and the larger community at large Springboard to lives of leadership characterized by high ethic concern service and care Offered on a satisfactory fail grading basis only

InfAs 592 Seminar in Information Assurance Cr 1 to 3 each time elected *Prereq Permission of instructor* Projects or seminar in Information Assurance

InfAs 697 Information Assurance Summer Internship Cr R *Prereq Permission of department graduate classification* One semester and one summer maximum per academic year professional work period Offered on a satisfactory fail grading basis only

Interdisciplinary Graduate Studies

(Interdepartmental Graduate Program)

Supervisory Committee G A Jackson Chair R W Bernard (Arts and Humanities) E C Powell (Biological and Physical Sciences) G A Jackson (General) Y Lee (International Development Studies) S J Crase (Social Sciences)

The degree of master of science or master of arts with major in interdisciplinary graduate studies is available to graduate students who wish to have a more diversified program of advanced study than that generally permitted students who specialize in a single subject Areas of specialization in arts and humanities biological and physical sciences international development studies physical sciences social sciences and a general area are designed to broaden and supplement a student s program Students must take courses in three different graduate subject matter areas each subject contributing a minimum of nine credits toward the 35 graduate credits required for the degree Courses which may be used for credit toward this degree program are selected from those listed in the Graduate College Catalog for graduate credit

Both thesis and nonthesis options are available except in arts and humanities in which a thesis is required If the thesis option is chosen a minimum of three credits of IGS 699 (Research) is required and a maximum of five credits of IGS 699 may be counted in the total of 35 required credits If the nonthesis option is elected evidence of original creative effort must be presented This may be in the form of a demonstration of independent creativity such as a written report of laboratory field or library research a project in fine arts or some other original contribution acceptable to the student s committee In the nonthesis option a minimum of three credits of IGS

599 (Creative Component) is required and a maximum of five credits of IGS 599 may be counted toward the total of 35 graduate credits The student in consultation with the program of study committee will decide on the option The committee also aids the student in planning a program of study and in selecting appropriate courses

Foreign language requirements if any will be decided by the student s committee

Graduates will have experience in designing their own program centered around issues they have identifired Because of the interdisciplinary nature of IGS students are expected to synthesize knowledge from three different areas of study

Students who wish to apply for admission to interdisciplinary graduate studies should communi cate with the chair of the program the chair of the supervisory committee or one of its members (see above)

Courses for Graduate Students

IGS 599 Creative Component Cr var

IGS 699 Thesis Research Cr var

Interdisciplinary Studies

A major in interdisciplinary studies is offered in the College of Liberal Arts and Sciences for undergraduate students who have unique interdisciplinary educational goals The major is designed by a faculty review board the academic adviser and student Leading to either the bachelor of arts or the bachelor of science degree the major includes 36 to 48 credits of coursework chosen to provide a coherent carefully planned program in an area of interest that bridges two or more departments This specialized area is identified on the diploma

A student seeking admission to the program in interdisciplinary studies writes a letter of application that explains how the proposed major meets specific educational goals Applications are screened by a faculty review board Since students are expected to earn at least 30 credits after they are admitted into the program the proposal is ordinarily submitted to the review board in the sophomore or junior year The proposal will be considered if the area of interest properly falls within the College of Liberal Arts and Sciences and if the student s educational goals cannot be accommodated by a more traditional combination of existing majors minors and electives

Students who wish to prepare for professional schools in health related fields and students who wish to develop an area of interest based upon one of the College s cross-disciplinary programs may wish to propose a degree in Interdisciplinary Studies Areas of interest in Interdisciplinary Studies have included Classical Studies International Relations Ecology Studies African American Cultural Studies Asian Studies and U S Latino/a Studies

The interdisciplinary studies major must satisfy the requirements of the liberal arts and sciences curriculum in the College of Liberal Arts and Sciences With the approval of the review board the student will identify courses leading to either the B A or the B S degree (A major emphasizing the humanities or communicative arts normally leads to a B A a major emphasizing the natural or social sciences normally leads to a B S) Different requirements for the B A and B S degrees are determined by the nature of the chosen field of study

Courses listed in the major may come from any department of the university with the following restrictions

1 The selection of courses needs to focus on a single theme and be consistent with the career and educational goals of the student

2 At least one half of the courses in the major must come from degree-offering departments within the College of Liberal Arts and Sciences

3 The courses must be chosen from at least two disciplines

4 The courses chosen for the major must be at the 200 level or higher Overall the degree program must include 45 credits at the 300 level or higher with at least 6 credits at the 400 level or higher

5 An average grade of C or better must be earned in 15 credits at the 300 level or higher in the major

6 The university diversity and international perspectives requirement may be met by choosing two 3-credit courses from the approved list

The following English proficiency requirements applies

1 An average grade of C or better is to be earned in Engl 104 and 105 If this grade is not achieved the student will be required to take an additional writing course as appropriate and earn a grade of C or higher

2 A grade of C or better must be earned in either an advanced English composition course or a course in the major with a significant writing component

Further information may be obtained from the college office

International Agriculture

(Interdepartmental Undergraduate Program)

Supervisory Committee Robert A Martin Chair Ricardo Salvador Anthony Pometto III Robert Andrews

The international agriculture program provides opportunities to develop knowledge and skills related to the factors that interact to impact agricultural and environmental issues production processes distribution and utilization worldwide The program puts emphasis on international experience through structured internships and study abroad The international agriculture program is appropriate for students seeking positions that require knowledge and experience related to global agricultural issues and their impact on local regional national and international policies and practices Students preparing for careers in the following areas will benefit from the international agriculture program governmental and non-governmental development agencies agribusinesses educational institutions and non profit assistance agencies Outcomes from participation in this program focus on developing an awareness for the role of international agriculture in the career development process analyzing international agricultural issues and policies acquiring skills for solving problems in international development and agribusiness and experiencing real situations and gaining perspectives about agriculture in a global setting

Secondary Major

International agriculture is an undergraduate secondary major that may be taken only in conjunction with a primary major in an agriculture curriculum Students choosing international agriculture will strengthen their career placement with a business or agency involved in international activities Technical knowledge of a primary major discipline will be strengthened by a global awareness of agriculture A secondary major in international agriculture will give students practical insight into the role of agriculture in a world of increasing food and fiber needs It is ideal for those who wish to broaden their international perspective or prepare for international work in agriculture The secondary major includes an emphasis on international and/or foreign languages and selection of appropriate courses (from an approved list) to meet the needs and interests of the student

See *International Agriculture Curriculum* for the specific program Students interested in earning a secondary major in international agriculture must contact a program adviser The early indication of an interest in international agriculture allows for effective integration of the secondary major course require ments with those of the primary major

Minor

A minor in international agriculture is available to interested students regardless of their major Students selecting the minor should have at least minimal familiarity with agriculture and agricultural systems

Courses for the minor should come from the following list Internship Study Abroad Foreign Language Agron 342 TSC 341 Pol S 241 Agron 406 Econ 370 and Econ 385 Nine credits of the 15 credit total for the minor can not be used for meeting requirements for the major

For more information about a secondary major or minor in international agriculture see descriptions in the designated departments or the supervisory committee

For more information about courses required for either a secondary major or a minor in international agriculture see descriptions in the designated departments

International Business

Interdepartmental Undergraduate Secondary Major

Supervisory Committee Dr Ann Coppernoll Farni (contact person) and others annually appointed by College

The international business program is designed to provide students with information that will enable them to work for companies that are involved with international business Students are expected to develop an understanding of international business issues applied to the different functional areas of business They will also develop skills to prepare themselves for business positions with international responsibilities The program is designed to prepare students for employment in multinational companies and for business assignments beyond the United States

International business is an undergraduate secondary major that may be taken only in conjunction with a primary major in business Technical knowledge of international business will strengthen the expertise acquired with the primary major Business students pursuing this program should strengthen their placement opportunities with multinational corpora tions

A student in the College of Business may earn a secondary major in International Business The requirements for this major include 12 credits in international business courses one year of the same university level foreign language (minimum of 6 credits) and an approved international experience (minimum 3 months) Students who pursue this secondary major will be required to complete the requirements for a primary major in Business Fifteen of the 18 credits required for the International Business major must not be used for the primary major

International Studies

(Interdepartmental Undergraduate Major and Minor Administered by the College of Liberal Arts and Sciences)

Supervisory Committee Steffen W Schmidt Chair Robert Baum R Douglas Hurt Hsian Ilahiane Kathy Leonard Robert E Mazur

The international studies program provides opportunities for students to develop skills and understanding about international events and problems and global issues The program is designed for students who wish to prepare for work or advanced study in the international arena such as in foreign service journalism advocacy organizations scientific or research institutions business nongovernmental development organizations (NGOs) humanitarian agencies environmental organizations human rights organizations think tanks international agriculture engineering and other fields

A secondary major and a minor in International Studies are available for undergraduates The program

requirements are structured around a combination of designated Topical Module and a Geographic Regional Studies Component Each student s program of study is designed to reflect programmatic opportunities at Iowa State University and the academic intellecutal and professional interests of the student

Secondary Major

A student seeking a secondary major in International Studies must successfully complete a minimum of 27 semester credits in courses approved for use in the International Studies program including

- IntSt 235
- IntSt 430
- 21 credits in courses approved for the International Studies program with a minimum of 9 credits (at least 6 of which are numbered 300 or above) in a designated Topical Module and a minimum of 9 credits (at least 6 of which are numbered 300 or above) in a Geographic Regional Studies Component
- Fulfillment of Language Proficiency (see below)

The major must include a minimum of 9 credits not used to meet any other department college or university requirement

Minor

A student seeking a minor in International Studies must successfully complete a minimum of 18 semester credits in courses approved for use in the International Studies program including

- IntSt 235
- IntSt 430
- 12 credits in courses approved for the International Studies program with a minimum of 6 credits (at least 3 of which are numbered 300 or above) in a designated Topical Module and a minimum of 6 credits (at least 3 of which are numbered 300 or above) in a Geographic Regional Studies Component
- Fulfillment of Language Proficiency (see below)

The minor must include a minimum of 9 credits not used to meet any other department college or university requirement

Language Proficiency

Students with a major or minor in International Studies fulfill the Language Proficiency requirement through one of the following options

- Completion of two years of university-level language instruction in a single appropriate foreign language as demonstrated by a foreign language course numbered 202 or higher Students whose first language is other than English fulfill Language Proficiency with Engl 105 at a grade of C or better
- Passing an examination given by the Dept of Foreign Languages and Literatures or otherwise certifying proficiency equivalent to two years of college instruction Students proficient in languages not offered at ISU may petition for special consider ation
- Intensive study abroad experience that includes in the-field use of a language other than English (individual prior approval of committee required for this option)

A Topical Modules

- Global Environmental Issues
- Social Change and Economic Development
- Women and Development
- Cultural Change in an Era of Globalization
- International Business and Trade
- Other topical clusters may be organized by teams of faculty and students around interests and strengths

B Geographic Regional Studies Component

- Latin America
- Europe
- Russia and Central Eurasia
- Asia
- Middle East
- Africa

International Studies students are strongly encour aged to participate in study and/or work abroad programs Students may petition to use up to 9 credits in the major (6 credits in the minor) earned in study abroad and/or international internship programs to substitute for courses within the Topical Module Geographic Regional Studies Component and/or Language Proficiency requirements

Courses Primarily for Undergraduate Students

IntSt 120 Study Abroad Credit (Same as LAS 120) Cr var *Prereq Permission of the program coordinator* ISU offers numerous opportunities for study abroad Please contact the Study Abroad Resource Center or your academic advisor for current programs

IntSt 220 Study Abroad Credit (Same as LAS 220) Cr var *Prereq Permission of the program coordinator* ISU offers numerous opportunities for study abroad Please contact the study abroad center or your academic advisor for current programs

IntSt 235 Introduction to International Studies (Same as LAS 235) (3 0) Cr 3 FSS Overview of international studies emphasizing cultural geographic economic and political characteristics of major world areas and nations

IntSt 320 Study Abroad Credit (Same as LAS 320) Cr var *Prereq Permission of the program coordinator* ISU offers numerous opportunities for study abroad Please contact the Study Abroad Resource Center or your academic advisor for current programs

IntSt 420 Study Abroad Credit (Same as LAS 420) Cr var *Prereq Permission of the program coordinator* ISU offers numerous opportunities for study abroad Please contact the Study Abroad Resource Center or your academic advisor for current programs

IntSt 430 Seminar in International Studies (Same as LAS 430 W S 430) (3 0) Cr 3 S Capstone seminar in international studies focused on economic development womens issues war and ethnic conflict population the environment globalization human rights international trade and business and other issues Students develop a project on a subject linked to their area of professional interest or academic specialization

Iowa Lakeside Laboratory

www lakesidelab org

(Interinstitutional Program)

Director Arnold van der Valk

Participating Faculty Dennis E Anderson (Biology Emeritus Humboldt State University) Neil P Bernstein (Biology Mount Mercy College) C Lee Burras (Agronomy Iowa State University) C Arthur Croyle (Art and Design Iowa State University) Paul J Currier (Director Platte River Whooping Crane Maintenance Trust) James J Dinsmore (Animal Ecology Iowa State University) John F Doershuk (Anthropology University of Iowa and State Archaeologist) Charles Drewes (Zoology and Genetics Iowa State University) Steven M Herrnstadt (Art and Design Iowa State University) Laura L Jackson (Biology University of Northern Iowa) Kenneth L Lang (Biological Sciences Humboldt State University) Michael J Lannoo (Muncie Center for Medical Education Ball State University) David R Mercer (Biology University of Northern Iowa) Clay L Pierce (Animal Ecology Iowa State University) Thomas R Rosburg (Biology Drake University) Michael J Shott (Sociology Anthropology and Criminology University of Northern Iowa) Daryl D Smith (Biology University of Northern Iowa) Sarah A Spaulding (Inst of Arttic & Alpine Research University of Colorado) Eugene F Stoermer (Center for Great Lakes University of Michigan) Lois H Tiffany (Botany Iowa State University) U Sunday Tim (Ag/Biosystems Engineering Iowa State University) James L Wee (Biological Sciences Loyola University)

Iowa Lakeside Laboratory is a field station run cooperatively by Iowa State University the University of Northern Iowa and the University of Iowa through the State Board of Regents

The Laboratory was established in 1909 for the conservation and study of the rich flora and fauna of northwest Iowa especially those of the Iowa Great Lakes region with its numerous lakes wetlands and prairies Its campus is located on approximately 140 acres of restored prairie wetland and gallery forest along the west shore of West Okoboji Lake Lakeside s mission is to provide undergraduate and graduate students an opportunity to get hands-on experience working with a variety of natural and human environments through its field-oriented summer courses and to provide research facilities and support for graduate students and faculty working on research projects in northwestern Iowa

Each summer Iowa Lakeside Laboratory offers students a unique educational experience small full-immersion field-oriented courses in the natural sciences (archaeology ecology environmental science hydrology evolution geology soils taxonomy) All courses meet all day from Monday through Friday The majority of courses run for either 3 or 4 weeks Enrollments in most courses are limited to 8 to 10 students Courses are taught at the undergraduate (sophomore and junior) and the senior/ graduate level Students obtain one credit for each week (40 hours) in class One and two week courses are also available including courses designed especially for teachers Weather permitting students normally spend at least part of each day doing field work either as part of their class work or working on individual or group projects Because there are courses offered only alternate summers the current Iowa Lakeside Laboratory Bulletin or Iowa State University Summer Session Bulletin (www lakesidelab org) should be consulted for the list of courses being offered in a given summer session The Iowa Lakeside Bulletin also contains additional information about the Laboratory and about each course being offered

Research projects by undergraduates graduate students and faculty can be done either on the campus or at many nearby natural areas Under graduate and graduate students are strongly encouraged to do independent projects at Lakeside and graduate students are welcome to use it as a base for their thesis and dissertation research Laboratory space and other facilities are available for long term or short term research projects

Teaching and research facilities include eight laboratory buildings a library and a lecture hall Living accommodations include cottages motel style units and a large mess hall All students are encouraged to stay at Lakeside while they are taking courses to take full advantage of its educational professional and social life

Financial Aid

Iowa Lakeside Laboratory Scholarships are available to both undergraduates and graduate students All scholarships cover room and board Information about how to apply for Iowa Lakeside Laboratory Scholarships is included in the Iowa Lakeside Bulletin (www lakesidelab org) Students should also consult the Student Financial Aid Office for other scholarship work study and loan programs for which they are eligible

Registration

Students can only enroll in Iowa Lakeside courses by submitting an Iowa Lakeside Registration and Scholarship Form and Housing Form to the Iowa Lakeside Laboratory Administrative Office These forms are found on the Iowa Lakeside Laboratory Website (www lakesidelab org) where they can be downloaded and in the Iowa State University Summer Session Bulletin and the Iowa Lakeside Laboratory Bulletin which can be obtained from

Iowa Lakeside Laboratory
131 Bessey Hall
Iowa State University
Ames IA 50011 1020
Phone (515) 294 2488
FAX (515) 294-9777
E Mail lakeside@iastate edu

Early registration is advisable Because enrollment in Lakeside courses is limited students should register before May 1 for the following summer session Housing is also limited and students must apply for housing or indicate that they plan to live off campus at the time of registration

Courses open for nonmajor graduate credit 402l 403l 415l 419l 422l 427l 461l 473l 480l 484l 494 536

Courses Primarily for Undergraduate Students

Ia LL 115 Introduction to the Life Sciences Cr 1 SS An overview of the various disciplines (develop mental biology ecology evolution molecular biology etc) that collectively are the life sciences Each section provides an opportunity to get hands-on experience with one or more of these disciplines This course is for high school students who have completed a course in biology
A Ecology and Evolutionary Biology
B Molecular Cellular and Developmental Biology

Ia LL 205l Flora of the Iowa Lakes Region Cr 2 SS

Ia LL 301l Iowa Natural History (Same as A Ecl 301l Bot 301l Zool 301l) Cr 4 Alt SS offered 2005 *Prereq One course in the biological sciences* Biological diversity and its causes examined through lectures and field trips to native lake marsh forest and prairie habitats topics include measuring the environment sampling and identifying organisms experimenting with the ecosystem understanding species interactions and appreciating influences of past and present climates and geological events on natural ecosystems of the region

Ia LL 302l Plant Animal Interactions (Same as Bot 302l) Cr 4 Alt SS offered 2004 *Prereq One course in the biological sciences* Introduction to ecology and co evolution of plants and animals emphasis on dispersal pollination and plant herbivore interactions field and laboratory work reading discussion

Ia LL 303l Undergraduate Internships (Same as A Ecl 303l) Cr 1 to 5 SS *Prereq Permission of instructor and sophomore standing* Placement with county conservation boards camps parks etc for experience as interpreters rangers and technicians

Ia LL 304l Physical Geology (Same as EnSci 304l Geol 304l) Cr 4 Alt SS offered 2004 Landscape development as a product of geologic materials and processes Emphasis on field studies of composition of the earth glaciation weathering erosion and sedimentation

Ia LL 312l Ecology (Same as A Ecl 312l Biol 312l Bot 312l EnSci 312l Zool 312l) Cr 4 SS An introduction to the principles of ecology at the population community and ecosystem level Field studies of local lakes wetlands and prairies are used to examine factors controlling distributions interactions and roles of plants and animals in native ecosystems

Ia LL 326l Ornithology (Same as A Ecl 326l) Cr 4 SS The biology ecology and behavior of birds with emphasis on field studies of local avifauna Group projects stress techniques of population analysis and methodology for population studies

Ia LL 364l Biology of Aquatic Plants Cr 4 Alt SS offered 2005 A field-oriented introduction to the taxonomy and ecology of aquatic plants in lakes wetlands and rivers Individual or group projects

Ia LL 367l PlantTaxonomy (Same as Bot 367l) Cr 4 SS Principles of classification and evolution of vascular plants taxonomic tools and collection techniques use of keys Field and laboratory studies emphasizing identification of local flowering plants and recognition of major plant families

Ia LL 371l Introduction to Insect Ecology (Same as Ent 371l) Cr 4 Alt SS offered 2005 Field and laboratory study of insects their diversity life history emphasis on ecology and behavior

Ia LL 401l Statistical Methods for Field Biologists (Same as Stat 401l) Cr 4 Alt SS offered 2005 Introduction to the design and implementation of ecological and environmental field studies and statistical analyses interpretation and presentation of field data Fundamentals of experimental design hypotheses testing with continuous and discrete data simple and multilinear regression and correlation introduction of analysis of variance and data presentation Individual and/or group projects will be used to collect field data

Ia LL 402l Watershed Hydrology and Surficial Processes (Same as Agron 402l EnSci 402l) Cr 4 SS *Prereq Four courses in physical or biological sciences or engineering* Effects of geomorphology soils and land use on transport of water and materials (nutrients contaminates) in watersheds Fieldwork will emphasize investigations of the Iowa Great Lakes watershed Nonmajor graduate credit

Ia LL 403l Evolution (Same as Biol 403l Bot 403l Zool 403l) Cr 4 SS Mechanisms and patterns in microevolution and macroevolution Field exercises will emphasize studies of natural selection adaptation genetic variation and population genetics of local plant and animal populations Nonmajor graduate credit

Ia LL 404l Behavioral Ecology (Same as A Ecl 404l Zool 404l) Cr 4 Alt SS offered 2004 *Prereq Two semesters of biology* Animal coloniality courtship territoriality predator defense habitat selection foraging mating systems and parental care will be examined in the field in order to evaluate various ecological and evolutionary theories of animal behavior

Ia LL 415l Freshwater Invertebrates (Same as Zool 415l) Cr 4 SS *Prereq One or more ecology courses* Field-oriented introduction to the identifica tion life history and ecology of common free living freshwater invertebrates of north temperate lakes rivers and wetlands Emphasis on the role of invertebrates in aquatic food chains and litter processing Nonmajor graduate credit

Ia LL 419l Vertebrate Ecology and Evolution (Same as A Ecl 419l Zool 419l) Cr 4 SS Field and laboratory study of representative vertebrates of northwestern Iowa Observations and experimenta tion emphasize ecological histories by integrating concepts of functional morphology behavioral ecology and evolutionary biology Nonmajor graduate credit

Ia LL 420l Amphibians and Reptiles (Same as A Ecl 420l Zool 420l) Cr 4 Alt SS offered 2004 *Prereq Two semesters of biology* Ecology behavior and conservation biology of amphibians and reptiles with emphasis on their anatomy and morphology temperature and water regulation locomotion life history reproduction population and community ecology and conservation

Ia LL 422l Prairie Ecology (Same as Bot 422l EnSci 422l) Cr 4 SS *Prerequisite Familiarity with basic principles in biological sciences and ecology* Basic patterns and underlying physical and biotic causes of both regional and local distributions of plants and animals of North American prairies field and laboratory analyses and projects Nonmajor graduate credit

Ia LL 427l Archaeology (Same as Anthr 427l) Cr 4 SS Nature of cultural and environmental evidence in archaeology and how they are used to model past human behavior and land use emphasis on Iowa prehistory basic reconnaissance surveying and excavation techniques Nonmajor graduate credit

Ia LL 435l Illustrating Nature I Sketching (Same as BPM I 435l) Cr 2 SS Sketching plants animals and terrain Visual communication development of a personal style and integration of typographic and visual elements on a page will be emphasized

Ia LL 436l Illustrating Nature II Photography (Same as BPM I 436l) Cr 2 SS Beginning to intermediate technical and compositional aspects of color photography of natural areas and their plants and animals

Ia LL 461l Introduction to GIS (Same as Bot 461l EnSci 461l Env S 461l L A 461l) Cr 4 SS Descriptive and predictive GIS modeling techniques spatial statistics and map algebra Application of GIS modeling techniques to environmental planning and resource management Nonmajor graduate credit

Ia LL 473l Soil Genesis and Landscape Relation ships (Same as Agron 473l EnSci 473l) Cr 4 Alt SS offered 2004 *Prereq Agron 154 or 402 or 402l* Relationships between soil formation geomorphology and environment Soil description classification geography mapping and interpretation for land use Nonmajor graduate credit

Ia LL 480l Introduction to Environmental Planning (Same as Env S 480l L A 480l) Cr 4 Alt SS offered 2004 Introduction to environmental planning theories and methods emphasis on environmental planning using GIS modeling approaches and public participation in the planning process Students should have basic familiarity with ArcView and database programs Individual or group environmental planning projects Nonmajor graduate credit

Ia LL 484l Plant Ecology (Same as Bot 484l) Cr 4 SS Principles of plant population community and ecosystem ecology illustrated through studies of native vegetation in local prairies wetlands and forests Group or individual projects Nonmajor graduate credit

Ia LL 490l Undergraduate Independent Study (Same as A Ecl 490l Anthr 490l Biol 490l Bot 490l Zool 490l) Cr 1 to 4 SS *Prereq Junior or senior classification and permission of instructor*

Ia LL 493 Natural History Workshop Cr 1to 2 SS Offered as demand warrants Five day long non technical introductions to a specific aspect of the natural history of the Upper Midwest or techniques for studying natural history
A Amphibians and Reptiles
B Birds and Birding
C Nature Photography
D Mushrooms and Other Fungi
E Iowa s Trees and Forests
F Fish Biology
G Prairies and Prairie Restoration
H Common Algae
I Common Insects
J Aquatic Plants
K Life in Rivers
L Life in Lakes
M Mosses and Liverworts
N Natural History of Iowa Great Lakes Region
P Field Archaeology
S Scuba Diving
U Sketching Nature

Ia LL 494 Ecosystems of North America Cr 2 to 4 SS *Prereq A general ecology course and permission of the instructor* An extended field trip to study a particular type of ecosystem (prairie coastal wetland forest alpine coral reefs etc) or the ecosystems of a specific region (Rocky Mountains Gulf Coast Appalachian Mountains Deserts of the Southwest Central America etc) Prior to the field trip there will

be an orientation period and after each field trip a review and synthesis period A field trip fee will be assessed to cover travel expenses Nonmajor graduate credit

Ia LL 499 Undergraduate Research Cr 1 to 4 *Prereq Junior or senior classification and permission of instructor*

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Ia LL 501I Freshwater Algae (Same as Bot 501I) Cr 4 SS Structure and taxonomy of freshwater algae based on field collected material emphasis on genus level identifications habitats visited include lakes fens streams and rivers algal ecology

Ia LL 503 Graduate Internships Cr 1 to 5 SS *Prereq Permission of instructor and graduate standing* Placement with county conservation boards camps parks schools etc for experience as interpreters rangers technicians and teachers

Ia LL 505I Watershed Modeling and GIS (Same as A E 505I EnSci 505I) Cr 4 Alt SS offered 2005 GIS techniques for watershed hydrology and water quality modeling and water resource management including various approaches to watershed analysis modeling and management analytical tools for modeling watershed hydrology and water quality and case studies in modeling and managing rural and urban watersheds

Ia LL 508I Aquatic Ecology (Same as A Ecl 508I EnSci 508I) Cr 4 SS *Prereq Courses in ecology chemistry and physics* Analysis of aquatic ecosystems emphasis on basic ecological principles ecological theories tested in the field identification of common plants and animals

Ia LL 511I Field Parasitology (Same as Zool 511I) Cr 4 Alt SS offered 2005 Ecology and life history of parasites protozoans helminths arthropods field and laboratory investigations including preparation identification and morphology of representative types and stages general and comparative concepts of parasitology

Ia LL 520I Fish Ecology (Same as A Ecl 520I) Cr 4 Alt SS offered 2004 Basic principles of fish interaction with the biotic and abiotic environment Field methods taxonomy and biology of fish with emphasis on the fish fauna of northwestern Iowa

Ia LL 526I Advanced Field Ornithology (Same as A Ecl 526I) Cr 2 SS *Prereq Concurrent registration in 326I* Field study of birds of the upper Midwest extended field trip to Minnesota and Wisconsin individual or group project

Ia LL 531I Conservation Biology (Same as Bot 531I) Cr 4 Alt SS offered 2004 *Prereq 312I* Population and community-level examination of factors influencing the viability of plant and animal populations from both demographic and genetic perspectives assessment of biodiversity design and management of preserves

Ia LL 535I Restoration Ecology (Same as A Ecl 535I Bot 535I EnSci 535I) Cr 4 Alt SS offered 2004 *Prereq A course in ecology* Ecological principles for the restoration of native ecosystems establishment (site preparation selection of seed mixes planting techniques) and management (fire mowing weed control) of native vegetation evaluation of restorations Emphasis on the restoration of prairie and wetland vegetation

Ia LL 536 Vegetation Restoration and Management Cr 4 Alt SS offered 2005 *Prereq A general ecology course* Theoretical and practical consider ations for the development and implementation of vegetation management plans Hands-on experience with a variety of techniques for restoring and managing natural vegetation including mowing burning grazing thinning mechanical and chemical weeding and planting techniques Nonmajor graduate credit

Ia LL 564I Wetland Ecology (Same as Bot 564I EnSci 564I) Cr 4 SS *Prereq 312I* Ecology classification creation restoration and management of wetlands Field studies will examine the composition structure and functions of local natural wetlands and restored prairie pothole wetlands Individual or group projects

Ia LL 573 Techniques for Biology Teaching Cr 1 or 2 each time taken SS The development and implementation of laboratory exercises suitable for inclusion in elementary middle high school and community college biology and environmental courses Exercises will be built around common organisms and ecosystems in Iowa Field trips
A Animal Biology (Same as A Ecl 573A)
B Plant Biology
C Fungi and Lichens
D Aquatic Ecology
E Prairie Ecology
F Wetland Ecology
G Limnology (Same as A Ecl 573G)
H Animal Behavior (Same as A Ecl 573H)
I Insect Ecology
J Biology of Invertebrates
K Non invasive Use of Living Organisms
L Leopold Education Project
W Project WET (Same as A Ecl 573W)

Ia LL 575I Field Mycology (Same as Bot 575I) Cr 4 Alt SS offered 2004 Identification and classification of the common fungi techniques for identification preservation and culture practiced with members of the various fungi groups

Ia LL 580I Ecology and Systematics of Diatoms (Same as Bot 580I) Cr 4 SS Field and laboratory study of freshwater diatoms techniques in collection preparation and identification of diatom samples study of environmental factors affecting growth distribution taxonomic characters project design and execution including construction of reference and voucher collections and data organization and analysis

Ia LL 590I Graduate Independent Study (Same as A Ecl 590I Anthr 590I Bot 590I Zool 590I) Cr 1 to 4 SS *Prereq Graduate classification and permission of instructor*

Ia LL 593 Natural History Workshop Cr 1 to 3 Offered as demand warrants Prereq Permission of instructor Graduate workshop on some aspect of the natural history of the Upper Midwest or on techniques for studying natural history

Courses for Graduate Students

Ia LL 699I Research (Same as A Ecl 699I Anthr 699I Bot 699I Zool 699I) Cr 1 to 4

Journalism and Communication, The Greenlee School of

www greenlee org (or) www jlmc iastate edu

John B Eighmey Chair of the School

Professors Abbott Beell Eighmey Emmerson Peterson Smith

Professors (Emeritus) Boyd Disney Friederich Gillette Kunerth Schwartz Shelley Wechsler

Associate Professors Coon Fowler Geske Haws Mack Prior Miller Redmond Rodriguez

Assistant Professors Chadwick Christen Patton

Assistant Professors (Adjunct) Vrchota

Lecturer Witherspoon

The Greenlee School of Journalism and Communica tion offers work for the bachelor of arts in advertising the bachelor of arts in communication studies and the bachelor of arts or science degree in journalism and mass communication

The unit founded in 1905 has been continuously accredited every six years since 1948 by the Accrediting Council on Education in Journalism and Mass Communications and was reaccredited in 1998 Accreditation which applies only to the majors in advertising and journalism and mass communication is based on the principle that students need a broad based liberal arts education as well as a solid core of courses within the discipline In 1995 the communication studies program joined the Greenlee School Communication Studies is committed to providing students with a liberal arts education that emphasizes scholarly inquiry into the contemporary study of human communication

Undergraduate Study

The School encourages students to develop an emphasis to ensure the depth necessary to succeed in the world of professional communication Supporting work is designed to provide expertise and depth in related content areas Graduates of the School will be able to generate ideas gather and interpret data and disseminate information The School also prepares students throughout the university to be informed media participants and consumers and communicators

There are no pre major classification requirements for communication studies To become an advertising or journalism and mass communication major and to graduate the student must have either achieved a score of 26 or higher on the ACT English exam 590 or higher on the SAT verbal exam or passed the School s English usage test Until these requirements are successfully completed advertising and journalism and mass communication students are designated as pre majors For additional require ments see the major

English Proficiency Requirement
To meet the University s English Proficiency requirement all majors in the School must earn a grade of C or better in English 104 and 105 (or 105H) These additional requirements apply
Advrt majors must earn a C+ or better in JI MC 201
ComSt majors must earn a C or better in one additional course from this list Engl 302 309 314 415
JI MC majors must earn a C+ or better in JI MC 201 and 202 or 206

The Advertising Major

The advertising major prepares students for graduate education and careers in business and industry Students majoring in Advrt will find their career opportunities enhanced in professions requiring applied communication expertise Graduates are qualified for positions in the creative and account sides of advertising within corporations businesses and advertising agencies

To become an advertising major a student must successfully complete JI MC 101 110 and 201 and Advrt 230 Until these courses are successfully completed advertising students are designated as pre majors To receive a bachelor of arts degree in advertising a student must earn at least 124 5 credits Of these at least 45 credits must be at the 300 and 400 course levels at least 65 credits must come from the liberal arts and sciences exclusive of advertising and journalism and mass communication The degree requirements allow for a minimum of 33 and a maximum of 40 credits to be taken in Advrt and JI MC

The Core for the Advertising Major

Foundation Requirements
Pre Major Requirements (9 credits)
3 Mass Media and Society JI MC 101
R Orientation to Journalism and Communication JI MC 110
3 Reporting and Writing for the Mass Media JI MC 201
3 Principles of Advertising Advrt 230

Major Requirements (15 credits)
3 Strategic Planning for Advertising and Public Relations Advrt 301
3 Law of Mass Communication JI MC 460
3 Select from JI MC 401 406 453 454 461 462 464 474 476 477

3 Professional Media Internship Jl MC 499
Select 3 credits from
3 Advertising Campaigns Advrt 434
3 Advanced Advertising Campaigns Advrt 435
3 Advanced Portfolio Practicum Advrt 436

Major Electives/Options (9 12 credits)
Choose a minimum of 9 credits from the following
3 Electronic Media Production Jl MC 306
3 Fundamentals of Photojournalism Jl MC 310
3 Multimedia Production Jl MC 315
3 Public Relations Techniques Jl MC 321
3 Advertising Creativity Advrt 334
3 Media Buying Advrt 335
3 Media Sales Advrt 336
3 Visual Principles for Mass Communication Jl MC 342 & 342L
3 Lab in Basic Visual Principles Jl MC 342L
3 Lab in Intermediate Visual Principles Jl MC 343L
3 Science Communication Jl MC 347
Minimum 33 Maximum 40

Advrt majors need a broad based academic background that the School seeks to ensure by requiring a designated area of concentration (DAC) made up of 25 credits with at least 15 credits from the 300 level or above Of the 25 credits 10 credits are in prescribed courses and 15 credits are from a student-designed adviser approved grouping of courses excluding Advrt and Jl MC that will meet the student s professional or academic interests A second major or minor outside of Advrt or Jl MC may substitute for the student-designed adviser approved part of the DAC

The Communication Studies Major

The communication studies major prepares students for careers in business and industry and graduate education Students majoring in ComSt will find their career opportunities enhanced in professions requiring applied communication expertise e g human resource management personnel training and development sales management organizational development business communication and international and intercultural relations

ComSt majors need to master a focused course of inquiry into the contemporary study of human communication The ComSt major provides this focus through emphasis in applied communication theory and research in interpersonal small group organizational and intercultural communication

ComSt majors must earn at least 124 5 credits with 45 credits at the 300-400 levels and a minimum of 36 credits in ComSt

The Core for the Communication Studies Major

Foundation Requirements (12 credits)
3 Introduction to Communication Studies ComSt 101
3 Introduction to Interpersonal Communication ComSt 102
3 Introduction to Communication Research Methods ComSt 203
Select one of these courses
3 Professional Communication ComSt 214
3 Conflict Management ComSt 218
Upper Division Requirements (18 credits)
3 Human Communication Theory ComSt 301
3 Intercultural Communication ComSt 310
3 Interpersonal Communication Theory and Research ComSt 311
3 Organizational Communication ComSt 314
3 Small Group Communication ComSt 317
3 Nonverbal Communication ComSt 325
Select any two of these seminars
3 Communication Theory or Research ComSt 404A
3 Interpersonal Communication ComSt 404B
3 Small Group Communication ComSt 404C
3 Organizational Communication ComSt 404D
3 Intercultural Communication ComSt 404E
3 Nonverbal Communication ComSt 404F
3 Training and Development ComSt 404G

36 Total
Enhancement Requirement (4 credits)
4 Principles of Statistics Stat 101

The Journalism and Mass Communication Major

The major in journalism and mass communication prepares students for careers that involve all aspects of news and information The emphasis is on generating ideas organizing writing editing and presenting information for various audiences Graduates most likely will work in magazines newspapers electronic media public relations and public information as well as related disciplines that expect articulate and informed writing and presenta tion Students select one of five emphases electronic media studies print media (magazine and newspa per) public relations/public information science communication or visual communication A sixth option is also available that allows the student to pursue a general program of study

To be a Jl MC major a student must successfully complete Jl MC 101 110 and 201 To receive a bachelor of arts or a bachelor of science degree in journalism and mass communication a student must earn at least 124 5 credits Of these at least 45 credits must be at the 300 and 400 course level at least 65 credits must come from the liberal arts and sciences excluding Advrt and Jl MC The degree requirements allow for a minimum of 33 and a maximum of 40 credits to be taken in Advrt and Jl MC

The Core for the Journalism and Mass Communication Major

Foundation Requirements
Pre Major Requirements (6 credits)
3 Mass Media and Society—Jl MC 101
R Orientation to Journalism and Mass Communication—Jl MC 110
3 Reporting and Writing for the Mass Media—Jl MC 201
Requirements of all Jl MC majors (9 credits)
3 Intermediate Reporting and Writing for the Mass Media—Jl MC 202 or Reporting and Writing for the Electronic Media—Jl MC 206
3 Law of Mass Communication—Jl MC 460
3 Professional Media Internship—Jl MC 499

Requirements determined by emphasis (minimum of 12 credits) Emphasis based courses must be selected from courses numbered from Jl MC 220 to Jl MC 355

Minimum of 6 credits must be selected at the 400 level at least one of which must be Jl MC 401 406 453 461 462 464 474 476 or 477 The remaining 3 credits to be determined by emphasis area

Additional credits can be selected from any Jl MC courses 220 and above

Minimum 33 Maximum 40

Enhancement Requirement (4 credits)
4 Principles of Statistics Stat 101 or equivalent

Jl MC majors need a broad-based academic background that the School seeks to ensure by requiring a Designated Area of Concentration (DAC) made up of 24 credits All courses for the DAC must be taken outside of Advrt and Jl MC At least 15 credits must be from the 300 level or above This is a student-designed adviser approved grouping of related courses that will meet the student s professional or academic interests A second major or two minors may substitute for the DAC

Minors

Advertising To become an advertising minor the student must have achieved a score of 26 or higher on the ACT English examination 590 or higher on the SAT verbal exam or have passed the School s English usage test and have earned a grade of at least a C+ in Jl MC 201

Jl MC majors may not minor in Advrt Advertising minors are required to complete at least 18 credits in Advrt and Jl MC courses This includes 9 credits in the core (Jl MC 201with a C+ or better Advrt 230 and Advrt 301) and either Advrt 434 or 435 or 436 (3 credits) 3 credits at the 300-400 level in Advrt or related Jl MC courses and 3 credits of Advrt or Jl MC electives

Communication Studies The requirements for a minor in ComSt may be fulfilled by credit in ComSt 101 plus at least 15 additional hours of communication studies of which 9 credits are in courses numbered 300 or above Students must earn a grade of C or better in all courses taken for the minor No credits in 490 499 or 590 may apply toward the minor

Journalism and Mass Communication
Jl MC minors are designed within each of the School s emphasis areas See the School s literature or an adviser in Jl MC for more information Advrt majors may not minor in Jl MC

To become a Jl MC minor the student must have achieved a score of 26 or higher on the ACT English examination 590 or higher on the SAT verbal exam or have passed the School s English usage test and have earned a grade of at least a C+ in Jl MC 201 and in either Jl MC 202 or Jl MC 206

Jl MC minors are required to complete at least 18 credits in Jl MC or Advrt courses This includes 6 credits in the core (201 and either 202 or 206) 6 credits from courses numbered 220 to 355 and 3 credits from among 400 level courses and 3 credits of Jl MC (or Advrt) elective

Graduate Study

The Greenlee School of Journalism and Communica tion offers work for a master of science degree in journalism and mass communication Two tracks are available one for students who desire specialized study in communication theory and research the second for students who wish to develop or strengthen professional skills A minor in journalism and mass communication is available for students taking major work in other departments

Majors plan programs of study in one of two concentrations

I Communication as a Social Science --The School offers advanced academic preparation in communica-tion theory and research leading to the master of science degree Graduate work prepares students to use and contribute to research and scholarship in the field of communication The degree requires a thesis based on original research which must be defended successfully before a committee at the end of the program

Areas of research emphasis include science communication political communication visual communication media effects advertising public relations conflict resolution interpersonal communi cation intercultural communication international communication and organizational communication

II Communication as a Profession –The School offers advanced professional training in journalism and mass communication leading to the master of science degree Graduate work prepares students for professional careers in a variety of mass communica tion fields Students with limited training or experience in journalism and mass communication may include skills courses in their programs The degree requires either a creative component or thesis

Areas of professional emphasis include journalistic writing and reporting for the traditional and new

media visual journalism and strategic communica tion

All students in the two degree emphases must complete four core courses Introduction to Graduate Study in Journalism and Mass Communication (JI MC 592) Theories of Mass Communication (JI MC 501) Communication Research Methods (JI MC 502) and Seminars in Mass Communication (JI MC 598) Each student selects elective courses based on his/her area of emphasis and career goal in consultation with the student s major professor and Program of Study Committee

Courses open for nonmajor graduate credit JI MC 460 461 464 and 477

Advertising (Advrt)
Courses Primarily for Undergraduate Students

Advrt 230 Advertising Principles (3-0) Cr 3 FS *Prereq Sophomore classification* Historical social economic and legal aspects of advertising Evaluations of advertising research media strategy and appeals Study of the creation of print and broadcast advertising

Advrt 301 Strategic Planning for Advertising and Public Relations (Same as JI MC 301) (3-0) Cr 3 FS *Prereq Advrt 230 or JI MC 220 majors and minors must also have credit or concurrent enrollment in JI MC 201* Prospect analysis market segmentation positioning strategic planning public opinion formation communication strategy formation and development of critical thinking skills

Advrt 334 Advertising Creativity (2 2) Cr 3 FS *Prereq Advrt 301* Development and execution of creative advertising materials Copywriting art direction and computer applications for print broadcast and digital media Creative strategy development execution and evaluation

Advrt 335 Advertising Media Buying (2 2) Cr 3 FS *Prereq Advrt 230* Concepts of media planning and selection in the development execution and evaluation of advertising campaigns Characteristics and capabilities of the advertising media Utilization of market segmentation consumer buying and media audience databases

Advrt 336 Advertising Media Sales and Manage ment (3 0) Cr 3 *Prereq Advrt 301 and Advrt 335* Fundamentals of advertising media sales with emphasis on sales techniques presentation skills and strengths of competing media Includes development of sales and training materials for a variety of media Sales simulations

Advrt 434 Advertising Campaigns (3-0) Cr 3 FS *Prereq Advrt 301 and 334 or 335 or 336* Development of advertising campaigns for business and social institutions Projects involve budgeting media selection market analysis campaign strategy and creative execution

Advrt 435 Advanced Advertising/Public Relations Campaigns Cr 1 3 to a maximum of 3 credits S *Prereq Permission of instructor Junior/senior standing strongly recommended* Preparation of materials for regional and national competitions

Advrt 436 Advertising Portfolio Practicum (0 6) Cr 3 *Prereq Advrt 334 or portfolio review* Advanced advertising writing and design Emphasis on creative strategy problem solving and execution of creative materials in print broadcast and on line media for a variety of clients

Advrt 497 Seminar in Advertising Cr 1 to 3 Seminars or one-time classes on topics of relevance to students in advertising

Communication Studies (ComSt)
Courses Primarily for Undergraduate Students

ComSt 101 Introduction to Communication Studies (3 0) Cr 3 FS An introduction to communication theory the development and functions of communica tion and a survey of interpersonal small group organizational and intercultural communication

ComSt 102 Introduction to Interpersonal Communi cation (3-0) Cr 3 FS Application of communication principles theory and research to the process of interpersonal communication improvement of communication skills most relevant to a broad range of interpersonal settings

ComSt 203 Introduction to Communication Research Methods (3-0) Cr 3 FS An introduction to analyzing and conducting communication research Includes theory development statistics and methodologies

ComSt 214 Professional Communication (3 0) Cr 3 FS Communication theory and skill development in organizational settings Emphasis on interpersonal skill development team and meeting facilitation informational interviewing and team presentations and self assessment

ComSt 218 Conflict Management (3 0) Cr 3 S Exploration of communication theories principles and methods associated with effective conflict management in interpersonal and organizational contexts

ComSt 301 Human CommunicationTheory (3-0) Cr 3 *Prereq 101* Examination of the major theories related to human communication with particular emphasis on theories underlying interpersonal small group organizational and intercultural communica tion

ComSt 310 Intercultural Communication (3-0) Cr 3 *Prereq 101 or 102 203 301* Examines the theories principles and research on intercultural communica tion to enhance cultural sensitivity and to recognize accept and adapt to cultural diversity Interactive assignments

ComSt 311 Interpersonal Communication Theory and Research (3 0) Cr 3 *Prereq 102 203 301* A study of contemporary interpersonal communication theories and research Emphasis on relational development research including initiation maintenance conflict management and dissolution

ComSt 314 Organizational Communication (3 0) Cr 3 *Prereq 101 or 102 203 301* Theory and research in organizational communication strategies for assessing and improving individual and organizational communication effectiveness an understanding of how organizational meaning is created and sustained through human communica tion

ComSt 317 Small Group Communication (3-0) Cr 3 *Prereq 101 or 102 203 301* Theory and research in small group communication application to group decision making and leadership Includes communi-cation analyses of groups and teams

ComSt 325 Nonverbal Communication (Same as Ling 325 Sp Cm 325) (3 0) Cr 3 *Prereq 101 or 102 203 301* Theory and research in nonverbal communication exploration of nonverbal codes and covert subcodes function of nonverbal communica tion in various contexts student-designed investiga tions

ComSt 404 Seminar in Communication Studies (Dual listed with 504) Cr 3 *Prereq a 3 credit 300-level ComSt course plus the appropriate 300 level course (as indicated in parenthesis below)*
A Communication Theory or Research (*any 300-level 3 credit course*)
B Interpersonal Communication (*ComSt 311*)
C Small Group Communication (*ComSt 317*)
D Organizational Communication (*ComSt 314*)
E Intercultural Communication (*ComSt 310*)
F Nonverbal Communication (*ComSt 325*)
G Training and Development (*ComSt 314*)

ComSt 490 Independent Study Cr 1 to 3 each time taken maximum of 6 FS SS *Prereq 9 credits in communication studies and junior classification* Application must be submitted for approval the semester prior to the independent study

ComSt 499 Professional Internship Cr var 1 to 3 each time taken maximum of 6 FS Four hundred hours of on site work is required for 3 hours credit Registration by application only Application must be submitted to Communication Studies faculty adviser for approval the semester prior to the internship

Courses Primarily for Graduate Students, Open to Qualified Undergraduates

ComSt 504 Seminar in Communication Studies (Dual listed with 404) Cr 3 FS *Prereq Graduate standing*
A Communication Theory and Research
B Interpersonal Communication
C Small Group Communication
D Organizational Communication
E Intercultural Communication
F Nonverbal Communication
G Training and Development

ComSt 590 Special Topics Cr 1 to 4 each time taken Application must be submitted for approval the semester prior to the independent study

Journalism and Mass Communication (JI MC)
Courses Primarily for Undergraduate Students

JI MC 101 Mass Media and Society (3 0) Cr 3 FS Communication models and their application to the mass media the mass communication process organization characteristics and responsibilities of the mass media media related professional operations

JI MC 110 Orientation to Journalism and Communication (1 0) Cr R FS Orientation to career opportunities emphasis areas and requirements in the advertising and journalism and mass communica tion curricula

JI MC 201 Reporting and Writing for the Mass Media (1-4) Cr 3 FS *Prereq Engl 105 (or testout) and either a score of 26 or higher on the ACT English examination 590 or higher on the SAT verbal exam or a passing score on the School s English usage test* Generating story ideas exercising news judgment and gathering information via interviews observation and documentary sources to produce news and informational material for the mass media Emphasis on analyzing and organizing information as well as accuracy and principles of good writing

JI MC 202 Intermediate Reporting and Writing for the Mass Media (1-4) Cr 3 FS *Prereq JI MC 201 with a grade of C+ or better* Covering standard news assignments and beats for student print publication Enhancing and refining skills in developing sources and generating story ideas information-gathering techniques reporting and writing Includes segments on local government and judiciary Primarily designed for students interested in writing for newspapers magazines and online media

JI MC 205 Publicity Methods (3 0) Cr 3 FS *Prereq Engl 105* Communication and publicity fundamentals and the use of media for publicity purposes Preparing releases for print and broadcast basics of publication layout Publicity campaigns Not available to JI MC and Advrt majors

JI MC 206 Reporting and Writing for the Electronic Media (2-3) Cr 3 FS *Prereq JI MC 201 with a grade of C+ or better* Researching organizing and writing for audio and visual media Basic principles of news information and entertainment programming content and structure

JI MC 220 Principles of Public Relations (3-0) Cr 3 FS *Prereq Sophomore classification* Introduction to public relations in business government and non profit organizations functions processes and management attitudes public opinion and persuasion overview of theory

JI MC 301 Strategic Planning for Advertising and Public Relations (Same as Advrt 301) (3 0) Cr 3 FS *Prereq Advrt 230 or JI MC 220 majors and minors must also have credit or concurrent enrollment in JI MC 201* Prospect analysis market segmentation positioning strategic planning public opinion formation communication strategy formation and development of critical thinking skills

JI MC 306 Electronic Media Production (2 3) Cr 3 FS *Prereq C+ or better in JI MC 201* Introduction to studio production techniques

JI MC 308 Video Field ProductionTechniques (2 3) Cr 3 FS SS *Prereq 202 or 206 306* Basic field techniques in single-camera video directing shooting editing and writing

JI MC 310 Fundamentals of Photojournalism (1-3) Cr 3 FS *Prereq 201* Basic photojournalism and photo techniques Includes camera operation lighting and composition lens and depth of focus and photo reproduction techniques for print broadcast or computer mediated applications Basic use of digital imaging and editing software

JI MC 315 Multimedia Production (3-0) Cr 3 FS SS *Prereq 342L or 343L or equivalent computer design proficiency* Concepts and principles for evaluating constructing and designing information for the World Wide Web and other computer mediated communication systems Explores the use of computer generated animation and graphics audio and video Issues of ethics and ownership of work pertinent to the new media are discussed

JI MC 321 Public Relations/Corporate Communications Techniques (2 3) Cr 3 FS *Prereq 201 220 or Advrt 230 and Advrt 301 342 and 342L or computer design proficiency recommended* Development and creation of public and corporate relations materials Computer applications used in production of press releases for print broadcast and online media annual reports and desktop publishing of creative materials

JI MC 341 Contemporary Magazine Publishing (Dual listed with 541) (3-0) Cr 3 FS *Prereq Junior classification* Analysis of magazine industry and specific audiences served through print and online magazines Editorial procedures and policies advertising circulation and history of the industry Individual study of magazines

JI MC 342 Visual Principles for Mass Communicators (3-0) Cr 3 FS *Prereq Sophomore classification* Understanding of the visual message Visual perception design syntax design elements and how they fit in the visual communication of mass media

JI MC 342L Laboratory in Basic Visual Principles (1-4) Cr 3 FS *Prereq Credit or enrollment in 342* Introduction to desktop publishing beginning techniques of layout in a step-by step process application of visual principles to simple print projects

JI MC 343L Laboratory in Intermediate Visual Principles (1-4) Cr 3 S *Prereq 342L or equivalent computer design proficiency* Application of more advanced features of desktop publishing and other document-enhancing software Production of newsletters multi page brochures and other documents

JI MC 344 Depth Reporting and Writing (2 2) Cr 3 F *Prereq 202 or 206* Developing and writing comprehensive news features and magazine articles

JI MC 346 Public Affairs Reporting (2 2) Cr 3 S *Prereq 202 or 206* Reporting on government business and other institutions identification of and access to public records investigative reporting techniques developing major stories on government and non profit organizations and issues for print and broadcast media

JI MC 347 Science Communication (Dual listed with 547) (2-2) Cr 3 S *Prereq 202 or 206 for JI MC majors Advrt 301 for Advrt majors* Reporting and writing about science and technology subjects for general audiences Outlets for stories include print broadcast and online media Story topics include reporting about basic and applied sciences as well as ethical and policy issues related to science and technology Topics from A to Z anthropology to zoology

JI MC 349 Print Media Editing (1 5) Cr 3 FS *Prereq 202 or 206* Grammar punctuation usage syntax and logic Editing newspaper magazine and online copy Headline title writing and visual presentation Use of computer editing technology

JI MC 353 Information Presentation and Performance (2 2) Cr 3 F *Prereq 306* Presentation style for the electronic media Exploration of techniques for the narrator announcer news anchor and interviewer/host

JI MC 354 Advanced Studio Production (2 3) Cr 3 FS *Prereq 206 306* Application of advanced television techniques producing directing and asset management of live and taped information programs

JI MC 355 Advanced Reporting and Writing for Visual Media (2-3) Cr 3 F *Prereq 206 306 308* Video news techniques reporting with electronic newsgathering equipment writing news scripts editing scripts and video producing news and public affairs programs

JI MC 390 Workshop Cr 1 each time taken maximum of 3 Offered as elective credit only Check School for course availability Offered on a satisfactory-fail grading basis only

JI MC 401 Mass CommunicationTheory (3-0) Cr 3 S *Prereq Junior classification* Theory and research in mass communication processes and effects the scientific process methods of measuring evaluating and reporting mass communication research

JI MC 406 Media Management (Dual listed with 506) (3 0) Cr 3 S *Prereq Junior classification* Decision-making functions of media Basic media market analysis media organization and management circulation and audience development technological developments affecting management decisions and relationships with labor and regulatory agencies that affect media operations

JI MC 424 Public Relations Campaigns (Dual listed with 524) (3 0) Cr 3 FS *Prereq 220 301 and 321 Junior classfication* Development of public relations and corporate communications campaigns for business and social institutions Projects involve research planning strategy/tactic development and evaluation

JI MC 449 Advanced Print Media Editing (1 5) Cr 3 S *Prereq 342 342L 349 Junior classification* Continued emphasis on grammar punctuation usage syntax and logic Editing of complex stories Publication design story selection and play fairness accuracy balance Editorial management and decision making Use of computer editing technology

JI MC 453 Electronic Media Technology and Public Policy (3 0) Cr 3 Alt S *Prereq Junior classification* Issues and policies affecting historical contemporary and future developments of electronic media and their technologies

JI MC 454 Critical Analysis and History of the Moving Image (3-0) Cr 3 Alt S *Prereq Junior classification* Evolution of motion picture and television content and other visual technologies Theories and techniques for evaluating and critiquing film and video

JI MC 455 Advanced Field Production (2 2) Cr 3 S *Prereq 206 308* Researching writing and producing informational video projects (documentaries corporate and instructional videos) Theory and practice

JI MC 460 Law of Mass Communication (3 0) Cr 3 FS *Prereq 201 Junior classification* First Amendment law libel privacy obscenity contempt copyright trademark the Federal Communications Act laws affecting advertising legal publication and other business activities of the media including the Internet Nonmajor graduate credit

JI MC 461 History of American Journalism (3 0) Cr 3 FS *Prereq Junior classification* Role of the mass media including advertising and public relations in shaping the social economic and political history of America impact of change in these areas on the development traditions and philosophies of the media Nonmajor graduate credit

JI MC 462 Media Ethics, Freedom Responsibility (3 0) Cr 3 FS *Prereq Junior classification* Media ethics and performance functions of the media in relation to the executive judicial and legislative branches of government agencies of media criticism right to know versus right to privacy

JI MC 464 Journalism and Literature (3-0) Cr 3 F *Prereq Junior classification* A study of journalism s impact on literary writing and literature s impact on journalism as seen through the works of such American author/journalists as Ernest Hemingway Walt Whitman Theodore Dreiser Truman Capote Joan Didion Nonmajor graduate credit

JI MC 474 CommunicationTechnology and Social Change (Same as T SC 474) (3 0) Cr 3 F *Prereq Junior classification* Examination of historical and current communication technologies including how they shape and are shaped by the cultural and social practices into which they are introduced

JI MC 476 World Communication Systems (Dual listed with 576) (3-0) Cr 3 F *Prereq Junior classification* World communication systems and social political and economic factors determining flow character and volume of news Impact of media information and entertainment content on nations and societies Comparative analysis of role and impact of traditional modes of communication the mass media and computer mediated systems

JI MC 477 Ethnicity Gender, Class and the Media (3 0) Cr 3 S *Prereq Junior classification* Portrayals of ethnic groups genders and classes in the media in news information and entertainment the effects of mass media on social issues and population groups Nonmajor graduate credit

JI MC 490 Independent Study in Communication Cr arr *Prereq Junior classification* No more than 6 credits of 490 may be used toward a degree in journalism and mass communication or advertising Independent studies are research based Students may study problems associated with a medium a professional specialization a philosophical or practical concern a reportorial method or writing technique or a special topic in their field Credit is not given for working on student or professional media without an accompanying research component

I Media Studies
- A Book Publishing
- B Electronic Media Studies
- C Magazine
- D Newspaper

II Professional Specialization
- E Advertising
- F Communication Technology
- G Education
- H Honors
- I Media Management
- K Public Relations
- L Visual Communication

III Problems and Methods
- M Contemporary Issues
- N Ethics and Responsibility
- O Special Communication (Agriculture Family and Consumer Sciences Engineering Science)
- P International Communication
- Q History and Literature
- R Law
- S Public Opinion
- T Research Methods

IV Technique and Style
- U Documentary
- V Persuasion and Criticism
- W Public Affairs Reporting
- Y Internet Issues and Applications

JI MC 498 Seminar in Journalism and Mass Communication Cr 1 to 3 *Prereq Junior classification* Seminars or one time classes on topics of relevance to students in journalism and mass communication

JI MC 499 Professional Media Internship Cr 3 *Prereq JI MC 202 or 206 or Advrt 301 junior classification and adviser s formal approval of written proposal* Required of all JI MC and Advrt majors A

400 hour internship in the student s journalism and mass communication or advertising specialization Satisfactory fail grade based on employer evaluation and student report Available only to JI MC and Advrt majors

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

JI MC 501 Theories of Mass Communication (3-0) Cr 3 F *Prereq 6 credits in social science or admission to the graduate program* Examination of major areas of research activity and theoretical development related to organization functions and effects of mass communication

JI MC 502 Communication Research Methods (3 3) Cr 4 S *Prereq 501* Use of quantitative and qualitative research methods including legal participant observation historical survey content analysis and experimental research

JI MC 506 Media Management (Dual listed with 406) (3 0) Cr 3 S *Prereq 6 credits in social science or admission to the graduate program (economics highly recommended)* Decision making functions of media Basic media market analysis media organization and management circulation and audience development technological developments affecting management decisions and relationships with labor and regulatory agencies

JI MC 510 Strategies of Communication (3 0) Cr 3 S *Prereq 501 or equivalent social science theory* The process of developing professional communication and persuasion strategies with emphasis on problem definition behavioral objectives situation analysis strategy formulation and justification through application of communication theories and research results

JI MC 520 Public Relations Theory and Methods (3 0) Cr 3 S *Prereq 501* Theories and research methods applied to the study and practice of public relations

JI MC 521 Theories of Visual Communication (2 2) Cr 3 F *Prereq 6 credits in social science* Introduction to the study of picture based media (film television photography advertising etc) Exploration of theoretical concepts of vision and perception visual literacy visual language visual persuasion/ manipulations and the cultural implications of visual images

JI MC 524 Public Relations Campaigns (Dual-listed with 424) (3 0) Cr 3 F *Prereq 6 credits in social science or admission to the graduate program* Development of public relations and corporate communications campaigns for business and social institutions Projects involve research planning strategy/tactic development and evaluation

JI MC 541 Contemporary Magazine Publishing (Dual-listed with 341) (3-0) Cr 3 FS Analysis of magazine industry and specific audiences served through print and online magazines Editorial procedures and policies advertising circulation and history of the industry Focus on the research literature

JI MC 547 Science Communication (Dual-listed with 347) (2 2) Cr 3 S *Prereq 6 credits of social science or admission to the graduate program 202 or 206 for JI MC majors Advrt 301 for Advrt majors* Reporting and writing about science and technology subjects for general audiences Outlets for stories include print broadcast and online media Story topics include reporting about basic and applied sciences as well as ethical and policy issues related to science and technology Topics from A to Z anthropology to zoology

JI MC 561 Media and Society Interrelationships (3 0) Cr 3 F *Prereq 6 credits in social science* Media functions in a democratic society conflicts between the media and social institutions ethical and social controls on the media

JI MC 574 CommunicationTechnologies and Social Change (Same as T SC 574) (3-0) Cr 3 F *Prereq 6 credits in social science* Personal organizational and social implications of the use of communication technologies Includes theories and empirical research across the continuum of perspectives from techno utopianism through an anti technology stance

JI MC 576 World Communication Systems Development (Dual listed with 476) (3 0) Cr 3 F World communication systems and social political and economic factors determining flow character and volume of news Impact of media information and entertainment content on nations and societies Comparative analysis of role and impact of traditional modes of communication the mass media and computer mediated systems

JI MC 590 SpecialTopics Cr arr *Prereq Permission of instructor*
A Media Studies
B Professional Specialization
C Research Problems and Methods
D Technique and Style
E Specialized Communication

JI MC 591 Professional Internship (0-6) Cr 2 FS SS *Prereq Permission of instructor* Supervised internship experience Offered on a satisfactory fail grading basis only

JI MC 592 Introduction to Graduate Study in Journalism and Communication (1 0) Cr R F *Prereq Graduate classification* Overview of advanced study in journalism and communication with special emphasis on requirements for obtaining the master of science degree

JI MC 598 Seminars in Mass Communication Cr 1 to 3 each
A Audiences and Effects
B Communication Technology
C Professional Communication
D Development Communication
E Evaluation Methods
F International Communication
G Mass Communication History
H Mass Communication Law
I Media Management
J Research Methods
K Society and Mass Communication
L Teaching Journalism and Mass Communication
M Visual Communication
N Broadcast Communication
O Communication Theory
P Computer Mediated Communication

JI MC 599 Thesis Research or Creative Component Cr var *Prereq Approved proposal*

Courses for Graduate Students

JI MC 699 Research Cr var

Landscape Architecture

www public iastate edu/~land_arch

J Timothy Keller, Chair of Department

Professors Anderson Hightshoe Keller

Distinguished Professors (Emeritus) Dyas

Professors (Emeritus) Boon Harvey Lane

Associate Professors Badenhope Chidister Engler Grundmann Martin

Associate Professors (Collaborators) Patchett

Assistant Professors Hohmann Kyber Langhorst J Miller Wagner

Assistant Professors (Adjunct) Kane M Miller Pritchard

Undergraduate Study

The profession of landscape architecture is concerned with the quality of land use It involves analysis of environmental factors and human needs which leads to recommendations for the planning design management conservation and/or development of landscapes The profession involves itself in a broad range of landscapes in urban suburban rural and wilderness settings The scale of such projects varies from broad regional landscape analysis and planning to detailed design

Graduates are able to begin to apply creative and technical skills and scientific cultural and political knowledge in the planned arrangement of natural and constructed elements on the land with a concern for the stewardship and conservation of natural constructed and human resources The resulting environments shall serve useful aesthetic safe and enjoyable purposes Graduates are able to communi cate clearly and work effectively with others on complex land design and planning problems They understand the ethical social and environmental dimensions of issues involving changes in the landscape

The purchase or lease of a laptop/notebook computer and appropriate software is recommended for students entering the professional program and highly recommended for students in the second year of the professional program Contact the Department or see the College of Design website for hardware and software specifications

To enhance the study of landscape architecture in off-campus settings the department recommends that each student participate in an approved study abroad program In addition the department recommends that each student participate in professional internship opportunities available through the department National Student Exchange programs through other campuses or both Additional information is available in the departmental office

The curriculum is accredited by the American Society of Landscape Architects and provides the education which combined with experience is necessary for professional registration

The curriculum is composed of a one year preprofessional program and a four year professional program Admission into the professional program depends upon available resources and is subject to the approval of a faculty committee at the completion of the preprofessional program Scholastic perfor mance aptitude and personal development are the qualifications considered The department also cooperates in the undergraduate minor in design studies

For undergraduate curriculum in landscape architecture leading to the degree bachelor of landscape architecture see *College of Design Curricula*

Graduate Study

The department offers opportunities for post-professional study leading to the degree master of landscape architecture Minor work is offered to students taking major work in other departments

The M L A degree is granted upon completion of 36 credits and the acceptance of a thesis or creative component Typically the program will require four semesters of study for students with a bachelor s degree in landscape architecture Students with a bachelor s degree in landscape architecture may also enter a special program to earn both the M L A and the master of community and regional planning (M C R P) degrees in three years Graduate students who do not possess a bachelor s degree in landscape architecture may complete additional coursework in the fundamental skill areas of the profession This is accomplished by concurrent enrollment in the undergraduate program to earn the B L A degree before fully engaging in graduate study The time necessary to earn the B L A in addition to the M L A will vary according to the student s background upon admission Students interested in the concurrent B L A /M L A and double degree M L A /M C R P programs should contact the department to receive a detailed description of requirements

Graduates have a broad understanding of landscape architecture and related disciplines They are able to communicate effectively with colleagues in the sciences and/or humanities as well as in the allied professions Graduates are prepared to work individually and in multidisciplinary teams to address

complex problems dealing with the physical environment They are skilled at undertaking research and/or creative activities and communicating the results of these efforts in a concise and persuasive manner

Courses open for nonmajor graduate credit 302 461I 480I

Courses Primarily for Undergraduate Students

L A 101 Landscape Architectural Design and Visualization I (1 9) Cr 4 F *Prereq Concurrent enrollment in L A 141 recommended* Introduction to landscape architectural visualization and interpreta tion Landscape change and precedence explored through analytic and expressive drawings photo copies models and computers

L A 102 Landscape Architectural Design and Visualization II (1-9) Cr 4 S *Prereq 101* Introduction to landscape architectural design Projects with an emphasis on cultural expression environmental ethics and technical constituents of the design process

L A 103 Introduction to Graphic Communication for Planners (2 2) Cr 3 FS *Prereq CRP major Introduction to graphic communication techniques* Basic skills to review and evaluate site plans Graphic formulation of land use plans and land development and zoning ordinances Focus on both working and presentation graphics

L A 141 Introduction to Landscape Architecture (3-0) Cr 3 F Overview of the profession including noteworthy works areas of practice theories philosophies and approaches of various landscape architects Lectures discussions readings

L A 201 Studio 1 Landscape Interpretation and Representation (1 15) Cr 6 F *Prereq Enrollment in the professional program* Reading and representing the varied midwestern landscape Development of aesthetic sensitivity to the geomorphology vegetation and cultural influences on this landscape Small scale interventions and exploration of landscape phenomena and change Emphasis is on a variety of documentation and drawing techniques

L A 202 Studio 2 Site Planning and Design I (1-15) Cr 6 S *Prereq 201* Fundamental issues of landscape planning and design at a site scale Projects introduce a variety of (objective and subjective) site inquiry methods space and place making and sensitive integration of architecture and landscape for specific landuses User needs precedent study programming site engineering planting design and outdoor space design are expressed through a variety of three-dimensional modeling graphic and written media

L A 221 Native Plants of the Midwest (2 3) Cr 3 F *Prereq Enrollment in the professional program* Observation and study of the wetland prairie and woodland vegetation native to the midwest region Emphasis on plant communities their distribution structure habitat and visual appearance Plant identification and use in landscape design Precedent and case studies of vegetation preservation restoration and use in built works

L A 241 Developing Identity as a Landscape Architect (1 0) Cr 1 F *Prereq Enrollment in the professional program* Designed to accompany L A 201 221 272 281 Development of life skills such as conflict resolution skills interpersonal communica tion and CPR/First Aid Examination of personal and others values backgrounds abilities and attitudes and how these influence personal decision making and group interaction Reading discussion class activities keeping a journal writing

L A 272 Cultural Landscape Studies (3 0) Cr 3 F *Prereq Enrollment in the professional program* Exploration of cultural landscapes from broad settlement patterns to individual sites with an emphasis on the origins and evolution of Midwestern landscapes Investigation of the relationships between vernacular and designed landscapes Landscapes will be considered as mode of cultural production that shape and are shaped by social political and economic processes Exploration of the landscape as one of the most persistent yet ephemeral repositories of culture Lectures reading field studies and writing

L A 273 Landscape Architectural History Prehistory to 1800 (Same as Dsn S 273) (3 0) Cr 3 F Landscape design concepts as observed over time Outstanding works and significant personalities from pre history through the 18th century Landscape design vocabulary and significant literature Social economic political and technical forces contributing to the development of landscape design styles Lectures readings abstracts reports

L A 274 The Social and Behavioral Landscape (Same as Dsn S 274) (3 0) Cr 3 S Exploration of social and behavioral factors pertinent to the design of the domestic civic and commercial landscape The course will focus on a working familiarity with design principles as they relate to the behavior and activities of people across a broad demographic and cultural spectrum and equip students to apply these principles to the design of exterior environments Lectures and discussions including group exercises and field trips

L A 281 Investigating Landscape Form Process, and Detail (1-6) Cr 3 F *Prereq Enrollment in professional program* Exploration of the poetics and principles of landscape construction Investigation and interpretation of landform and natural processes such as hydrology erosion and sedimentation Close observation and representation of detail design with an emphasis on material types their connections and weathering Readings field studies and drawings

L A 301 Site Planning and Design II (1 15) Cr 6 F *Prereq 202* Continuation of exploration of landscape planning and design at a site scale Students explore greater levels of design and progam complexity and sophistication with focus on multiple uses and the refinement of detail elements integrated into site scale design proposals

L A 302 Regional Landscape Design (1 15) Cr 6 S *Prereq 301 or permission of instructor* Cultural and natural influences on regional design Regional patterns theories processes forms and materials as landscape design influences Application of ecological concepts and regional design concepts methods tools and data in mitigation design Use of geographic information systems to model regional processes and communicate regional patterns Nonmajor graduate credit

L A 303 Landscape Design Studio (0-12) Cr 4 each time taken maximum of 8 SS *Prereq Enrollment in the professional program and permission of advisor* Development of solutions for landscape architectural problems at intermediate and advanced levels of design A maximum of 8 credits may be applied towards graduation

L A 309 Field Travel Cr 1 to 2 each time taken FS SS *Prereq Enrollment in the professional program and permission of advisor* Observation of professional practice and landscapes in urban rural and wilderness areas Offered on a satisfactory fail grading basis only

L A 321 Introduced Plants of the Midwest (2-3) Cr 3 S *Prereq 221* Observation and study of exotic plants and horticultural varieties introduced to and cultivated in the midwest region Emphasis on functional and aesthetic uses and cultural requirements of plants used in landscape design Preparation of planting plans and plant list for small scale garden design

L A 322 Fundamentals of Planting Design (1 9) Cr 4 S *Prereq 221 Concurrent enrollment with L A 321 recommended* The art of creating plant compositions in the landscape Emphasis on compositions using form color texture and space making qualities of plants The science of creating plant assemblages that are adapted to the regional and site influences of climate soils aspect drainage and geomorphology of places Technologies of preparing design projects planting plans use of plant selection software plant lists and cost estimates Community design projects of large and small scale lectures oral and written reports and field trips

L A 341 Contemporary Landscape Architecture (1-0) Cr 1 S Exploration of contemporary landscape architecture practice through individualized research into practicing firms Preparation of paper and presentation outlining broad framework and specific parameters of a selected area of contemporary practice using specific projects as examples Work may result in invitation of current practitioner(s) as a lecture series or event

L A 371 Landscape Architectural History 1800 to Present (Same as Dsn S 371) (3-0) Cr 3 F Landscape design concepts as observed over time Outstanding works and significant personalities from 1800 to the present Landscape design vocabulary and significant literature Social economic political and technical forces contributing to the development of landscape design styles Lectures readings abstracts reports

L A 381 Shaping the Land (1 3) Cr 2 S *Prereq 281* Introductory surface drainage grading and modeling manipulation of land forms and its implications on the surrounding environment Road alignment and control parking layout earthwork and preliminary development of construction documents

L A 401 Community Landscape Design (1 15) Cr 6 F *Prereq 402* Design of large urban and rural areas with emphasis on outreach regional landscape analysis resource management impact assessment public involvement and land use feasibility Design for multiple use with a basis in human ecology and landscape ecology Planning methods and concepts communicated through drawings oral presentations and written reports

L A 402 Urban Landscape Design (1-15) Cr 6 F *Prereq 302* Comprehensive planning and design for urban sites or for sites within urban contexts often engaging outreach projects in Iowa communities Projects typically include planning for a variety of integrated land uses and cover the full range of design scales from master planning to proposals for site details Emphasis on written and verbal as well as graphic communications Integrated seminar component will engage topical issues in community design precedent studies town planning and urban design principles

L A 403 SeniorThesis PreparationTutorial Cr 2 F *Prereq 402 and permission of instructor* Preparation for senior thesis

L A 404 Advanced Landscape Architectural Design (1 15) Cr 6 S *Prereq 401* Advanced forums for the demonstration of sophistication in landscape architectural design Experimentation and innovation are encouraged

L A 405 SeniorThesis (0-15) Cr 6 S *Prereq 401 402 403 and permission of advisor chair and thesis advisor* Individual advanced forum for the demonstration of sophistication in landscape architectural design Experimentation and innovation are expected

L A 441 Professional Practice (3-0) Cr 3 F *Prereq 482* Exploration of professional practice in the private public non-governmental organization and academic setting Develop office organization and management techniques proposal preparation project budgeting and scheduling project management and construction observation

L A 450 Landscape Architecture Professional Internship or National Student Exchange Seminar (1 0) Cr 1 FS SS *Prereq 301* Orientation to and preparation for L A 451

L A 451 Landscape Architecture Professional Internship Study Abroad, or National Student Exchange Cr R FS SS *Prereq L A 450 DsnS 301 permission of advisor and chair* Exploration of landscape architectural design implementation and history and theory through professional work

experience out-of region national study experience or international study experience
A Professional Internship
B Study Abroad
C National Student Exchange

L A 461I Introduction to GIS (Same as Ia LL 461I) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

L A 465 Landscape Change and Conservation (Dual listed with 565 same as NREM 465) (2 2) Cr 3 F *Prereq L A 202* Exploration of issues in landscape ecology and conservation biology relevant to landscape change design and planning Examination of foundational principles and their applications across a continuum of land uses from wilderness to urban areas

L A 477 Landscape Architectural Theory (3 0) Cr 3 F *Prereq L A 371* Exploration of the major theories of landscape architectural design and their relationships to broader cultural and theoretical practices Examination of key texts and projects in landscape architecture architecture art and related fields Emphasis will be placed on developing critical ways of analyzing ideas Lectures readings discussion and writing

L A 478 Topical Studies in Landscape Architecture (Dual listed with 578 same as Dsn S 478) (2-0 or 3 0) Cr 2 or 3 each time taken FS SS *Prereq 371 or senior classification or graduate standing*
A Landscape Design
B Planting Design
C Construction
D History/Theory/Criticism
E Landscape Planning
F Urban Design
G Graphics
H Honors
I Interdisciplinary Studies
J International Studies
K Computer Applications
L Ecological Design

L A 480I Introduction to Environmental Planning (Same as Ia LL 480I) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

L A 481 Landscape Construction (1 3) Cr 2 F *Prereq 381* Solving complex site construction problems with an emphasis on the aesthetic and functional uses of building materials Characteristics and uses of construction materials Wood technology and structural theory paving systems retaining walls preliminary preparation of contract documents

L A 482 Advanced Landscape Construction (1-3 to 1-15) Cr 2 S *Prereq 481* Advanced complex site construction problems and detailing water and irrigation systems mechanical and electrical systems site lighting project scheduling cost estimates final contract document preparation with drawings and specifications

L A 490 Independent Study Cr 1 to 4 FS SS *Prereq Written approval of instructor and department chair on required form* Investigation of a topic of special interest to the student
A Landscape Design
B Planting Design
C Construction
D History
E Landscape Planning
F Urban Design
G Graphics
H Honors
I Interdisciplinary Studies
J International Studies
K Computer Applications
L Ecological Design

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

L A 501 Advanced Landscape Architectural Theory Cr 3 S *Prereq Admission to graduate program or permission of instructor* Discussion of landscape design theories Evaluation of how the landscape is perceived how that perception is formed filtered and focused

L A 509 Mining Reclamation and Mitigation (3-0) Cr 3 Alt S offered 2005 *Prereq Admission to graduate program or permission of instructor* Historical and cultural attitudes toward mining and reclamation environmental impacts of mining mining and reclamation planning pre and post mining inventories and legal requirements for mining and reclamation

L A 541 Principles of Research for Landscape Architects (3 0) Cr 3 F *Prereq Admission to graduate programs or permission of instructor* Examination of research methods appropriate to landscape architectural projects including biblio graphical historical numerical statistical survey and geographical methods Readings discussions and application problems Preparation of a research proposal

L A 562 Studio in Resource Conservation and Management (1 3 to 1-15) Cr 2- 6 each time taken maximum of 6 credits applied to degree program S *Prereq Admission to graduate program or permission of instructor* Developing plans and policies that feature ecological landscape description planning and resource conservation Hands-on field experience with professional resource planners and managers

L A 565 Landscape Change and Conservation (Dual listed with 465 same as NREM 565) (2 2) Cr 3 F *Prereq L A 202* Exploration of issues in landscape ecology and conservation biology relevant to landscape change design and planning Examination of foundational principles and their applications across a continuum of land uses from wilderness to urban areas

L A 567 Advanced GIS Landscape Modeling (0-4) Cr 2 *Prereq L A 302 or C R P 451/551* Application of Geographic Information Systems (GIS) modeling techniques to landscape planning and management issues Selection acquisition and conversion of digital landscape data Modeling applications for studio projects outreach projects and research projects

L A 572 Landscape Architectural History and Preservation (3 0) Cr 3 F *Prereq Admission to graduate program or permission of instructor* Research methods applied to the preservation and restoration of the historic landscape Outstanding landscape architectural works of the 18th 19th and 20th centuries will be used to familiarize students with methods of archaeological and documentary research technical problems of restoration and conservation and curatorial problems of interpretation and maintenance Lectures readings abstracts reports

L A 578 Topical Studies in Landscape Architecture (Dual-listed with 478 same as Dsn S 578) (2 0 or 3 0) Cr 2 or 3 each time taken FS SS *Prereq Senior classification or graduate standing*
A Landscape Design
B Planting Design
C Construction
D History/Theory/Criticism
E Landscape Planning
F Urban Design
G Graphics
H Honors
I Interdisciplinary Studies
J International Studies
K Computer Applications
L Ecological Design

L A 580 Thesis Creative ComponentTutorial Cr 1 to 4 each time taken maximum of 4 credits applied to degree program FS SS *Prereq Permission of major professor* Hands on participation in a creative or research activity in the student s area of specialization Development of a detailed prospectus that defines the thesis or creative component

L A 582 Research Colloquium (1 0) Cr 1 F *Prereq Admission to graduate program or permission of instructor* Examination and discussion of professional practice research in landscape architecture and environmental planning through research and projects by faculty in landscape architecture and related fields

L A 590 Special Topics Cr 1 to 4 FS SS *Prereq Written approval of instructor and department chair on required form*
A Landscape Design
B Planting Design
C Construction
D History
E Landscape Planning
F Urban Design
G Graphics
H Honors
I Interdisciplinary Studies
J International Studies
K Computer Applications
L Ecological Design

L A 591 Environmental Law (Same as C R P 591) See *Community and Regional Planning*

L A 599 Creative Component Cr var FS SS *Prereq Permission of major professor* Comprehensive study and original development of a project selected by the student and approved by the department Completed project must be submitted to and approved by a graduate faculty committee as evidence of mastery of the principles of landscape architecture

Course for Graduate Students, major or minor

L A 699 Thesis Research Cr var FS SS *Prereq Permission of professor*

Liberal Arts and Sciences Cross-Disciplinary Studies

Zora D Zimmerman Associate Dean for Academic Programs

Cross-disciplinary studies in the College of Liberal Arts and Sciences encompass programs of study and courses that cross established departmental lines

Cross-Disciplinary Programs

African American Studies Program (Minor only) see *Index African American Studies*

American Indian Studies Program (Minor only) see *Index American Indian Studies*

Biological/Premedical Illustration Program (Major or minor) see *Index Biological/Pre Medical Illustration*

Classical Studies (Minor only) see *Index Classical Studies*

Criminal Justice Studies (Minor only) see *Index Criminal Justice Studies*

Emerging Global Disease (Minor only) see *Index Emerging Global Disease*

Environmental Science (Major or minor) see *Index Environmental Science*

Environmental Studies (Secondary minor or major) see *Index Environmental Studies*

The Honors Program in Liberal Arts and Sciences see *Index Honors Program*

Interdisciplinary Studies Program (Major only) see *Index Interdisciplinary Studies*

International Studies Program (Second major or minor) see *Index International Studies*

U S Latino/a Studies Program

Program Director H Avalos

U S Latino/a Studies is devoted to the study of Mexican Americans Puerto Ricans Cuban Americans and other groups of people living in the United States who trace their ancestry to the Spanish speaking countries of Latin America and who comprise the fastest growing ethnic groups in America U S Latino/

a Studies is to be distinguished from Latin American studies which focuses on people living in Latin America The methodology of U S Latino/a Studies is cross disciplinary drawing from the methods established in anthropology sociology political science economics history literary studies and other fields

In addition to the general requirements of a major in Interdisciplinary Studies (see Index *Interdisciplinary Studies*) a major in Interdisciplinary Studies focusing on U S Latino/a Studies would require the completion of 24 credit hours At least 15 of the 24 credits must be in courses numbered 300 and above These 24 credits in the major focusing on U S Latino/a Studies must include the following courses each of which is worth three credits LAS 211 (Introduction to U S Latino/a Studies) Anthr 323 (Peoples and Cultures of Latin America) Engl 344 (U S Latino/a Literature) Hist 441 (History of Mexico and Central America) or a course in U S Latino/a history Relig 338 (The Latino/a Religious Experience) and Soc 332 (The Latino/a Experience in U S Society)

The student must have an average grade of C in the required courses of the major Fulfillment of the foreign language requirement with Spanish is strongly recommended but not required For a list of other eligible courses and more information on the U S Latino/a Studies Program contact the program committee chair

Linguistics Program (Major or minor, graduate minor) see *Index Linguistics*

Premedical and Preprofessional Health Programs see *Index Preprofessional Study*

Speech Communication Program (Major or minor) see *Index Speech Communication*

Teacher Education Program see *Index Teacher Education Courses and Programs*

Technology and Social Change (Minor, graduate minor)

Women's Studies Program (Major or minor) see *Index Womens Studies*

Courses Primarily for Undergraduate Students

LAS 101 Orientation for Open Option and Preprofessional Students (1 0) Cr 0 5 FS First 8 weeks Liberal Arts and Sciences staff Self responsibility and university procedures LAS general education requirements ISU departments and programs time management academic study skills adjustment to the university environment Required of all first year students in the Open Option and Preprofessional Health Programs Offered on a satisfactory fail grading basis only

LAS 104 Personal Career Development (2 0) Cr 2 FS *Prereq 12 credits of ISU coursework* Compre hensive approach to personal career development intensive self analysis utilization of a computerized career exploration system contact with area professionals examination of work in modern society and the impact of technology on the future of work exposure to job search skills necessary for career choice implementation

LAS 120 Study Abroad Credit (Same as IntSt 120) See *International Studies*

LAS 129 Introduction to Creativity (3 0) Cr 3 S Creativity and humor in the problem solving process The use of lateral thinking for developing new ideas

LAS 130 Cross Cultural Learning Community Seminar (1 0) Cr 1 Required seminar for participants in the Cross Cultural Learning Community The focus is on developing students cross-cultural communica tion skills increasing their awareness of international concerns and introducing them to international sources and opportunities available at Iowa State University Offered on a satisfactory fail grading basis only

LAS 150 Society Culture and Change in a Diverse Nation Cr 3 *Prereq Approval of instructor* An analysis of contemporary patterns of diversity in the United States The focus will be on patterns of gender class ethnicity nationality and race in the development of a multi-cultural society There will also be analysis of multiculturalism and national character

LAS 211 Introduction to U S Latino/a Studies (3 0) Cr 3 S A survey of the people in the United States who trace their origin to the Spanish-speaking countries of Latin America focusing principally on Mexican Americans Puerto Ricans and Cuban Americans History religion social structure political participation literature and other aspects of each group within the framework of various sociological theories of ethnic identity and relationship

LAS 220 Study Abroad Credit (Same as IntSt 220) See International Studies

LAS 235 Introduction to International Studies (Same as IntSt 235) See *International Studies*

LAS 250 Cultures in Transition Cr 3 An interdisci plinary introduction to a world region in a state of rapid social and cultural transition Discussion of the history social and political institutions arts economy agriculture and environment of the new nations

LAS 290 Special Problems Cr 1 to 3 each time taken FS SS *Prereq Freshman or sophomore classification* This course may be taken only with permission of the dean of the College of Liberal Arts and Sciences
G Catt Center Project Cr 1 to 3

LAS 298 Internship/Co op Cr R FS SS *Prereq Permission of Business/Liberal Arts and Sciences Career Services and the College of Liberal Arts and Sciences sophomore classification* Students participating in an internship or co-op on a full time basis must register for this course prior to beginning their work experience to remain in full time student status

LAS 320 Study Abroad Credit (Same as IntSt 320) See *International Studies*

LAS 325 Asian American Cultures History and Community Cr 3 *Prereq Engl 105* Development of Asian American cultures in the United States from 1850 to present Immigration and settlement patterns legal issues social movements assimila-tion media stereotypes and the impact of these phenomena on community building and the evolution of culture

LAS 350 Topics in Interdisciplinary Studies Cr 2-4 *Prereq Engl 105* Content varies

LAS 380 Orientation for Life in Iowa Service Learning Practicum Cr 1 FS Second 8 weeks Open to students from across the curriculum Prepares students for service learning in Iowa communities Class work examines the sustainable community from five perspectives politically economically spiritually ecologically and in community Students perform research and asset mapping of the community in which they will be working

LAS 381 Life in Iowa Seminar Cr 3 FS Introduces students to the philosophy and ethics of bioregionalism emphasizing the profound connections between humans and their environment Students examine the attributes of humane livable communi ties and healthy natural environments Students will be eligible for Life in Iowa paid internships and service learning practica and may perform research and asset mapping of an Iowa community in preparation for internship

LAS 382 Life in Iowa Service Learning Practicum Cr 4 FS SS Introduces students to community based learning for leadership and service in locations *throughout the state Student resides in an Iowa* community to work on a locally defined project Guided activity/reflection (via WEBCT) and a final report are required

LAS 383 Life in Iowa Internship Cr 4 SS Student resides in community usually as part of a team for 10 weeks during the summer Internships are tailored to the student s academic major and directed particularly to community leadership and sustainability In addition at least 100 hours of community service to the host community are required while in residence Campus and community mentors help design and oversee both the internship and the service learning practicum Guided reflection and a final report are required

LAS 385 The Holocaust (2 0) Cr 2 or (3 0) Cr 3 F An examination of the religious social scientific and historical contexts for the Nazi destruction of European Jewry Topics covered include anti-Semitism German volkish philosophy eugenics World War II the Final Solution rescuers and contemporary issues Optional third credit requires a term paper

LAS 395 Interdisciplinary Study Abroad Interdisci plinary examination of a selected world region via study abroad Multi faceted exploration of a selected world region directed at developing a comprehensive understanding of a selected culture s role in contemporary society
A Pre Departure Seminar Cr 1
B Humanities Cr 1-4
C Communications Cr 1 4
D Mathematics & Natural Science Cr 1-4
E Social Sciences Cr 1-4

LAS 398 Internship/Co op Cr R FS SS *Prereq Permission of Business/Liberal Arts and Sciences Career Services and the College of Liberal Arts and Sciences junior classification* Students participating in an internship or co-op on a full time basis must register for this course prior to beginning their work experience to remain in full time student status

LAS 417 StudentTeaching Cr var each time taken FS *Prereq Music 466 admission to teacher education approval of coordinator during semester before student teaching* Evaluation of instruction lesson planning and teaching in the liberal arts and sciences
K Music –Secondary
L Music – Elementary

LAS 420 Study Abroad Credit (Same as IntSt 420) See *International Studies*

LAS 430 Seminar in International Studies (Same as IntSt 430) See *International Studies*

LAS 480 Field Experience for SecondaryTeaching Preparation Cr 0 5 to 2 each time taken maximum of 2 Observation and participation in a variety of school settings after admission to the teacher preparation program Permission of area coordinator required prior to enrollment (S/F grading may be used in some offerings of some sections)
A History/Social Sciences
B Physical Sciences
C Mathematics
D Biological Sciences
F Speech Communication
J Earth Sciences
K Music

LAS 490 Independent Study Cr var FS SS *Prereq Permission of the dean of the College of Liberal Arts and Sciences* No more than 9 credits of LAS 490 may be applied toward graduation This course may be taken only with the permission of the dean of the College of Liberal Arts and Sciences
G Catt Center Project

LAS 498 Internship/Co op Cr R FS SS *Prereq Permission of Business/Liberal Arts and Sciences Career Services and the College of Liberal Arts and Sciences senior classification* Students participating in an internship or co-op on a full time basis must register for this course prior to beginning their work experience to remain in full time student status

LAS 499 Internship Cr 1 to 4 FS SS *Prereq Permission of the dean of the College of Liberal Arts and Sciences* Work experience in professional setting appropriate to the student s degree program Academic work under faculty supervision may include written projects reports and guided reading

Library

Olivia M A Madison, Dean of Library Services

Professors Cole Madison

Professors (Emeritus) Cook Dobson Galejs Kuhn McNee Morris Yates

Associate Professors Boydston Gerhard Goedeken Gregory Hanthorn Jackson Kushkowski Lawson Leysen Marinko McKiernan Osmus Parsons Pedersen Pellack Pelzer Shonrock Vega Garcia Wiese Wool Zanish Belcher

Associate Professors (Emeritus) Mathews Wendell

Assistant Professors Arcand Christian Coffey Daly Fowler Fryer Johns Lindstrom Llewellyn Sickles Stacy Bates

Undergraduate Study

The library offers non-credit presentations for undergraduate students in the effective use of the library s resources with emphasis on information literacy The presentations cover electronic and print sources of information in varied fields Arrangements are made by individual course instructors

Graduate Study

The library provides non credit presentations to assist faculty and graduate students in the effective use of the library s research resources The presentations cover electronic and print sources of information in varied fields Offered F S SS For more information call the library at 294 3642

Courses Primarily for Undergraduate Students

Lib 160 Library Instruction (1 0) Cr 0 5 FS SS 8 weeks *Prereq for students whose native language is not English Completion of English 101 requirement* Use of libraries and information sources both print and electronic including locations and services of the University Library with an emphasis on the research process To be taken as early as possible in the student s undergraduate career See course descriptions of Engl 105 and 105H for prerequisite related to Lib 160 Offered on a satisfactory fail grading basis only

Linguistics

www engl iastate edu/tesling/ba html

(Interdepartmental Program)

Program Committee D Bratsch Prince J Dow D Douglas B Schwarte C Thogmartin H Venkatagiri J Wagner

Undergraduate Study

The linguistics program is a cross-disciplinary program in the College of Liberal Arts and Sciences designed to meet the needs of students interested in various aspects of language—its structure history varieties meanings and uses The program includes courses in anthropology English computer science foreign languages and literatures psychology and speech communication thus providing a multi disciplinary approach to the study of human language

Courses in linguistics serve as background for students interested in any career that involves working with language such as anthropology computer word processing foreign language teaching teaching English both as a first and as a second language psychology sociology speech language pathology and audiology

In the College of Liberal Arts and Sciences courses in linguistics can be applied as electives or as part of the group requirements They may also be used in a minor or in a major

Majors in linguistics complete a minimum of 33 hours in courses from the list below Courses specifically required are Ling 219 309 371 419 and one of the following 420 or 498 Credit for only one course from the following set may be applied toward the major 486 487 524 525 To graduate with a major in linguistics a student must earn a C (not a C–) or better in each of the courses taken to fulfill the minimum requirements of the program of study in linguistics Students who believe they have extenuating circumstances may appeal to the chair of the supervisory committee In addition majors in linguistics must show proficiency in a foreign language equivalent to that achieved after two years of university-level study

Minors in linguistics are usually individually tailored to the interests of the student who consults with the chair of the supervisory committee for linguistics All minors must have a minimum of 15 credits in linguistics of which 6 must be in courses numbered over 300 All programs must include Ling 219 or 309

English proficiency requirement The linguistics program requires grades of C or better in each of the following English 104 105 (or 105H) and one of English 305 314 or a Foreign Language 370 course

For information about using linguistics courses in an interdisciplinary studies major see *Liberal Arts and Sciences Cross Disciplinary Studies*

Graduate Study

A graduate minor in linguistics is offered through a cooperative agreement with the departments and programs of Anthropology Computer Science English Foreign Languages and Literatures Psychology and Speech Communication The minor permits students to investigate a variety of aspects of linguistics emphasizing the ability to think about language in a systematic and disciplined way and to apply the methods of the field to research problems in their own disciplines

For the master s degree a declared minor consists of 9 credits in linguistics including two foundation courses (511 and either 514 or 516) and one elective from the list of courses approved for graduate credit For the Ph D degree the minor consists of 12 credits in linguistics including three foundation courses (511 514 and 516) and one elective It is recommended that the elective course be taken in a department other than English Additional courses beyond those listed below may be used as electives The chair of the supervisory committee can provide information about these

At least one member of the linguistics faculty will serve on a student s program of study committee A list of faculty members may be obtained from the chair of the supervisory committee Ph D candidates will write one section of the preliminary examination on an area of linguistics All students in the minor are expected to attend linguistics lectures and colloquia Students in English with a specialization in Teaching English as a Second Language/Linguistics are not eligible for a graduate minor in linguistics

Courses open for nonmajor graduate credit 331 352 413 420 422 425 462 463 471 498

Courses Primarily for Undergraduate Students

Ling 207 Introduction to Symbolic Logic (Same as Phil 207) See *Philosophy*

Ling 219 Introduction to Linguistics (Same as Engl 219) See *English*

Ling 220 Descriptive English Grammar (Same as Engl 220) See *English*

Ling 275 Introduction to Communication Disorders (Same as CmDis 275) See *Speech Communication*

Ling 286 Basic Sign Language (Same as CmDis 286) See *Speech Communication*

Ling 309 Linguistic Anthropology (Same as Anthr 309) See *Anthropology*

Ling 325 Nonverbal Communication (Same as ComSt 325) See *Speech Communication*

Ling 331 Theory of Computing (Same as Com S 331) See *Computer Science* Nonmajor graduate credit

Ling 352 Introduction to Spanish Phonology (Same as Span 352) See *Foreign Languages and Literatures* Non major graduate credit

Ling 371 Phonetics and Phonology (Same as CmDis 371) See *Speech Communication*

Ling 413 Psychology of Language (Same as Psych 413) See *Psychology* Nonmajor graduate credit

Ling 419 Grammatical Analysis (Dual listed with 516 same as Engl 419) See *English*

Ling 420 History of the English Language (Same as Engl 420) See *English* Nonmajor graduate credit

Ling 422 Women Men and the English Language (Same as Engl 422) See *English* Nonmajor graduate credit

Ling 425 Second Language Learning and Teaching (Same as Engl 425) See *English* Nonmajor graduate credit

Ling 462 Contrastive Analysis of Spanish/English for Translators (Same as Span 462) See *Foreign Languages and Literatures* Nonmajor graduate credit

Ling 463 Hispanic Dialectology (Same as Span 463) See *Foreign Languages and Literatures* Nonmajor graduate credit

Ling 471 Language Development (Same as CmDis 471) See *Speech Communication* Nonmajor graduate credit

Ling 486 Methods in Elementary School Foreign Language Instruction (Same as F Lng 486) See *Foreign Languages and Literature*

Ling 487 Methods in Secondary School Foreign Language Instruction (Same as F Lng 487) See *Foreign Languages and Literatures*

Ling 489 Undergraduate Seminar (Same as Engl 489) See *English* Acceptable only when offered as a course in linguistics

Ling 490B Independent Study Linguistics Semantics (Same as Engl 490B) See *English*

Ling 490D Independent Study Linguistic Anthropology (Same as Anthr 490D) See *Anthropology*

Ling 498 History of the Germanic Language (Same as F Lng 498) See *Foreign Languages and Literatures* Nonmajor graduate credit

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Ling 500 Language and Culture (Same as Anthr 500) See *Anthropology*

Ling 511 Introduction to Linguistic Analysis (Same as Engl 511) See *English*

Ling 512 Linguistic Change in English Historical Analysis of Literary and Non-Literary Texts (Same as Engl 512) See *English*

Ling 514 Sociolinguistic (Same as Engl 514) See *English*

Ling 516 Grammatical Analysis (Dual listed with 419 same as Engl 516) See *English*

Ling 517 Second Language Acquisition (Same as Engl 517) See *English*

Ling 518 Teaching English as a Second Language Methods and Materials (Same as Engl 518) See *English*

Ling 524 Literacy Issues and Methods for Nonnative Speakers of English (Same as Engl 524) See *English*

Ling 525 Methods in Teaching Listening and Speaking Skills to Nonnative Speakers of English (Same as Engl 525) See *English*

Ling 526 Computer Assisted Language Learning (Same as Engl 526) See *English*

Ling 527 Discourse Analysis (Same as Engl 527) See *English*

Ling 590 Special Topics (Same as Anthr 590) See *Anthropology* Acceptable only when taught as a course in linguistics

Ling 590B Special Topics Teaching English as a Second Language (TESL)/Linguistics (Same as Engl 590B) See *English*

Ling 591 Studies in Applied Linguistics (Same as Engl 591) See *English*

Management

Russell N Laczniak Chair of Department

Distinguished Professors Wortman

University Professors Morrow

Professors Chacko Hunger McElroy Shrader Van Auken Werbel

Associate Professors Blackburn DeMarie Johnson

Associate Professors (Emeritus) Aitchison

Assistant Professors Herrmann Kaufmann

Lecturers Smith

Undergraduate Study

For undergraduate curriculum in business major in management see *College of Business Curricula*

The Department of Management offers a major in management Students will complete the general education requirements (including business foundation courses) and business core requirements for the bachelor of science degree (B S)

Management is a broadly defined discipline and activity which is neither industry nor function specific Management concepts theories techniques and skills are applicable to all business functional areas and are essential components for successful organizations Management requires sound conceptual technical and human skills for the effective utilization of organizational resources For the Management major students are required to take Mgmt 371 377 414 and 471 In addition students select two courses from an approved list to complete the 18-credit major

The department also offers a minor for non Management majors in the College of Business The minor requires 15 credits from an approved list of courses of which 9 credits must stand alone Students with declared majors have priority over students with declared minors in courses with space constraints

Graduate Study

The Department of Management participates in three graduate programs the M S in Business the M B A full time and part time programs and the interdisciplinary M S degree in Industrial Relations The M S in Business is a 30-credit curriculum culminating in a thesis The M B A program is a 48-credit hour curriculum Twenty four of the 48 credit hours are core courses and the remaining 24 are graduate electives A student can obtain a specialization in Human Resource Management by taking 12 credit hours of courses from a selected list of courses Finally the department is one of several participating departments offering coursework leading to an interdisciplinary M S in industrial relations

Courses open for nonmajor graduate credit Mgmt 414 415 472 479

Courses Primarily for Undergraduate Students

Mgmt 310 Entrepreneurship and Innovation (3-0) Cr 3 FS *Prereq Junior classification* Review of the entrepreneurial process with emphasis on starting a new business How to analyze opportunities develop an innovative product organize finance market launch and manage a new venture Deals with the role of the entrepreneur and the importance of a business plan Speakers and field project

Mgmt 313 Feasibility Analysis and Business Planning (3 0) Cr 3 S *Prereq 310* Developing an idea for a new business venture conducting a feasibility study researching the potential market analyzing the competition and writing a formal business plan Basic business functions are discussed in terms of their application to conducting feasibility analysis and writing a business plan for an entrepreneurial venture

Mgmt 370 Management of Organizations (3-0) Cr 3 FS SS *Prereq Econ 101* A management functions approach is used to explain what managers do in organizations how they deal with external constituents how they structure their companies and how they deal with employees A contingency approach is used as a framework for understanding how to increase the effectiveness and efficiency of organizations in today s dynamic highly competitive business environment

Mgmt 371 Organizational Behavior (3-0) Cr 3 FS *Prereq 370* The study of individual attributes interpersonal relations and employee attitudes in organizations Instructional emphasis is placed on how management concepts such as reward systems job design leadership teams etc can be used to manage employee attitudes and behavior

Mgmt 377 Competitive Strategy (3-0) Cr 3 F *Prereq Econ 101 and junior classification* Developing competitive strategy and achieving competitive advantage in firms including industry analysis generic strategies hypercompetition competing against time and building distinctive capabilities

Mgmt 414 International Management (3-0) Cr 3 F The nature and economic role of the multinational firm and entrepreneurial ventures including the impact of legal political and cultural variables upon firm performance and managerial activity case studies illustrate interdependent nature of functional areas of business projected across national boundaries Nonmajor graduate credit

Mgmt 415 Managing New Ventures (3 0) Cr 3 FS *Prereq 370 Mkt 340 Fin 301 TrLog 360 POM 320* Examination of business problems and issues in new and growing firms Emphasis is on analyzing existing businesses Includes a field project Nonmajor graduate credit

Mgmt 419 Social Responsibility of Business (3 0) Cr 3 S A consideration of the role of business in society Critical analysis of ethical managerial and public issues as they affect the corporation

Mgmt 471 Personnel and Human Resource Management (3-0) Cr 3 FS *Prereq Junior standing* Recruitment and selection utilization and development of people in organizations Examination of each personnel function interrelationships among the functions

Mgmt 472 Management of Diversity (3-0) Cr 3 FS *Prereq Junior classification* One of the most crucial problems in organizations today is the management of diversity Attempts to define the difference between equal employment opportunity/affirmative action which has a legal basis and diversity which has an educational basis Organized around the concepts of (1) cultural diversity and cultural unity (2) development of skills and tools to manage diversity and (3) structure of diversity development programs in organizations Nonmajor graduate credit

Mgmt 478 Strategic Management (3-0) Cr 3 FS SS *Prereq 370 POM 320 Fin 301 Mkt 340 TrLog 360 Acct 285 graduating senior* Strategy formulation implementation and evaluation and control in today s organizations Emphasis is on strategic planning and decision making using the case method and/or projects

Mgmt 479 Management Seminar (3 0) Cr 3 S *Prereq Senior classification in management and permission of the instructor* Discussion of new or controversial issues in management Course utilizes advanced material and research drawn from topic areas within management Nonmajor graduate credit

Mgmt 490 Independent Study Cr 1 to 3 each time taken *Prereq 370 senior classification permission of instructor*

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Mgmt 501 Strategy Formation (1-0) Cr 1 F *Prereq Graduate classification* An introduction to the strategic planning process How to formulate strategy in context of environmental opportunities and threats how to analyze industry competition and build competitive advantages

Mgmt 507 Organizational Behavior (2-0) Cr 2 F *Prereq Graduate classification* Understanding human behavior in organizations and the nature of organizations from a managerial perspective Special emphasis is placed on how individual differences such as perceptions personality and motivation influence individual and group behavior in organizations and on how behavior can be influenced by job design leadership groups and the structure of organizations

Mgmt 511 Ethics and Social Responsibility (1-0) Cr 1 S *Prereq Graduate classification* The ethical issues moral dilemmas and stakeholder responsibilities embraced by today s corporate decision makers The morality of current management models and practices Corporate governance and control moral reasoning in groups whistleblowing employee safety truth in advertising environmental pollution plant closings insider trading employee rights

Mgmt 512 Strategic Management (2 0) Cr 2 S *Prereq 501 507 POM 502 MIS 503 Mkt 504 Fin 505 Acct 508* Critical analysis of case studies in strategic management with an emphasis on integrative decision making Strategy implementation in light of the legal regulatory economic social and political contexts of business

Mgmt 565 Technology Transfer and Feasibility Analysis (3 0) Cr 3 *Prereq Graduate classification* Commercialization of new technology Topics covered include market analysis intellectual property product development feasibility analysis and new business evaluation

Mgmt 566 Entrepreneurship and New Business Creation (3 0) Cr 3 *Prereq 512* The essentials of starting and operating a new business Topics include current research on entrepreneurial perspective starting and developing a new business financing the venture managing the growing firm and special issues

Mgmt 570 Managing Employee Attitudes and Behaviors (3 0) Cr 3 FSS *Prereq 371 or 507 or Psych 450* Advanced topics germane to the management of individuals and groups over their work lives sustained work commitment motivation and job/career satisfaction absenteeism turnover stress leadership and career development (e g career ladders mentoring)

Mgmt 571 Seminar in Personnel and Human Resources Management (3-0) Cr 3 S *Prereq 371 or 507 or Soc 420* Topics and issues in personnel management with a focus on the management of human resources in organizations Current personnel practices philosophies and behavioral science research

Mgmt 573 Employment Law for Managers (3-0) Cr 3 *Prereq Graduate classification* Survey of employment law for managers Topics include hiring employees employment practices (e g handbooks harassment drug testing discipline) union relations and termination of employment (e g COBRA)

Mgmt 575 Compensation Management (3 0) Cr 3 F *Prereq 571* Concepts techniques and issues dealing with remuneration of the work force The impact of government legislation as well as organizational and societal issues

Mgmt 581 Strategic Planning and Environmental Analysis (3 0) Cr 3 F *Prereq 501 or permission of instructor* Discussion of concepts and techniques used in long range strategic planning Examination of planning practices in business and not for profit organizations Topics include environmental scanning industry analysis forecasting corporate and competitive strategies and tactics

Mgmt 590 Special Topics Cr 1 to 3 each time taken FSSS *Prereq Permission of instructor* For students wishing to do individual research in a particular area of management

Management Information Systems

(Administered by the Department of Logistics Operations and Management Information Systems)

Richard F Poist Jr Interim Chair of Department

Distinguished Professors Allen Baumel

Professors Crum Poist

Professors (Emeritus) Thompson Voorhees

Associate Professors Hendrickson Larson Lummus Mennecke Nilakanta Premkumar Ruben Townsend Walter

Assistant Professors Hackbarth Johnson Montabon Strader Suzuki Zhu

Instructors (Adjunct) Blanshan Chang Choobineh Clayton Tandradinata

Undergraduate Study

For undergraduate curriculum in business major in management information systems (MIS) see *College of Business Curricula*

The MIS Program is designed to provide students with a strong educational foundation that prepares them as information system (IS) professionals The academic program consists of a specially designed curriculum that emphasizes conceptual analytical technical and interpersonal skills The major offers students comprehensive training in the application use and management of information systems to prepare them to provide effective information services and support to organizations The coursework is designed to provide the technical and conceptual skills associated with the use of information technology in business organizations The program will impart knowledge on existing and emerging information technologies and their impact on the IS function train to critically analyze business processes identify inefficiencies and problems assess information requirements create business solutions and technical specifications for the supporting system provide expertise to design and develop database applications using the latest database technologies provide expertise in the latest telecommunication technologies train in interpersonal and communication skills to effectively interact with various information systems clients and provide managerial skills to manage IS projects

To enter the MIS major students must achieve a cumulative ISU grade point average of 2 75 or a grade point average of 2 75 in the foundation (see *College of Business Curricula*) The MIS major requires students to take six courses The required courses are Com S 201 MIS 331 MIS 432 MIS 433 and MIS 435 In addition they will take one additional elective course from an approved list These courses are designed to provide the conceptual technical and managerial skills necessary to design and develop systems in organizations

Graduate Study

The MIS area participates in three graduate programs in the College of Business—M S in Business MSIS and full time and part time M B A programs The M S program is a 30 credit hour curriculum with a thesis

The M B A program is a 48 credit hour curriculum Twenty four of the 48 credit hours are core business courses and the remaining 24 credit hours are graduate electives Students can obtain a MIS specialization in the M B A program by taking 12 credit hours of graduate MIS courses from a selected list of courses

The masters of science in information systems (MSIS) is a 32 credit (minimum) curriculum designed around three inter related areas Foundation IS and electives All students are expected to be familiar with basic computing skills before they enter the program The MSIS will educate students on applying IS theory and concepts to modern IS development through classes that enable them to learn and use the latest software in application projects Students graduating from the program will have advanced technical and managerial skills to develop and manage information systems projects

The MIS area also participates in an interdeptmental MS program in Information Assurance

Courses open for nonmajor graduate credit 432 433 435 and 438

Courses Primarily for Undergraduate Students

MIS 330 Management Information Systems (3 0) Cr 3 *Prereq Com S 103* The role of information technology in organization Overview of methodologies for design and development of systems including decision support systems expert systems data bases end user computing etc Computer applications relate concepts to practice Lecture and laboratory work emphasizes the enabling role of IT in contemporary organizations

MIS 331 File Structures and Programming (3 0) Cr 3 *Prereq 330 Com S 207* Introduction to the concepts and use of data structures file accesses and object oriented programming methodologies in contemporary business environments Object oriented programming languages such as C++ used Application development environments will be covered

MIS 432 Information Systems Analysis (3-0) Cr 3 *Prereq 330 Com S 201* Critical analysis of business processes data and process modeling feasibility studies CASE tools and developing system design specifications Nonmajor graduate credit

MIS 433 Database Management Systems (3-0) Cr 3 *Prereq 331* Database design development and implementation Focus on data models both classical and object oriented Uses relational and/or object oriented database management systems Nonmajor graduate credit

MIS 434 Electronic Commerce Strategy (3 0) Cr 3 *Prereq 330 Mkt 340 TrLog 360* Overview of business strategies and technologies used for electronic commerce Emphasis is on the strategic operational and technical issues associated with global electronic commerce using class lecture/discussion and case studies

MIS 435 Business Telecommunications (3 0) Cr 3 *Prereq 331* Overview of communications technology used in various business applications - local area network wide area network broad band network wireless and voice network Understand the role of protocols particularly internet protocols in communications Train to analyze network requirements design and implement local area networks Nonmajor graduate credit

MIS 438 Information Systems Development (3 0) Cr 3 *Prereq 432 433* Design of business systems using contemporary tools and methods such as SQL CASE tools OOD tools etc Focuses on synthesizing concepts from earlier MIS courses Nonmajor graduate credit

MIS 439 Topics in Management of Information Systems (3-0) Cr 3 *Prereq 331 permission of instructor* A variety of topics will be covered and topics may vary between semesters Some of the topics are information resources management electronic commerce decision support systems and expert systems

MIS 490 Independent Study Cr 1 to 3 each time taken *Prereq 330 senior classification permission of instructor*

Courses Primarily for Graduate Students Open to Qualified Undergraduate Students

MIS 503 Management Information Systems (2 0) Cr 2 *Prereq Graduate classification* Current theories and practices of information processing and decision making Focus on information technology and its uses in improving work practices products and tools for decision support Use of artificial intelligence and other developments in technology Competitive pressures and risks of information technology (IT) Setting IT strategy information system planning and development of enterprise architecture Focus on systems development and implementation

MIS 531 Business Software Development (3 0) Cr 3 *Prereq 503* A survey of business oriented programming languages with emphasis on design writing debugging and testing of computer programs for business transaction processing and managerial decision support Topics include structured programming and file processing

MIS 532 Advanced Business Software Development (3 0) Cr 3 *Prereq 531 or equivalent* A survey of business oriented programming languages with emphasis on state of the art development techniques for business software Topics include object oriented and Internet programming issues and methods

MIS 533 Data Management for Decision Makers (3 0) Cr 3 *Prereq 503* The course will address the data needs of functions such as marketing finance production etc The course will focus on teaching advanced data base management skills needed to design develop and use database data warehousing and data mining systems for effective decision support Importance of contemporary technologies will be stressed

MIS 534 Electronic Commerce (3 0) Cr 3 *Prereq 503* Overview of how modern communication technologies including the internet and world wide web have revolutionized the way we do business It will provide an understanding of various internet technologies and how companies are using the internet for commercial purposes The course will also explore future scenarios on the use of these technologies and their impact on various industries and the society

MIS 535 Telecommunications Management (3-0) Cr 3 *Prereq 503* Issues involved in the management of telecommunications function Overview of communications technology used in various business applications local area network wide area network broad band network wireless and voice networks Internet technologies and protocols Analyzing the strategic impact of these technologies on organizations Strategic planning for telecommunications including network planning and analysis

MIS 537 Information Resource Management (3 0) Cr 3 *Prereq 503* Information Resource Management (IRM) is a popular concept of viewing information systems resources from a strategic resource perspective This course will present and discuss the IRM concept as well as provide pragmatic tools for implementing this approach within the organization Topics will include IS outsourcing total cost of ownership IS planning and strategic analysis justification for IT investment management of IT human resources traditional project management theory and project management techniques derived from the Theory of Constraints (TOC)

MIS 538 Business Processes and Systems Development (3 0) Cr 3 *Prereq 503* Discusses the theory and techniques used to analyze information systems to support various business processes The course also discusses the theory and concepts related to business systems design such as data and process modeling relational data base theory database management systems design and developing technical specifications for a business system A working prototype for a business application will be developed using popular software development packages

MIS 539 Topics in Management of Information Systems (3 0) Cr 3 *Prereq 503* A variety of topics may be offered in different semesters Topics may include electronic commerce information resources management decision support systems and expert systems

MIS 590 Special Topics Cr 1 to 3 each time taken *Prereq Permission of instructor* For students wishing to do individual research in a particular area of MIS

MIS 599 Creative Component Cr 3 *Prereq Graduate classification permission of supervisory committee chair* Preparation and writing of creative component

Courses for Graduate Students

MIS 699 Research Cr 3 to 6 arranged FS SS *Prereq Graduate classification permission of major professor* Research

Marketing

Russell N Laczniak Chair of Department

Distinguished Professors Teas

Professors Laczniak Ramaswami

Professors (Emeritus) Zober

Associate Professors Agarwal Barone DeCarlo Palan Wong

Assistant Professors Mallalieu Norman

Lecturers Akili

Undergraduate Study

For undergraduate curriculum in business major in marketing see *College of Business Curricula*

In addition to the business core marketing majors are required to complete 18 credits of marketing or department approved courses Included in these 18 credits are three required courses Mkt 443 444 and 447

Marketing is concerned with management decisions that deal with the satisfaction of customer needs and wants in the purchase and use of goods and services The primary decision areas in marketing involve the identification of market segments and decisions dealing with product design pricing promotion (including personal selling and marketing communications) and distribution A major in marketing prepares the student for careers in selling and sales management marketing research marketing management retailing marketing communications promotion management and international marketing Each field of study may be applied to consumer industrial and service marketing in business and nonprofit organizations

The instructional objective of the Marketing department is to provide knowledge of the marketing process and an understanding of the marketing function The students are expected to develop decision making skills computational skills and communication skills with appreciation for global marketplace and ethical concerns

The department also offers a minor for non Marketing majors in the College of Business The minor required 15 credits from an approved list of courses of which 9 credits must stand alone Students with declared majors have priority over students with declared minors in courses with space constraints

Graduate Study

The Department of Marketing participates in two graduate programs the M S in Business and the M B A full time and part time programs The M S in business is a 30-credit curriculum culminating in a thesis or creative component The M B A program is a 48-credit nonthesis noncreative-component curriculum Twenty four of the 48 credit hours are core courses and the remaining 24 are graduate electives Within the M B A program students may develop an area of specialization in marketing This specialization requires that 12 of the 24 credit hours of graduate electives be from marketing

Courses open for nonmajor graduate credit 410 442 444 447 448 449 and 492

Courses Primarily for Undergraduate Students

Mkt 340 Principles of Marketing (3 0) Cr 3 FS SS *Prereq Econ 101* The role of marketing in society Markets marketing institutions and marketing functions with emphases on product price marketing communication and marketing channel decisions

Mkt 343 Personal Sales (3 0) Cr 3 *Prereq 340* Analysis of the theory and practice of personal selling with the context of relationship marketing and salesforce automation Topics include goal setting prospecting time/territory management questioning presentations objections commitment and customer service simulations of selling situations

Mkt 410 Promotional Strategy (3 0) Cr 3 FS *Prereq Credit or enrollment in 447* Principles concepts and problems involved in the development and implementation of promotional strategies Coordination of a variety of promotional elements advertising sales promotion direct marketing public relations and publicity of web communications and personal selling Nonmajor graduate credit

Mkt 442 Sales Management (3 0) Cr 3 FS *Prereq 340* Functional aspects of sales force management personal selling methods procedures for recruiting selecting and training new salespeople compensation and expense control systems problems of sales force motivation and supervision methods of territorial and quota assignment sales department budgets distributor dealer relations other selected topics Nonmajor graduate credit

Mkt 443 Strategic Marketing Management (3-0) Cr 3 FS *Prereq 444 447* Analysis of major elements of strategic marketing management May include case studies or business simulations involving decision making using marketing tools from previous courses (For marketing majors only)

Mkt 444 Fundamentals of Marketing Research (3-0) Cr 3 FS *Prereq 340 Stat 226 Marketing research* techniques problem formulation research design questionnaire construction sampling data collection procedures and analysis and interpretation of data related to marketing decisions Nonmajor graduate credit

Mkt 446 Retailing (3-0) Cr 3 FS *Prereq 340* Basic areas of retail management buying merchandising retail promotion store location store layout credit management and inventory control Emphasis on practical application of retail management principles

Mkt 447 Fundamentals of Consumer Behavior (3-0) Cr 3 FS *Prereq 340* Study of how consumers select purchase use and dispose of goods and services Includes analyses of how markets and others influence these processes Application of concepts and methods of the behavioral sciences to marketing management decision making Nonmajor graduate credit

Mkt 448 Fundamentals of International Marketing (3-0) Cr 3 FS *Prereq 340* Introduction to terms used in international marketing and sources of information on international markets Development of sensitivity toward foreign business environment and familiarity with operations of multinational corporations Nonmajor graduate credit

Mkt 449 Marketing Seminar (3 0) Cr 3 *Prereq 340* Analysis of current issues and problems in marketing with emphasis on new theoretical and methodological developments Additional seminars may be offered Nonmajor graduate credit
C Marketing for the Internet

Mkt 490 Independent Study Cr 1 to 3 each time taken *Prereq 340 senior classification permission of the instructor*

Mkt 492 Comparative Marketing (3 0) Cr 3 SS *Prereq 340* The course is designed to provide experience to students in culture social economic and political environment of marketing in a foreign country Students complete a term project (e g a marketing plan) based on information collected in the foreign country Students attend briefings by experts/officials of private and public organizations Nonmajor graduate credit

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Mkt 504 Marketing (2 0) Cr 2 *Prereq Graduate classification* The scope of marketing and the identification and assessment of marketing opportunities Consumer behavior and decision making process organizational buyer behavior and the role of research in the marketing planning process Market definition and analysis segmentation competitor analysis targeting and strategic decisions involved in developing the marketing program Developing marketing mix strategies and relating them to the overall strategic marketing plan Organizational design for marketing strategy implementation and control and effectiveness

Mkt 509 International Business (2-0) Cr 2 *Prereq Graduate classification Survey of the structure and* environment of international business Patterns of international trade economic and monetary systems cross cultural and legal aspects of international business Global dimensions of the functional disciplines of business Tools for developing global strategies such as economic analysis and risk analysis

Mkt 540 Marketing Management (3-0) Cr 3 FS *Prereq 504* Strategic marketing and decision making with emphasis on cases utilizing qualitative and quantitative techniques and marketing models

Mkt 541 International Marketing (3 0) Cr 3 F *Prereq 504 509* Scope and nature of global marketing operation the context of international environment in which firms operate Recent developments of international business activities and a framework for better understanding of the basic forces driving international business and marketing operations Development of market entry strategies and global marketing mix policies as well as export operations Organizational issues related to the globalization of the firm

Mkt 542 New Product Development and Marketing (3 0) Cr 3 S *Prereq 504* Principles and concepts of new product development and introduction decision areas include market definition and structure idea generation concept evaluation test marketing launch tracking and global product planning models and techniques of new product evaluation used by consumer product companies

Mkt 544 Marketing Research (3-0) Cr 3 S *Prereq 504 Stat 328 or 401* Marketing research methods are examined with emphasis on the use of advanced research methods in business research Application of advanced sampling measurement and data analysis methods in research on market segmentation market structure consumers perceptions and decision processes marketing communication new product development and pricing

Mkt 545 Integrated Marketing Communication (3-0) Cr 3 *Prereq Mkt 504* This course introduces the student to the field of marketing communications It will cover a number of topics and areas essential for understanding how to design and evaluate communication strategies necessary for the successful marketing of products and services An integrated marketing communications (IMC) perspective is employed in covering material with a corresponding focus on various elements of an IMC strategy including advertising promotions point-of purchase communications direct marketing techniques and other topics

Mkt 547 Consumer Behavior (3-0) Cr 3 S *Prereq 504* The behavior of consumers Intensive review of literature from relevant disciplines Applications of concepts and methods of the behavioral sciences to marketing management decision making

Mkt 590 Special Topics Cr 1 to 3 each time taken *Prereq Permission of instructor* For students wishing to do individual research in a particular area of marketing

Materials Engineering

(Administerd by the Department of Materials Science and Engineering)

Mufit Akinc Chair of Department

Distinguished Professors Gschneidner Thiel Thompson Trivedi

Professors Akinc Chumbley Genalo Jiles D Martin S Martin McGee Pecharsky Tsukruk

Professors (Adjunct) Anderson McCallum

Distinguished Professors (Emeritus) Verhoeven

Professors (Emeritus) Larsen Patterson Smith Wechsler Wilder

Associate Professors K Constant Conzemius Gleeson Mallapragada Russell

Associate Professors (Adjunct) Biner Lograsso

Assistant Professors Cann A Constant Napolitano Tan Zoubarev

Assistant Professors (Adjunct) Kramer Selby Snyder Sordelet

Undergraduate Study

For the undergraduate curriculum in materials engineering leading to the degree bachelor of science see *College of Engineering Curricula* This curriculum is accredited by the Engineering Accreditation Committee of the Accreditation Board for Engineering and Technology

Materials engineering is a broadly based discipline relating the composition microstructure and processing of materials to their properties uses and performance Materials engineering includes a variety of traditional and modern technologies involving metals ceramics polymers composites and electronic materials

Because of its interdisciplinary nature career opportunities for materials engineers bridge all industrial and government sectors including materials based technologies (materials production) communication/information technologies (semicon ducting materials fiber optics) medical/environmen tal technologies (biomedical energy production waste containment) consumer products (building and construction durable goods) and transportation industries (automotive aerospace)

The objectives of the materials engineering program are to produce graduates who
- practice materials engineering in a broad range of industries including materials production seminconductors medical/environmental consumer products and transportation products
- are capable of responding to environmental social political ethical and economic constraints to improve the quality of life in Iowa and the world
- are capable of working independently and in teams and are proficient in written oral and graphical communication
- engage in lifelong learning in response to the rapidly expanding knowledge base and changing environment of our world
- engage in advanced study in materials and related or complementary fields

Graduates in materials engineering are able to apply scientific and engineering principles to select or design the best materials to solve engineering problems They are also able to control the microstructure of materials through processing to optimize properties and performance They are skilled in creative independent problem solving under time and resource constraints Graduates will have gained experience in materials engineering practice through cooperative work experience or internships in industry national laboratories or other funded research work They will have hands on skills with a broad range of modern materials processing and characterization equipment and methods

A degree in materials engineering relies on a strong foundation of math chemistry and physics The core materials courses include fundamentals of materials kinetics and thermodynamics mechanical properties computational methods and design experience throughout the program (beginning in the sophomore year) Students tailor their programs to their goals and interests through the selection of two areas of specialization from the four available ceramic materials electronic materials metallic materials and polymeric materials Additional technical electives can be taken in other areas of interest The breadth and depth of the program provide excellent preparation for both immediate entry into industry or further study in graduate school

The department also offers a cooperative education program that combines classroom learning with work experience (See *College of Engineering Cooperative Programs)*

Well qualified juniors in materials engineering who are interested in graduate study may apply for concurrent enrollment during their senior year in the Graduate College to simultaneously pursue both B S and M S degrees See *Materials Science and Engineering* for more information

Courses open for nonmajor graduate credit All 300 or 400 level courses except 313 370 396 397 398 413 414 466 490 498

Courses Primarily for Undergraduate Students

Mat E 211 Introduction to Materials Science and Engineering (4-3) Cr 5 F *Prereq Chem 177 or 167* Structure and properties of ceramic electronic polymeric and metallic materials emphasizing differences based on structure and bonding Phase equilibria and phase transformations Laboratory exercise in materials property measurements Restricted to Materials Engineering majors

Mat E 212 Thermodynamics in Materials Engineer ing (3-0) Cr 3 S *Prereq Chem 178 and credit or enrollment in Math 266* Basic laws of thermodynam ics applied to materials systems Thermodynamics of chemical reactions Homogeneous and heteroge neous equilibrium Phase diagrams for materials systems

Mat E 213 Integrated Materials Design (1 3) Cr 2 F *Prereq Credit or enrollment in 211* Design of devices parts processes or systems (including experiments) taking into account physical chemical mechanical economic and ethical principles Project planning including scheduling and cost estimation Application of design tools such as CAD CAM and FEM Analysis of problems design and development of solutions Safety concept of shared responsibility teamwork communication Testing and data collection Interpretation of results and reporting Oral presentation skills

Mat E 214 Structural Characterization of Materials (2 3) Cr 3 S *Prereq Credit or enrollment in Phys 221* Structural characterization of ceramic electronic polymeric and metallic materials Techniques include optical and electron microscopy x ray diffraction and thermal analysis Identification of materials type microstructure and crystal structure

Mat E 272 Principles of Materials Science and Engineering (2-0) Cr 2 FS SS *Prereq Chem 167 or 177* Introduction to the structure of metals polymers and ceramics Crystal structure and imperfections in metals Diffusion mechanical properties and failure mechanisms Phase equilibrium diagrams and heat treatment principles for steels cast irons composite materials and aluminum alloys Corrosion and electrical properties Engineering applications

Mat E 298 Cooperative Education Cr R FS SS *Prereq Permission of department* First professional work period in the cooperative education program Students must register for this course before commencing work

Mat E 313 Integrated Materials Design (1 3) Cr 2 F *Prereq 213* Design of devices parts processes or systems (including experiments) taking into account physical chemical economic and ethical principles Project planning including scheduling and cost estimation Application of design tools such as CAD CAM and FEM Analysis of problems design and development of solutions Safety concept of shared responsibility teamwork communication Testing and data collection Interpretation of results and reporting Oral presentation skills

Mat E 315 Kinetics and Phase Equilibria in Materials (3 0) Cr 3 F *Prereq 211* Kinetic phenomena and phase equilibria relevant to the origins and stability of microstructure in metallic ceramic and polymeric systems Application of thermodynamics to the understanding of stable and metastable phase equilibria interfaces and their effects on stability defects and diffusion empirical rate equations for transformation kinetics driving forces and kinetics of nucleation diffusional and diffusionless phase transformations Nonmajor graduate credit

Mat E 316 Computational Methods in Materials (2 2) Cr 3 S *Prereq 211* Use of mathematical and statistical computer tools for materials design and analysis Applications of statistical principles to problems concerned with materials Computer assisted design of experiments Nonmajor graduate credit

Mat E 318 Mechanical Behavior of Materials (2 3) Cr 3 S *Prereq E M 324* Mechanical behavior of ceramics metals polymers and composites Relationships between materials processing and atomic aspects of elasticity plasticity fracture and fatigue Life prediction stress and failure analysis Nonmajor graduate credit

Mat E 321 Ceramic Processing Forming (2 3) Cr 3 F *Prereq 211* Raw materials characterization of ceramic powders and slurries ceramic forming methods slip casting injection molding extrusion dry pressing drying and evaluation of green microstructures relationship between forming method and resulting microstructure Nonmajor graduate credit

Mat E 322 Ceramic Processing - Firing (2 3) Cr 3 FS *Prereq 211* High temperature ceramic firing interpretation of phase diagrams analysis of silicate systems liquid and solid state sintering grain growth microstructure development and advanced fabrication methods Nonmajor graduate credit

Mat E 331 Introduction to Electronic Properties of Materials (3 2) Cr 4 F *Prereq 211* Introduction to electronic properties of materials and their practical applications Elementary electrical circuit concepts Band theory of electron states in materials conduction mechanisms electrical properties and magnetic properties of metallic semiconducting and dielectric materials Laboratory experiments Nonmajor graduate credit

Mat E 332 Semiconductor Materials and Devices (Same as E E 332) (3 0) Cr 3 S *Prereq 331 or E E 333 and credit or enrollment in E E 312 or Phys 222* Introduction to semiconductor material and device physics Quantum mechanics and band theory of semiconductors Charge carrier distributions generation/recombination transport properties Physical and electrical properties and fabrication of semiconductor devices such as MOSFETs bipolar transistors laser diodes and LED s Nonmajor graduate credit

Mat E 341 Metals Processing and Fabrication (2-3) Cr 3 F *Prereq 211 214* Emphasis on secondary processing of metals and alloys Machining deformation and texturing effects joining (welding brazing soldering) casting powder metallurgy Nonmajor graduate credit

Mat E 342 Structure/Property Relations in Metals (2 3) Cr 3 S *Prereq 214 315* Processing of metals and alloys to obtain desired mechanical properties by manipulation of their microstructure and composition of consituent phase(s) Relevance of defects to mechanical properties plastic flow Strengthening mechanisms in metals and alloys Microstructure heat treatment and mechanical properties of engineering alloys Metal matrix composites Nonmajor graduate credit

Mat E 351 Introduction to Polymeric Materials (3-0) Cr 3 F *Prereq 211* Introduction to polymeric materials synthesis structure and properties Relationship between polymer composition processing and properties Oral presentation Nonmajor graduate credit

Mat E 362 Principles of Nondestructive Testing (Same as E M 362) (3-0) Cr 3 S *Prereq Phys 112 or 222* Radiography ultrasonic testing magnetic particle inspection eddy current testing dye penetrant inspection and other techniques Physical bases of tests materials to which applicable types of defects detectable calibration standards and reliability safety precautions Nonmajor graduate credit

Mat E 362L Nondestructive Testing Laboratory (Same as E M 362L) (0 3) Cr 1 S *Prereq Credit or enrollment in 362* Application of nondestructive testing techniques to the detection and sizing of flaws in materials and to the characterization of material s microstructure Included are experiments in hardness dye penetrant magnetic particle x ray ultrasonic and eddy current testing Field trips to industrial laboratories Nonmajor graduate credit

Mat E 370 Toying with Technology (Same as Cpr E 370) (2-2) Cr 3 FS *Prereq C I 201 junior standing in non-engineering major* A project-based hands-on learning course Technology literacy appreciation for technological innovations principles behind many technological innovations hands-on laboratory experiences based upon simple systems constructed out of LEGOs and controlled by small microcomputers Future K-12 teachers will leave the course with complete lesson plans for use in their upcoming careers

Mat E 396 Summer Internship Cr R SS *Prereq Permission of department* Summer professional work period

Mat E 397 Engineering Internship Cr R FS *Prereq Permission of department junior classification* Professional work period one semester maximum per academic year

Mat E 398 Cooperative Education Cr R FS SS *Prereq 298 permission of department* Second professional work period in the cooperative education program Students must register for this course before commencing work

Mat E 413 Integrated Materials Design (0-6) Cr 2 F *Prereq 313* Design of devices parts processes or systems (including experiments) taking into account physical chemical mechanical economic and ethical principles Project planning including scheduling and cost estimation Application of design tools such as CAD CAM and FEM Analysis of problems design and development of solutions Safety concept of shared responsibility teamwork communication Testing and data collection Interpretation of results and reporting Oral presentation skills

Mat E 414 Materials Engineering Design (0-6) Cr 2 S *Prereq Senior classification* Practical applications of physical chemical mechanical and/or electrical principles to solving materials science and engineering design problems Consideration of economic and time constraints in design of materials and processes Involvement in real world design problems specified by external sponsors such as industry or government Oral and written final project report

Mat E 423 Glass Science and Engineering (2 3) Cr 3 F *Prereq 212* Composition structure properties manufacturing and uses of inorganic glasses especially silicate glasses Nonmajor graduate credit

Mat E 424 Ceramic Industries (3-0) Cr 3 S *Prereq 322* Property control of products for various ceramic industries Utilization of ceramic products in contemporary applications with a global perspective for raw materials engineering science and industrial activity Ethical economic and life-long learning aspects for professional engineering practice Nonmajor graduate credit

Mat E 432 Microelectronics Fabrication Techniques (Same as E E 432) (2-4) Cr 4 Semester varies *Prereq E E 332 or Mat E 332* Techniques used in modern integrated circuit fabrication including diffusion oxidation ion implantation lithography evaporation sputtering chemical-vapor deposition and etching Process integration Process evaluation and final device testing Extensive laboratory exercises utilizing fabrication methods to build electronic devices Use of computer simulation tools for predicting processing outcomes Recent advances in processing CMOS ICs and micro mechanical systems (MEMS) Nonmajor graduate credit

Mat E 433 Advanced Electronic Materials (2-3) Cr 3 F *Prereq 331* Advanced concepts in band theory of solids including chemical bonding in solids and the linear combination of atomic orbitals phase transitions in electronic magnetic and optical materials Dielectric materials ferroelectricity piezoelectricity sensors and non stoichiometric conductors Optical properties optical spectra of materials optoelectronic devices Magnetic and superconducting materials Nonmajor graduate credit

Mat E 443 Ferrous Metallurgy (2 3) Cr 3 F *Prereq 211 212 214* Production and processing of ferrous metals Extraction of pig iron from ore Steelmaking processes Equilibrium and nonequilibrium phases in the Fe C system Properties and processing of cast irons plain carbon and alloy steels stainless and specialty steels Transformation diagrams hardenability and surface treatments Continuous casting forging hot rolling quenching and tempering as they apply to ferrous materials Cost and mechanical performance considerations in cast iron and steel selection and heat treatment Nonmajor graduate credit

Mat E 444 Corrosion and Failure Analysis (2 2) Cr 3 S *Prereq 211 318* Corrosion and corrosion control of metallic systems Corrosion fundamentals classification of different types of metallic corrosion corrosion properties of various engineering alloys corrosion control Failure analysis Characteristics of common types of metallic failures case studies of failures designing to reduce failure risk Nonmajor graduate credit

Mat E 453 Physical and Mechanical Properties of Polymers (Dual-listed with MSE 553) (2 3) Cr 3 *Prereq 351* Overview of polymer chemical composition microstructure thermal and mechanical properties rheology and principles of polymer materials selection Intensive laboratory experiments include chemical composition studies microstructural characterization thermal analysis and mechanical testing Nonmajor graduate credit

Mat E 454 Polymer Composites and Processing (Dual-listed with MSE 554) (3-0) Cr 3 *Prereq 351* Basic concepts in polymer composites phase separation and miscibility microstructures and mechanical behavior Polymer surfaces and interfaces rubber toughened plastics thermoplastic elastomers block copolymers fiber reinforced and laminated composites Techniques of polymer processing and materials selection Viscosity and rheology of polymers Polymer melt processing methods such as injection molding and extrusion selection of suitable processing methods and their applications Nonmajor graduate credit

Mat E 466 Multidisciplinary Engineering Design (Same as Cpr E 466 E E 466 I E 466 M E 466) (1-4) Cr 3 FS *Prereq Student must be within two semesters of graduation and receive permission of the instructor* Application of team design concepts to projects of a multidisciplinary nature Concurrent treatment of design manufacturing and life cycle considerations Application of design tools such as CAD CAM and FEM Design methodologies project scheduling cost estimating quality control manufacturing processes Development of a prototype and appropriate documentation in the form of written reports oral presentations computer models and engineering drawings

Mat E 490 Independent Study Cr arr Investigation of individual research or special topics

Mat E 498 Cooperative Education Cr R FS SS *Prereq 398 permission of department* Third and subsequent professional work periods in the cooperative education program Students must register for this course before commencing work

Materials Science and Engineering

Mufit Akinc, Chair of Department

Distinguished Professors Gschneidner Thiel Thompson Trivedi

Professors Akinc Chumbley Genalo Jiles D Martin S Martin McGee Pecharsky Tsukruk

Professors (Adjunct) Anderson McCallum

Distinguished Professors (Emeritus) Verhoeven

Professors (Emeritus) Larsen Patterson Smith Wechsler Wilder

Associate Professors K Constant Conzemius Gleeson Mallapragada Russell

Associate Professors (Adjunct) Biner Lograsso

Assistant Professors Cann A Constant Napolitano Tan Zoubarev

Assistant Professors (Adjunct) Kramer Selby Snyder Sordelet

Graduate Study

The department offers work toward the degrees master of science (with thesis) and doctor of philosophy with a major in materials science and engineering Research in the department is administered through the College of Engineering and Institute for Physical Research and Technology (IRPRT) Centers such as the Ames Laboratory the Center for Nondestructive Evaluation the Microelectronics Research Center and the Center for Advanced Technology Development which provide excellent facilities and graduate student research assistantships

Graduates have a broad understanding of materials science and engineering and related disciplines They are able to communicate effectively with scientific colleagues in formal and informal settings Graduates are able to address complex problems in materials science and process design while considering the various constraints inherent to both industrial and research environments They are skilled in carrying out independent and collaborative research communicating research results and writing concise and persuasive grant proposals

Prerequisite to major graduate work is completion of an undergraduate curriculum in physical science or related engineering However well qualified juniors in materials engineering interested in graduate study can apply for concurrent enrollment in the Graduate College to simultaneously pursue M S and B S degrees Graduate assistantships can be awarded to students concurrently enrolled Both M S and B S degrees can be obtained in five years of study under the concurrent enrollment plan

The requirements for the MS and PhD degrees are established by the student s program of study committee within the established guidelines of the Graduate College These requirements include coursework research dissertation and a final oral examination The PhD degree also includes a qualifying examination

There are no foreign language requirements for either of the graduate degrees administered by the Department of materials science and engineering

Graduate students wishing to declare a formal minor in materials science and engineering will have at least one M S E faculty member serving on their advisory committee For the M S and Ph D degrees they will take a minimum of 8 and 12 M S E course credits respectively

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

M S E 501 Thermodynamics of Materials (3 0) Cr 3 F *Prereq Mat E 315 or Mat E 212 or Chem 321 Math 266* Review of basic principles thermodynamic laws and functions statistical thermodynamics probabilities and distributions phase transformations solution thermodynamics phase diagrams reactions with gases

M S E 502 Kinetics of Processes in Materials Science (3-0) Cr 3 S *Prereq 501* Reaction kinetics surfaces and interfaces solid state diffusion nucleation and diffusion controlled growth solidifica tion microstructures diffusionless transformations

M S E 515 Advanced Polymers Materials (3-0) Cr 3 Overview of basic principles of polymeric materials and the latest developments in design and applications Recently introduced polymeric materials (functional block-copolymers biomedical conductive nanocomposites electrooptical non linear optial polymers) and prospective applications in functional coatings artificial implants microelectronics nanodevices chemo/bio sensors and optical computing Independent research and an oral presentation on a specific polymer topic

M S E 516 Chemistry of Crystalline Materials (3 0) Cr 3 *Prereq Mat E 211* Review of the fundamentals of bonding in solids Crystal and ligand field theories Crystal systems and symmetry operations Crystal chemistry of metals and inorganic compounds Crystal structure-property relationships

M S E 517 Physical Metallurgy of Alloys (3-0) Cr 3 *Prereq Mat E 443* Application of fundamental concepts of phase transformations heat flow mechanical behavior and structure-property relations to the problems of heat treatment and selection of steels and aluminum copper and titanium alloys

M S E 518 Metallurgy of Rare Earths (2 0) Cr 2 *Prereq Mat E 443 or Phys 322 or 324 or Chem 321* Electronic configuration valence states minerals ores beneficiation extraction separation metal preparation and purification crystal structure transformation melting and boiling points chemical behavior inorganic compounds alloy chemistry nature of the chemical bond mechanical and elastic properties magnetic properties resistivity and superconductivity

M S E 519 Magnetism and Magnetic Materials (Same as E E 519) (3-0) Cr 3 *Prereq Mat E 211 or 272 or E E 311or Phys 364* Magnetic fields flux density and magnetization Magnetic materials magnetic measurements Magnetic properties of materials Domains domain walls domain processes magnetization curves and hysteresis Types of magnetic order magnetic phases and critical phenomena Magnetic moments of electrons theory of electron magnetism Technological application soft magnetic materials for electromagnets hard magnetic materials permanent magnets magnetic recording technology magnetic measurements of properties for materials evaluation

M S E 521 Mechanical Behavior and Manufacturing of Polymers and Composites (Same as M E 521) See *Mechanical Engineering*

M S E 528 Structure and Properties of Glass (3 0) Cr 3 *Prereq Mat E 423 or Mat E 212 or Chem 321* Advanced theory of the vitreous state Structure of glasses nucleation theory control of devitrification composition structure property relationships

M S E 533 Characterization Methods in Materials Science (2 3) Cr 3 *Prereq Mat E 214 or equivalent* Characterization of ceramic metal polymer and glassy materials using modern analytical techniques Spectroscopic (IR Raman UV/VIS/NIR and NMR) thermal (DSC DTA/TGA and DMA) methods mechanical and rheological testing magnetic and electrical characterization and powder characteriza- tion

M S E 534 Scanning and Auger Electron Micros copy (2-3) Cr 3 *Prereq Phys 222* Characterization of materials using scanning electron microscope (SEM) electron microprobe and auger spectrometer Compositional determination using energy and wavelength dispersive x ray and Auger spec troscopies Specimen preparation Laboratory covers SEM operation

M S E 535 X Ray Electron and Neutron Diffraction (3 0) Cr 3 *Prereq Mat E 214* Introduction to theory of X-ray electron and neutron diffraction symmetry operations space groups and reciprocal lattice Laue and powder diffraction methods and their application to precise lattice parameters determination of simple crystal structures phase identification orientation texture grain size strain residual stress and order-disorder

M S E 539 Electronic Properties of Materials (Same as E E 539) (3-0) Cr 3 *Prereq Mat E 331 or E E 332 or Phys 322* Review of quantum mechanics band theory of solids LCAO model metallic condution lattice vibrations semiconductors semiconductor devices dielectrics polarization mechanisms dieletric relaxation crystal anisotropy ferroelectricity piezoelectricity conducting oxides magnetism

M S E 541 Mechanical Behavior of Materials (3 0) Cr 3 F *Prereq Mat E 315 Math 266* Mechanical behavior of materials based on atomic and microstructural considerations Elasticity plasticity yield criteria introduction to dislocation theory Brittle and ductile fracture fatigue and creep design criteria statistical aspects of failure

M S E 544 Oxidation and Corrosion (3 0) Cr 3 *Prereq Mat E 212* Study of origin development and current applicability of theories of corrosion and oxidation of materials

M S E 550 Fundamentals of Nondestructive Evaluation (Same as E M 550) See *Engineering Mechanics*

M S E 553 Physical and Mechanical Properties of Polymers (Dual-listed with Mat E 453) (2 3) Cr 3 *Prereq Mat E 351* Overview of polymer chemical composition microstructure thermal and mechanical properties rheology and principles of polymer materials selection Intensive laboratory experiments include chemical composition studies microstructural characterization thermal analysis and mechanical testing

M S E 554 Polymer Composites and Processing (Dual listed with Mat E 454) (3-0) Cr 3 *Prereq Mat E 351* Basic concepts in polymer composites phase separation and miscibility microstructures and mechanical behavior Polymer surfaces and interfaces rubber toughened plastics thermoplastic elastomers block copolymers fiber reinforced and laminated composites Techniques of polymer processing and materials selection Viscosity and rheology of polymers Polymer melt processing methods such as injection molding and extrusion selection of suitable processing methods and their applications

M S E 563 Powder Processing of Materials (3 0) Cr 3 *Prereq Mat E 214* Introduction to materials processing science Powder processing routes characterization of powders Fabrication of materials by casting molding pressing rolling and forging operations Densification by solid or liquid phase sintering hot pressing and hot isostatic pressing Microstructure development

M S E 564 Fracture and Fatigue (Same as E M 564) See *Engineering Mechanics*

M S E 570 Toying With Technology for Practicing Teachers (Same as C I 570) (2 0) Cr 2 A project based hands-on learning course Technology literacy appreciation for technological innovations principles behind many technological innovations hands-on experiences based upon simple systems constructed out of LEGOs and controlled by small microcomput ers Other technological advances with K 12 applications will be explored K-12 teachers will leave the course with complete lesson plans for use in their classrooms

M S E 580 Biomaterials (3 0) Cr 3 S *Prereq Mat E 211 or 272* Presentation of the basic chemical and physical properties of biomaterials including metals ceramics and polymers as they are related to their manipulation by the engineer for incorporation into living systems Role of microstructure properties in the choice of biomaterials and design of artificial organs implants and prostheses

M S E 590 Special Topics Cr var *Prereq Permission of instructor*

M S E 599 Creative Component Cr var

Courses for Graduate Students

M S E 603 Mathematical Methods for Materials Research (3 0) Cr 3 *Prereq Math 266 and permission of instructor* Development of mathemati cal tools for problem solving and modeling in materials science and engineering including crystallography wave propagation phase transforma tions heat and mass transfer diffraction and anisotropic properties

M S E 612 Alloy Theory (3 0) Cr 3 *Prereq 516 or Chem 402* Substitutional solid solution alloys— models of Friedel Hume Rothery Brewer Engel interstitial solid solution alloys compound formation— Miedema s model crystal chemistry approaches and metastable alloys

M S E 635 Transmission Electron Microscopy (3 3) Cr 4 S *Prereq 534* Characterization of inorganic materials using TEM Selected area and convergent beam electron diffraction bright field/dark field/high resolution imaging Compositional analysis using x-ray and electron energy loss spectroscopy

M S E 690 Advanced Topics in Materials Science Cr var *Prereq Permission of instructor*

M S E 697 Engineering Internship Cr R FS SS *Prereq Permission of department graduate classification* One semester and one summer maximum per academic year professional work period Offered on a satisfactory fail grading basis only

M S E 699 Research

Mathematics

www math iastate edu

Justin Peters Chair of Department

Distinguished Professors Athreya Gunzburger Levine

Professors Bergman Dahiya Dickson Evans Fink Gautesen Hentzel Hou E Johnston Kliemann Lieberman Luecke Maddux Murdock Peters Peterson Rothmayer Sacks Smiley Smith Tesfatsion Tondra Willson Wright

Distinguished Professors (Emeritus) Miller Vinograde

University Professors (Emeritus) Cornette

Professors (Emeritus) Barnes Cain Carlson Colwell Homer Mathews Peglar Pigozzi Rudolph Sanderson Seifert A Steiner E Steiner Weiss

Associate Professors Alexander Ashlock Davidson Gregorac Hansen Hogben Keinert Liu Poon Sethuraman Song Tidriri Wagner Wang Weerasinghe Wilson Wu

Associate Professors (Collaborators) Yan

Associate Professors (Emeritus) Heimes

Assistant Professors Axenovich Burstein DAlessandro Emanouvilov

Assistant Professors (Emeritus) Peake

Lecturers Chan Doolittle Hall Harper G Johnston Pfantz Thompson

Undergraduate Study

For the undergraduate curriculum in liberal arts and sciences major in mathematics leading to the degree bachelor of science see *Liberal Arts and Sciences Curriculum*

The program in mathematics offers training suitable for students planning to enter secondary school teaching to work in mathematics and computation for industry or government or to continue their studies in graduate school The requirements for an undergraduate major in mathematics are designed so that the student may have opportunity for appropriate specialization to meet one or more of the foregoing objectives and at the same time obtain a thorough introduction to the mathematics underlying all of them

Graduates understand a broad range of mathematical topics and are familiar with a broad range of mathematical models They have skills for solving problems in diverse situations They can construct rigorous arguments to demonstrate mathematical facts They can communicate their mathematical methods to others and can justify their assumptions

The requirements for an undergraduate major include

(a) The sequence 175 176 or the sequence 165 166 201 Also 265 301 317 414 and either 266 or 267

(b) 15 additional credits chosen from math courses at the 300 level or above 6 of which must be included in (341 365 471 481)

(c) The courses used to satisfy a) and b) above must include one of the sequences 301 302 414 415 435 436

(d) In addition to the credits in (b) either Math 492 or 2 credits of C I/LAS 480C (C I/LAS 480C is available only for students seeking secondary school certification)

(e) English proficiency requirement The department requires a grade of C– or better in each of English 104 and 105 (or 105H) and an upper level writing requirement that may be met by writing an acceptable undergraduate thesis (Math 491) or by taking at least one of Engl 302 305 314 or JI MC 201 A grade of C or better is required

The department strongly recommends that each student majoring in mathematics include in the program substantial supporting work beyond the minimum general education requirement of the college in one or more areas of application of mathematics such as other mathematical sciences engineering natural science or social science In particular it recommends that each student take Com S 207 208 Phys 221 222 and Stat 341 342 (or Math 304) It also strongly recommends two years of French German or Russian for students contemplat ing graduate study in mathematics Credits earned in Math 104 105 140 141 142 150 151 160 181 182 195 196 297 cannot be counted toward graduation by mathematics majors

The department offers a minor in mathematics which may be earned by credit in Math 165 166 265 301 307 or 317 and 266 or 267 Courses below 165 cannot be used

Graduate Study

The department offers programs leading to a master of science or doctor of philosophy degree in mathematics or applied mathematics as well as minor work for students whose major is in another department The department also offers a program leading to the degree of master of school mathemat ics (M S M)

Students desiring to undertake graduate work leading to the M S or Ph D degree should have at least 12 semester credits of work in mathematics beyond calculus It is desirable that these credits include advanced calculus and abstract algebra

The M S degree requires at least 30 credit hours and students must write a creative component or thesis and pass a comprehensive oral examination over their coursework and their creative component or thesis See the department handbook for specific requirements

The Ph D degree requires a student to take 54 hours of coursework in addition to research hours pass written qualifying examinations pass an oral preliminary exam and perform an original research project culminating in a dissertation which is defended by an oral exam Ph D candidates must have at least one year of supervised teaching experience See the department handbook for specific requirements (Also see the website *www math iastate edu/gradcomm/gradreq html* for details)

The M S M degree is primarily for inservice secondary mathematics teachers Students desiring to pursue the M S M degree should present some undergraduate work in mathematics beyond calculus Candidates for the M S M degree must write an approved creative component and pass a comprehen sive oral examination over their course work and their creative component

Courses open for nonmajor graduate credit 301 302 304 307 308 314 317 331 350 365 378 385 395 414 415 421 426 435 436 439 465 471 481 484 489

Courses Primarily for Undergraduate Students

Math 10 High School Algebra (4 0) Cr 0 FS SS For students who do not have adequate facility with topics from high school algebra or do not meet the algebra admission requirement All students should initially enroll in Math 10 The course is divided into tracks of one and two semester lengths For most students a diagnostic exam will determine which track must be taken Students will receive a grade in Math 25 or 30 respectively depending on the level of material covered Satisfactory completion of Math 30 is recommended for students planning to take Math 140 or 151 while Math 25 is sufficient for Math 104 105 150 195 Stat 101 or 105 Students must complete Math 30 to remove a deficiency in the algebra admission requirement Topics include signed numbers polynomials rational and radical expres sions exponential and logarithmic expressions and equations Offered on a satisfactory fail grading basis only

Math 20 High School Geometry (4 0) Cr 0 S For students who do not meet the geometry admission requirement Elements of Euclidean geometry including congruence parallel lines circles similar polygons perimeters areas surface areas and volumes Offered on a satisfactory fail grading basis only

Math 25 High School Algebra (4 0) Cr 0 FS SS For students who do not have adequate facility with topics from high school algebra or do not meet the algebra admission requirement All students should initially enroll in Math 10 The course is divided into tracks of one and two-semester lengths For most students a diagnostic exam will determine which track must be taken Students will receive a grade in Math 25 or 30 respectively depending on the level of material covered Satisfactory completion of Math 30 is recommended for students planning to take Math 140 or 151 while Math 25 is sufficient for Math 104 105 150 195 Stat 101 or 105 Students must complete Math 30 to remove a deficiency in the algebra admission requirement Topics include signed numbers polynomials rational and radical expres- sions exponential and logarithmic expressions and equations Offered on a satisfactory fail grading basis only

Math 30 High School Algebra (4 0) Cr 0 FS SS For students who do not have adequate facility with topics from high school algebra or do not meet the algebra admission requirement All students should initially enroll in Math 10 The course is divided into tracks of one- and two semester lengths For most students a diagnostic exam will determine which track must be taken Students will receive a grade in Math 25 or 30 respectively depending on the level of material covered Satisfactory completion of Math 30 is recommended for students planning to take Math 140 or 151 while Math 25 is sufficient for Math 104 105 150 195 Stat 101 or 105 Students must complete Math 30 to remove a deficiency in the algebra admission requirement Topics include signed numbers polynomials rational and radical expres sions exponential and logarithmic expressions and equations Offered on a satisfactory fail grading basis only

Math 101 Orientation in Mathematics (1-0) Cr R F For new majors Issues to consider in planning a program of study Sources of general information and perspectives concerning mathematics Discussion of possible areas of study or careers Offered on a satisfactory fail grading basis only

Math 104 Introduction to Probability and Matrices (3 0) Cr 3 FS *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of high school geometry* Permutations combinations probability binomial and multinomial theorems matrices expected value Either 104 or 150 may be counted toward graduation but not both

Math 105 Introduction to Mathematical Ideas (3-0) Cr 3 FS *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of high school geometry* Topics from mathemat ics and mathematical applications with emphasis on their nontechnical content

Math 140 College Algebra (3 1) Cr 3 FS SS *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of high school geometry* Coordinate geometry complex numbers quadratic and polynomial equations functions graphing polynomial and rational functions exponential and logarithmic functions systems of equations Students in the College of Liberal Arts and Sciences may not count Math 140 141 142 149 or 195 toward Group III of the General Education Requirements

Math 141 Trigonometry (2 0) Cr 2 FS SS *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of high school geometry or enrollment in 140 May be taken concurrently with 140* Trigonometric functions and their inverses solving triangles trigonometric identities and equations graphing Students in the College of Liberal Arts and Sciences may not count Math 140 141 142 149 or 195 toward Group III of the General Education Requirements Only one of 141 142 may count toward graduation

Math 142 Trigonometry and Analytic Geometry (2 1) Cr 3 FS SS *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of high school geometry or enrollment in 140 May be taken concurrently with 140* Trigonometric functions and their inverses solving triangles trigonometric identities and equations graphing polar coordinates complex numbers standard equations of lines and conic sections parametric equations Students in the College of Liberal Arts and Sciences may not count Math 140 141 142 149 or 195 toward Group III of the General Education Require ments Only one of 141 142 may count toward graduation

Math 149 Precalculus Mathematics (5-0) Cr 4 F *Prereq Satisfactory performance on placement exams 2 years high school algebra 1 year geometry 1 semester of trigonometry* A fast paced review of topics from algebra trigonometry and analytic geometry required for the Math 165 166 265 *calculus sequence Students in the College of Liberal* Arts and Sciences may not count Math 140 141 142 149 or 195 toward Group III of the General Education Requirements Only one of 140 149 may count toward graduation

Math 150 Discrete Mathematics for Business and Social Sciences (2 1) Cr 3 FS SS *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of high school geometry* Linear equations and inequalities linear programming matrix algebra discrete probability Either 104 or 150 may be counted toward graduation but not both

Math 151 Calculus for Business and Social Sciences (2 1) Cr 3 FS SS *Prereq Satisfactory performance on placement exam 2 years of high*

school algebra 1 year of high school geometry Differential calculus integral calculus introduction to max min theory for functions of two variables Will not serve as prerequisite for 265 or 266 Only one of 151 160 the sequence 165 166 the sequence 175 176 or the sequence 181 182 may be counted towards graduation

Math 160 Survey of Calculus (4 0) Cr 4 FS *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of geometry* Analytic geometry differentiation and integration of elementary functions Will not serve as a prerequisite for 265 or 266 Only one of 151 160 the sequence 165-166 the sequence 175 176 or the sequence 181-182 may be counted towards graduation

Math 165 Calculus I (4-0) Cr 4 FS SS *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of geometry 1 semester of trigonometry or enrollment in 141 or 142* Functions limits continuity differentiation derivatives of vector valued functions applications of derivatives Only one of 151 or 160 or the sequence 165-166 the sequence 175 176 or the sequence 181 182 may be counted towards graduation

Math 165H Honors Calculus I (4-0) Cr 4 F *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of geometry 1 semester of trigonometry High math placement scores recommended but not required* Functions limits continuity differentiation derivatives of vector valued functions applications of derivatives Additional material of a theoretical conceptual computational or modeling nature Some of the work may require more ingenuity than is required in Math 165 Preference will be given to students in the University Honors Program Only one of 151 or 160 or the sequence 165 166 or the sequence 175 176 or the sequence 181 182 may be counted towards graduation

Math 166 Calculus II (4-0) Cr 4 FS SS *Prereq Grade of C- or better in 165 165H or 175 or high math placement scores* Integration applications of the integral matrices differentiation of functions of several variables Only one of 151 160 the sequence 165-166 the sequence 175-176 or the sequence 181 182 may be counted towards graduation

Math 166H Honors Calculus II (4 0) Cr 4 FS *Prereq Permission of instructor and 165 165H or 175 or high math placement scores* Integration applications of the integral matrices differentiation of functions of several variables Additional material of a theoretical conceptual computational or modeling nature Some of the work may require more ingenuity than is required for Math 166 Preference will be given to students in the University Honors Program Only one of 151 or 160 the sequence 165 166 the sequence 175 176 or the sequence 181 182 may be counted towards graduation

Math 181 Calculus and Differential Equations for the Life Sciences (3 2) Cr 4 FS *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of high school geometry 1 semester of trigonometry or enrollment in 141 or 142* Exponential and logarithm functions derivative first order linear difference equations and differential equations Examples taken from laboratory experiments Only one of 151 160 the sequence 165-166 the sequence 175 176 or the sequence 181 182 may be counted towards graduation

Math 182 Calculus and Differential Equations for the Life Sciences (3 2) Cr 4 FS *Prereq 181* Integral nonlinear and second order difference equations and differential equations Examples taken from laboratory experiments Only one of 151 160 the sequence 165 166 the sequence 175-176 or the sequence 181 182 may be counted towards graduation

Math 195 Mathematics for Elementary Education I (2 2) Cr 3 FS *Prereq Satisfactory performance on placement exam 2 years high school algebra 1 year of high school geometry enrollment in elementary education* Language of sets systems of whole numbers numeration and algorithms for computation topics from number theory geometric shapes and measurement congruence similarity and transforma tions probability and statistics

Math 196 Mathematics for Elementary Education II (2-2) Cr 3 FS *Prereq Grade of C or better in 195* Language of sets systems of whole numbers numeration and algorithms for computation topics from number theory geometric shapes and measurement congruence similarity and transforma tions probability and statistics

Math 201 Introduction to Proofs (2 0) Cr 2 FS *Prereq 166 or 166H* Reading and writing simple proofs Proofs involving sequences and the definitions of limit derivative and the definite integral Proofs by mathematical induction Only one of the sequence 175 176 or 201 may be counted towards graduation

Math 205 Computer Programming in FORTRAN (Same as Com S 205) See *Computer Science*

Math 265 Calculus III (4 0) Cr 4 FS SS *Prereq Grade of C- or better in 166 166H or 176* Multiple integrals vector fields and vector integrals sequences and series

Math 265H Honors Calculus III (4 0) Cr 4 FS *Prereq Permission of the instructor and 166 166H or 176* Multiple integrals vector fields and vector integrals sequences and series Additional material of a theoretical conceptual computational or modeling nature Some of the work may require more ingenuity than is required in Math 265 Preference will be given to students in the University Honors Program

Math 266 Elementary Differential Equations (3-0) Cr 3 FS SS Prereq *Grade of C- or better in 166 166H or 176* Solution methods for ordinary differential equations First order equations linear equations constant coefficient equations Eigenvalue methods for systems of first order linear equations Introduction to stability and phase plane analysis

Math 267 Elementary Differential Equations and Laplace Transforms (4 0) Cr 4 FS SS *Prereq Grade of C- or better in 166 166H or 176* Same as 266 but also including Laplace transforms and series solutions to ordinary differential equations

Math 268 Laplace Transforms (1 0) Cr 1 F *Prereq 266* Laplace transforms and series solutions to ordinary differential equations Together 266 and 268 are the same as 267

Math 273 Introduction to Scientific Computation (3 0) Cr 3 FS SS *Prereq Math 265 or enrollment in Math 265 Math 266 or Math 267 knowledge of Fortran or C* Vector matrix and graphics programming for scientific applications Algorithms for interpolation systems of linear equations least squares nonlinear equations and optimization in one and several variables and ordinary differential equations Emphasis on high quality mathematical software its strengths and limitations

Math 290 Special Problems Cr 1 to 3 each time taken
H Honors

Math 297 Intermediate Topics in Elementary Mathematics (2-2) Cr 3 FS *Prereq Grade of C or better in 196* Additional topics in geometry including coordinates congruence similarity and transforma tions Pre-algebraic reasoning Topics in mathematics of current importance to prospective elementary teachers

Math 298 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator sophomore classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Math 301 Introduction to Abstract Algebra (3 0) Cr 3 FS *Prereq 166 or 166H or 176 and 307 or 317* Introduction to the theory of groups and rings Emphasis on writing proofs Nonmajor graduate credit

Math 302 Introduction to Abstract Algebra (3-0) Cr 3 S *Prereq 301* Theory of fields abstract vector spaces and linear algebra Emphasis on writing proofs Nonmajor graduate credit

Math 304 Introductory Combinatorics (3 0) Cr 3 F *Prereq 166 166H or 176* Permutations combina tions binomial coefficients inclusion-exclusion principle discrete probability classical probability Additional topics selected from recurrence relations generating functions random walks and Markov chains Nonmajor graduate credit

Math 307 Theory of Matrices (3 0) Cr 3 FS SS *Prereq 2 semesters of calculus* Systems of linear equation determinants vector spaces inner products linear transformations eigenvalues and eigenvectors Emphasis on methods and techniques Only one of 307 317 may be counted toward graduation Nonmajor graduate credit

Math 308 Application of Linear Algebra to Discrete Optimization (3-0) Cr 3 S *Prereq 307 or 317* Linear programming and topics chosen from game theory transportation and assignment problems discrete dynamic processes and multiple objective linear programming Nonmajor graduate credit

Math 314 Graphs and Networks (3 0) Cr 3 S *Prereq 166 166H or 176* Graphs directed graphs and trees Connectedness Graph colorings Eulerian and Hamiltonian chains Matching and covering Optimization for networks Applications Nonmajor graduate credit

Math 317 Theory of Linear Algebra (4 0) Cr 4 FS *Prereq 166* Systems of linear equations determi-nants vector spaces inner product spaces linear transformations eigenvalues and eigenvectors Emphasis on writing proofs and results Nonmajor graduate credit Only one of 307 317 may be counted toward graduation

Math 331 Topology (3 0) Cr 3 Alt S offered 2005 *Prereq 307 or 317* Topological properties of metric spaces including Rn sequences continuous functions completeness compactness Nonmajor graduate credit

Math 341 Introduction to Theory of Probability and Statistics (Same as Stat 341) See *Statistics*

Math 342 Introduction to Theory of Probability and Statistics (Same as Stat 342) See *Statistics*

Math 350 Number Theory (3 0) Cr 3 Alt S offered 2005 *Prereq 307 or 317* Properties of the integers Diophantine equations prime number distribution and representation problems Applications to cryptogra phy Nonmajor graduate credit

Math 365 Complex Variables with Applications (3 0) Cr 3 FS *Prereq 265* Functions of a complex variable including differentiation integration and series expansions residues evaluation of integrals conformal mapping Only two of 365 385 395 may be counted toward graduation Nonmajor graduate credit

Math 378 Optimization and Modeling with Artificial Life (3-0) Cr 3 S *Prereq One of 301 304 Com S 330 or other discrete math* Familiarity with programming Introduction to the modeling and optimization techniques that together are called artificial life or alife Biological paradigms from evolution and ecology are used to solve problems in biology engineering and areas such as combinatorial or functional optimization Evolutionary programming genetic algorithms genetic programming evolution-ary neural nets and their uses in optimization and modeling Nonmajor graduate credit

Math 385 Introduction to Partial Differential Equations (3-0) Cr 3 FS *Prereq 265 and one of 266 267* Separation of variables methods for elliptic parabolic and hyperbolic partial differential equations Fourier series Sturm-Liouville theory Bessel functions and spherical harmonics Only two of 365 385 395 may be counted toward graduation Nonmajor graduate credit

Math 395 Intermediate Engineering Mathematics (4-0) Cr 4 FS *Prereq 265 and 267* Complex variables and analytic functions complex integration techniques complex series Fourier series separation of variables in partial differential equations Only two of 365 385 395 may be counted toward *graduation Nonmajor graduate credit*

Math 398 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator junior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Math 414 Advanced Calculus (3 0) Cr 3 FS SS *Prereq 201 or 176 265 and 307 or 317* A careful development of calculus of functions of a real variable limits continuity differentiation integration series Nonmajor graduate credit

Math 415 Advanced Calculus (3-0) Cr 3 S *Prereq 414* Sequences and series of functions of a real variable uniform convergence power series and Taylor series Stone Weierstrass Theorem elementary functions Fourier series introduction to measure theory and Lebesgue integration Other topics at the discretion of the instructor Nonmajor graduate credit

Math 421 Logic for Mathematics and Computer Science (Same as Com S 421) (3 0) Cr 3 S *Prereq 301 or 307 or 317 or Com S 330* Propositional and predicate logic Horn logic equational logic resolution and unification foundations of logic programming reasoning about programs program specification and verification Nonmajor graduate credit

Math 426 Mathematical Methods for the Physical Sciences (3-0) Cr 3 F *Prereq 266 or 267* A fast paced course primarily for first year graduate students in physics and chemistry Emphasis on techniques needed for quantum mechanics and electrodynamics Functions of a complex variable and contour integration integral transforms and applications series methods for ordinary differential equations Green s functions Sturm-Liouville problems and orthogonal functions boundary value problems for partial differential equations Credit will not be given for both 395 and 426 Nonmajor graduate credit

Math 435 Geometry (3-0) Cr 3 F *Prereq 307 or 317* Euclidean geometry through properties invariant under similarity transformations Use of both synthetic and analytic methods Nonmajor graduate credit

Math 436 Geometry (3-0) Cr 3 S *Prereq 435* Non Euclidean geometry through properties invarient under isometric transformations Analytic methods applied to at least two of elliptic projective and hyperbolic geometries Nonmajor graduate credit

Math 439 Mathematics of Fractals (3-0) Cr 3 Alt S offered 2004 *Prereq 265 some knowledge of programming* Topology of metric spaces iterated function systems algorithms for generation of fractals fractal dimension Julia sets and the Mandelbrot set applications to chaotic systems Nonmajor graduate credit

Math 465 Advanced Calculus for Applied Mathematics (4-0) Cr 4 FSS *Prereq 265* Frequently applied concepts from multivariable calculus presented with enough theory to promote understanding of applications Topics may include derivative matrices Taylor polynomials curvilinear coordinates Green s theorem divergence theorem Stokes s theorem uniform convergence operations on series and integrals improper integrals Nonmajor graduate credit

Math 471 Computational Linear Algebra and Fixed Point Iteration (Same as Com S 471) (3 0) Cr 3 FS *Prereq 265 and either 266 or 267 knowledge of FORTRAN or C* Computational error solutions of linear systems least square methods similarity methods for eigenvalues non linear equations fixed point iteration in one and several variables Newton s method in several variables Nonmajor graduate credit

Math 481 Numerical Solution of Differential Equations and Interpolation (Same as Com S 481) (3-0) Cr 3 S SS *Prereq 265 and either 266 or 267 knowledge of FORTRAN or C* Orthogonal polynomials least square and spline methods numerical differentiation and integration Euler Taylor Runge-Kutta and predictor-corrector methods for solution of systems of ordinary differential equations Nonmajor graduate credit

Math 484 Computational Mathematics for Biologists (Same as BCB 484) (3 0) Cr 3 F A survey of graph theory linear algebra discrete math and algorithms used in computational biology with examples taken from genomics phylogenetics and structure problems This course provides mathemat ics background for BCB/Gen/Com S/Math 594 *Nonmajor graduate credit*

Math 489 History of Mathematics (3 0) Cr 3 S *Prereq 6 credits in mathematics at the 300 level or above* History of mathematical ideas found in the undergraduate curriculum It includes a discussion of the historical and cultural settings in which these ideas arose and the influence of the culture on the type of mathematical ideas that developed Some of the particular cultures and their mathematics that are studied include Babylonian and Ancient Egyptian Ancient Greek Arabic Indian Western European and Chinese Nonmajor graduate credit

Math 490 Independent Study Cr 1 to 3 each time taken *Prereq 301 or 317 6 credits in mathematics* No more than 9 credits of Math 490 may be counted toward graduation
H Honors

Math 491 Undergraduate Thesis Cr 2 or 3 Writing a formal mathematics paper Upon approval by the department the paper will satisfy the departmental advanced English requirement

Math 492 Undergraduate Seminar Cr 2 S *Prereq Consent of instructor* Introduction to mathematics research Mathematical presentation mathematical literature search participating in seminar on advanced topics in mathematics Seminar content varies

Math 497 Teaching Secondary School Mathematics (Same as C I 497) See *Curriculum and Instruction*

Math 498 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator senior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Math 501 Introduction to Real Analysis (3-0) Cr 3 F *Prereq 265 and 307 or 317* A careful development of the real numbers Study of metric spaces completeness continuity and sequences with particular attention to R^n and real valued functions of one and several variables Differentiation and integration of real valued functions sequences of functions limits and convergence equicontinuity

Math 502 Numerical Analysis I (3 0) Cr 3 F *Prereq 414* Numerical linear algebra including eigenvalue problems numerical solution of nonlinear equations and optimization problems

Math 503 Numerical Analysis II (3-0) Cr 3 S *Prereq 414* Approximation theory including polynomial interpolation and best approximation numerical integration numerical methods for ordinary differential equations

Math 504 Abstract Algebra (3-0) Cr 3 F *Prereq 302* First semester of full year course Algebraic systems and their morphisms including groups rings modules and fields

Math 505 Abstract Algebra (3-0) Cr 3 S *Prereq 504* Continuation of 504

Math 507 Numerical Solution of Ordinary Differential Equations (Same as Com S 507) (3 0) Cr 3 SS *Prereq 481 or 465 or 415 knowledge of FORTRAN or C* One step methods for initial value problems one step methods for systems multistep methods boundary value problems Examples using university computers

Math 510 Linear Algebra (3 0) Cr 3 S or SS *Prereq 302 or 307 or 317* Advanced topics in linear algebra including canonical forms inner product spaces bilinear forms tensor products and applications to other branches of mathematics

Math 511 Functions of a Single Complex Variable (3 0) Cr 3 S or SS *Prereq 465 or 414* Theory of analytic functions integration topology of the extended complex plane singularities and residue theory

Math 514 Measure Theory (3-0) Cr 3 F *Prereq 414* Measure and integration construction of measures (Lebesgue and Lebesgue-Stieltjes measures) Lp spaces Hilbert spaces differentiation Radon Nikodym theory product measures finite measure spaces Primarily for non majors particularly statistics

Math 515 Real Analysis I (3-0) Cr 3 F *Prereq 414 or 501* Measure and integration differentiation topology of metric spaces Lp spaces Hilbert spaces

Math 516 Real Analysis II (3 0) Cr 3 S *Prereq 515* Elementary theory of Banach spaces Product integration Fubini s theorem Decomposition of measures differentiation theory Fourier analysis

Math 517 Finite Difference Methods (3-0) Cr 3 F *Prereq 414* Finite difference methods for parabolic equations finite difference methods for linear hyperbolic equations and hyperbolic conservation laws elliptic equations and iterative methods

Math 518 Finite Element Methods (3-0) Cr 3 S *Prereq 414* Elements of functional analysis Sobolev spaces variational principles and weak formulations approximation theory in finite element spaces analysis of finite element methods implementation issues applications

Math 519 Methods of Applied Mathematics I (3 0) Cr 3 F *Prereq 365 or 385 or 426 or 465* Techniques of classical and functional analysis with applications to partial differential equations integral equations and boundary value problems for ordinary differential equations

Math 520 Methods of Applied Mathematics II (3-0) Cr 3 S *Prereq 519* Continuation of Math 519

Math 525 Numerical Analysis of High Performance Computing (Same as Com S 525) (3 0) Cr 3 S *Prereq Cpr E 308 or one of Math 471 481 experience in scientific programming knowledge of FORTRAN or C* Development analysis and testing of efficient numerical methods for use on current state-of-the art high performance computers Applications of the methods to the students areas of research

Math 527 Mathematics of Complex Physical Systems (3 0) Cr 3 S *Prereq 365 or 426 385* Classical molecular dynamics stochastic modeling and Monte Carlo techniques random walks and diffusion processes nonlinear dynamics and pattern formation

Math 531 Introduction to Functional Analysis (3 0) Cr 3 Alt F offered 2003 *Prereq Permission of instructor* First semester of full year course Fundamental theory of normed linear spaces and algebras emphasizing aspects that provide a framework for the study of boundary value problems eigenvalue problems harmonic analysis analytic function theory and modern operator theory

Math 532 Introduction to Functional Analysis (3-0) Cr 3 Alt S offered 2004 *Prereq 531* Continuation of 531

Math 533 Cryptography (Same as Cpr E 533 InfAs 533) (3-0) Cr 3 S *Prereq Math 301 or Cpr E 310 or Com S 330* Basic concepts of secure communica tion DES and IDEA public key cryptosystems elliptic curves hash algorithms digital signatures

applications Relevant material on number theory and finite fields

Math 534 Topology (3 0) Cr 3 F *Prereq Permission of instructor* Introduction to general topology Emphasizes topics useful in analysis

Math 537 Algebraic Topology (3-0) Cr 3 Alt S offered 2005 *Prereq 331 or 534 301* Foundations of algebraic topology Simplicial complexes Simplicial and singular homology groups

Math 540 Seminar in Mathematics Education (3 0) Cr 3 Offered on a 3 year cycle offered SS 2005 *Prereq Enrollment in the master of school mathematics program or professional studies in education* Research studies in mathematics learning and teaching exemplary practices in mathematics education and current state and national trends in the mathematics curriculum in grades K 12

Math 542 Investigating the Teaching and Learning of Secondary Mathematics (1 0) Cr 1 Alt F offered 2004 *Prereq Enrollment in master of school mathematics program professional studies in education or by permission for secondary mathematics education majors* Research discussion and evaluation of efforts to improve instruction in the mathematics classroom Math 542 may be taken for credit multiple times

Math 543 Seminar in Mathematics Education (1 0) Cr 1 F *Prereq Teaching a mathematics course* Selected topics in collegiate mathematics education including cooperative learning instructional use of technology writing in mathematics and cognitive learning theories Research studies exemplar practices and trends in mathematics education

Math 545 Intermediate Calculus (4 0) Cr 4 Offered on a 3 year cycle offered SS 2004 *Prereq 3 semesters of calculus and enrollment in the master of school mathematics program* Further development of the fundamental concepts of calculus and their applications with an emphasis on a constructivist approach to learning cooperative groups problem solving the use of technology

Math 546 Algorithms in Analysis and Their Computer Implementation (2 2) Cr 3 Offered on a 3 year cycle offered SS 2004 *Prereq 3 semesters in calculus or concurrent enrollment in 545 and enrollment in the master of school mathematics program* The use of technology in secondary mathematics with an emphasis on the exploration and implementation of algorithms

Math 547 Discrete Mathematics and Applications (4-0) Cr 4 Offered on a 3 year cycle offered SS 2006 *Prereq Enrollment in the master of school mathematics program* Applications of graph theory game theory linear programming recursion combinatorics and algebraic structures Issues in integrating discrete topics into the secondary curriculum Use of the computer to explore discrete mathematics

Math 549 Intermediate Geometry (3-0) Cr 3 Offered on a 3-year cycle offered SS 2006 *Prereq 435 or equivalent and enrollment in the master of school mathematics program* A study of geometry with emphasis on metrics the group of isometries the group of similarities and the affine group Specific spaces studied normally include the Euclidean plane the 2 sphere and projective 2 space Emphasis on analytical methods

Math 551 Design Theory and Association Schemes (3 0) Cr 3 F *Prereq 301 or 304 or 307 or 317* Combinatorial designs and Latin squares Construction methods including finite fields Error-correcting codes Adjacency matrices and algebraic combinatorics

Math 552 Enumerative Combinatorics and Ordered Sets (3 0) Cr 3 S *Prereq 301 or 304 or 307 or 317* Ordered sets and lattices Generating functions Mobius inversion and other enumeration methods

Math 554 Introduction to Stochastic Processes (Same as Stat 554) (3 0) Cr 3 S *Prereq Stat 542* Markov chains on discrete spaces in discrete and continuous time (random walks Poisson processes birth and death processes) and their long term behavior Optional topics may include branching processes renewal theory introduction to Brownian motion

Math 555 Theory of Stochastic Processes (Same as Stat 555) (3 0) Cr 3 F *Prereq 514 or 515 Stat 542* Martingales Markov processes on continuous spaces and their qualitative behavior Wiener processes Optional topics may include elementary theory of Ito calculus and diffusions linear stochastic systems advanced topics in branching process

Math 557 Ordinary Differential Equations (3 0) Cr 3 F *Prereq 266 or 267 307 or 317 415 or 465* First semester of full-year course The initial-value problem existence and uniqueness theorems continuous dependence on parameters linear systems stability and asymptotic behavior of solutions topics from dynamical systems and two-point boundary value problems

Math 558 Ordinary Differential Equations (3-0) Cr 3 Alt S offered 2005 *Prereq 557* Continuation of 557

Math 561 Dynamical Systems (3 0) Cr 3 Alt S offered 2005 *Prereq 414* Smooth mappings and flows on manifolds Fixed points stable unstable and center manifolds normal forms Structural stability bifurcations Horseshoe maps introduction to chaotic behavior

Math 562 Manifolds Tensors and Differential Geometry (3 0) Cr 3 Alt S offered 2004 *Prereq 414* Geometry of curves and surfaces Manifolds coordinate systems Tensors differential forms Riemannian metrics Connections covariant differentiation curvature tensors

Math 567 Boolean Algebras (3-0) Cr 3 Alt S offered 2005 *Prereq 302 or 421* Structure of Boolean algebras and their representations Stone spaces and duality Atomicity completeness distributivity operators extensions of homomorphisms Examples and applications from mathematical logic and topology

Math 571 Mathematical Logic (3 0) Cr 3 Alt F offered 2004 *Prereq 421* First semester of full year course Algebraic structures in logical systems recursive functions consistency undecidability and incompleteness of axiomatic theories results of Gentzen and Godel theory of models ultraproducts and ultralimits nonstandard analysis

Math 572 Mathematical Logic (3 0) Cr 3 Alt S offered 2005 *Prereq 571* Continuation of 571

Math 573 Random Signal Analysis and Kalman Filtering (Same as Aer E 573 E E 573 M E 573) (3 0) Cr 3 F *Prereq E E 321 or Aer E 331 or M E 370 or M E 411 or Math 341 or 395* Elementary notions of probability Random processes Autocorrelation and spectral functions Estimation of spectrum from finite data Response of linear systems to random inputs Discrete and continuous Kalman filter theory and applications Smoothing and prediction Linearization of nonlinear dynamics

Math 574 Optimal Control (Same as Aer E 574 E E 574 M E 574) (3 0) Cr 3 S *Prereq 577* The optimal control problem Variational approach Pontryagin's principle Hamilton Jacobi equation Dynamic programming Time-optimal minimum fuel minimum energy control systems The regulator problem Structures and properties of optimal controls

Math 575 Introduction to Robust Control (Same as E E 575) See *Electrical Engineering*

Math 576 Digital Feedback Control Systems (Same as Aer E 576 E E 576 M E 576) (3 0) Cr 3 F *Prereq 415 or Aer E 432 or E E 475 or M E 411 or M E 414 and Math 267* Sampled-data discrete data and the z transform Design of digital control systems using transform methods root locus frequency response and direct design methods Design using state space methods Controllability observability pole placement state estimators Digital filters in control systems Microcomputer implementation of digital filters Finite wordlength effects Linear quadratic optimal control in digital control systems Simulation of digital control systems

Math 577 Modern Control Systems I (Same as Aer E 577 E E 577 M E 577) (3 0) Cr 3 F *Prereq 415 or Aer E 331 or M E 414 and Math 307 or 317* State variable and input output descriptions of linear continuous time and discrete-time systems Solution of linear dynamical equations Controllability and observability of linear dynamical systems Canonical descriptions of linear equations Irreducible realizations of rational transfer function matrices Canonical form dynamical equations State feedback State estimators Decoupling by state feedback Design of feedback systems Stability of linear dynamical systems

Math 578 Modern Control Systems II (Same as Aer E 578 E E 578 M E 578) (3-0) Cr 3 S *Prereq 577* Well posedness of nonlinear control systems Approximate analysis methods Poincaré perturbation method and describing function method Lyapunov stability theory Absolute stability of feedback systems Input-output stability Large-scale systems

Math 579 Adaptive Control (Same as E E 579) See *Electrical Engineering*

Math 584 Category Theory (3-0) Cr 3 Alt F offered 2004 *Prereq 302* Categories and functors and their applications

Math 585 Partial Differential Equations (3 0) Cr 3 Alt F offered 2003 *Prereq 515 or 519* First semester of full year course First order equations and systems General theory of linear partial differential equations including wave heat and potential equations in several variables maximum principles theory of distributions and fundamental solutions Variational and Hilbert space methods evolutionary equations and applications of semigroup theory introduction to the theory of nonlinear equations and systems One or more of ill posed problems singularity formation regularity theory equations of mixed type bifurcation theory

Math 586 Partial Differential Equations (3 0) Cr 3 Alt S offered 2004 *Prereq 585* Continuation of 585

Math 588 General Theory of Algebraic Structures (3 0) Cr 3 Alt F offered 2003 *Prereq 504* First semester of full year course Subalgebras homomorphisms congruence relations and direct products Lattices and closure operators Varieties and quasivarieties of algebras free algebras Birkhoff's theorems clones Mal cev conditions Advanced topics

Math 589 General Theory of Algebraic Structures (3 0) Cr 3 Alt S offered 2004 *Prereq 588* Continuation of 588

Math 590 Special Topics Cr var

Math 594 Computational Molecular Biology (Same as Gen 594) See *Zoology and Genetics*

Math 597 Introductory Computational Structural Biology (Same as BCB 597) (3 0) Cr 3 S *Prereq Math 265 and some knowledge of programming* Mathematical and computational approaches to protein structure prediction and determination Topics include molecular distance geometry potential energy minimization and molecular dynamics simulation

Math 599 Creative Component Cr var

Courses for Graduate Students

Math 610 Seminar Cr var

Math 642 Advanced Probability Theory (Same as Stat 642) See *Statistics*

Math 690 Advanced Topics Cr var *Prereq Permission of instructor*

A Algebra
B Functional Analysis
C Measure Theory
D Approximation Theory
E Linear Algebra

F Calculus of Variations
H Harmonic Analysis
I Combinatorics
K Mathematics Education
L Logic and Foundations
M Complex Analysis
N Numerical Analysis
O Ordinary Differential Equations
P Partial Differential Equations
Q Group Theory
R Mathematical Physics
S Set Theory
T Topology
U Automata Theory
V Optimization Theory
W Probability and Stochastic Processes
Y Special Functions
Z Ring Theory

Math 699 Research

Mechanical Engineering

Jon Van Gerpen, Interim Chair of Department

Distinguished Professors Bernard

University Professors Bahadur

Professors Brown Chandra Colver DeVries Molian Nelson Okiishi Pate Pletcher Sanmer Shapiro VanGerpen Wilson

Professors (Collaborators) *Vanderploeg*

Distinguished Professors (Emeritus) Serovy

Professors (Emeritus) Bathie Baumgarten Cook Danofsky DeJong Eide Hall Hendrickson Henkin Junkhan Kavanagh Mischke Peters Roberts Spinrad Wechsler

Associate Professors Bullen Flugrad Garimella Heindel Kelkar Luecke Mann Maxwell Oliver Vance

Associate Professors (Adjunct) Edelson Gray McClelland

Associate Professors (Collaborators) Prusa

Associate Professors (Emeritus) Joensen Van Meter

Assistant Professors Bastawros Battaglia Bryden Cao Olsen Qamhiyah Subramaniam Sundararajan

Assistant Professors (Collaborators) Pham

Lecturers Comer Gassman Starns

Undergraduate Study

For the undergraduate curriculum in mechanical engineering leading to the degree bachelor of science see *College of Engineering Curricula* This curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology

Mechanical engineers are typically involved with such activities as
•generation distribution and use of energy
•development and application of *manufacturing* systems and processes
•automation and control of mechanical and thermal systems
•design of various products for consumer and commercial markets

About one-fourth of all engineers practicing today have been educated as mechanical engineers Their activities include research development design testing production technical sales and technical management

Mechanical engineers are characterized by personal creativity breadth of knowledge and versatility For these reasons they are found to function and thrive as valuable members and leaders of multidisciplinary teams Through clever use of analysis modeling design synthesis and interpersonal skills they solve important problems to improve our world

The overall objective of the curriculum in mechanical engineering is *to prepare students for lifelong learning and growth in careers as mechanical engineers in the rapidly-changing industrial world*

Upon successfully completing the mechanical engineering curriculum students will be prepared for immediate entry into the field or for further study at the graduate level

The mechanical engineering curriculum is organized to provide students with a broad foundation in mathematics and the sciences of physics and chemistry
•Through courses in these subjects students will attain the basic knowledge required to understand and analyze mechanical engineering systems

This background is extended and organized through studies in solid mechanics fluid mechanics *thermodynamics heat transfer materials and* electrical applications
•Upon completion of courses in these areas of the curriculum students will be able to apply engineering principles to create analyze or improve processes devices or systems to accomplish desired objectives

A major focus throughout the mechanical engineering curriculum is a series of experiences that emphasize engineering design
•Students will develop engineering judgment through open ended problems that require establishment of reasonable engineering assumptions and realistic constraints

In addition a sequence of courses emphasizing engineering design begins in the first year and culminates with a capstone design experience
•Students will not only be able to apply their engineering knowledge to real life design problems but also to critically evaluate the solutions

Development of skills needed to be independent creative thinkers effective communicators and contributing team members is emphasized throughout the curriculum
•Students will learn to effectively work in multi disciplinary teams to solve engineering problems subject to technical and business constraints through critical thinking that crosses content boundaries

•Students will develop an understanding of the societal context in which they will practice engineering They will include ethical legal and aesthetic considerations in design of engineering components and systems

The *curriculum provides flexibility* to allow students to broaden their perspectives or to focus in more depth in areas of particular interest Organized sequences of technical electives can be chosen from areas which represent major concentrations in the field of mechanical engineering Optional areas of specialization include energy conversion and utilization thermal *system design mechanical system design materials* and manufacturing nuclear engineering thermal and environmental engineering and vehicle propulsion
•Elective courses provide additional emphasis in terms of the student s unique educational goals whether they include immediate entry into industry or further study at the graduate level

In addition students elect courses in the humanities social sciences U S diversity and international perspectives
•Through these courses students develop an understanding of the societal context in which they will practice engineering including environmental legal aesthetic and human aspects

Students in mechanical engineering are encouraged to participate in the cooperative education program or to obtain engineering internships both in the United States and abroad Study abroad is also encouraged and the department has exchange programs with several universities around the world These experiences help students to round out their education and to better prepare for careers in the increasingly global practice of engineering

Graduate Study

The department offers work for the degrees of master of science and doctor of philosophy with major in mechanical engineering The master of science degree may be earned with or without thesis Although co-major and formal minor programs are not offered in mechanical engineering courses may be used for minor work by students taking major work in other departments

The graduate program offers advanced study in fluid mechanics fluid power controls heat transfer computer aided design machines and systems materials and manufacturing processes thermodynamics energy utilization virtual reality applications micro-electro mechanical systems computational fluid dynamics combustion HVAC IC engines and radioactive waste management

The department offers students the opportunity to broaden their education by participating in minor programs in established departments interdepartmental programs or other experiences as approved by their program of study committees

The requirements for advanced degrees are established by the student s program of study committee within established guidelines of the *Graduate College Graduate students who have not* completed an undergraduate program of study substantially equivalent to that required of under graduate students in the department can expect that additional supporting coursework will be required A foreign language requirement exists for the degree of doctor of philosophy only if the student s program of *study committee deems it appropriate to a specific* program of study

Courses open for nonmajor graduate credit All 300 and 400 level courses except 330 396 397 398 466 490 and 498

Courses Primarily for Undergraduate Students

M E 102 Mechanical Engineering Orientation (1 0) Cr R FS Information concerning university college and departmental policies and procedures Information on cooperative intern summer and career placement Review of degree audit and registration

M E 190 Learning Communities Cr 1 FS Enrollment in M E learning communities

M E 202 Mechanical Engineering Seminar (1 0) Cr R FS *Prereq Sophomore classification* Technical seminar

M E 231 EngineeringThermodynamics I (3-0) Cr 3 FS *Prereq Math 265 Chem 167 Phys 222* Fundamental concepts based on zeroth first and second laws of thermodynamics Properties and processes for ideal gases and solid-liquid vapor phases of pure substances Applications to power cycles Credit for either 231 or 330 but not both may *be applied toward graduation*

M E 270 Introduction to Mechanical Engineering Design (1-6) Cr 3 FS *Prereq Engr 170 Phys 222* Introduction to fundamentals of mechanical engineering design with applications to thermal and mechanical systems Examination of existing machines and systems Team based projects open ended problems and prototyping Application of engineering tools Oral and written reports required

M E 298 Cooperative Education Cr R FS SS *Prereq Permission of department* First professional work period in the cooperative education program Students must register for this course before commencing work

M E 324 Manufacturing Engineering (3 2) Cr 4 FS *Prereq Mat E 272 E M 324* Plastic deformation and work hardening Manufacturing processes including forming machining casting and welding with emphasis on manufacturing considerations in design Quality control and computer integration issues Laboratory exercises will be an integral component of the course Nonmajor graduate credit

M E 325 Machine Design (3-0) Cr 3 FS *Prereq Engr 170 E M 324 Stat 305* Philosophy of design and design methodology Consideration of stresses and

failure models useful for static and fatigue loading Analysis selection and synthesis of machine elements Nonmajor graduate credit

M E 330 Thermodynamics (3 0) Cr 3 FS *Prereq Phys 222* For students electing one course in engineering thermodynamics First and second laws of thermodynamics Properties and processes for pure substances Selected applications including cycles for power and refrigeration Psychrometrics Credit for either 213 or 330 but not both may be applied toward graduation Majors in mechanical engineering may not apply M E 330 toward a degree in mechanical engineering

M E 332 EngineeringThermodynamics II (3-0) Cr 3 FS *Prereq 231* Fundamentals of gas mixtures psychrometry and thermochemistry Applications to one-dimensional compressible flow refrigeration air conditioning and combustion processes Nonmajor graduate credit

M E 335 Fluid Flow (3 2) Cr 4 FS *Prereq Credit or enrollment in 332 E M 345 Math 266 or 267 credit or enrollment in 370* Incompressible and compressible fluid flow fundamentals Dimensional analysis and similitude Internal and external flow applications Lab demonstrations and experiments emphasizing concepts in thermodynamics and fluid flow Written reports are required Nonmajor graduate credit

M E 370 Engineering Measurements and Instrumentation (2 3) Cr 3 FS *Prereq E E 442 Stat 305* Fundamentals of design selection and operation of components of measuring systems Measurement processes data acquisition systems analysis of data and propagation of measurement uncertainty Nonmajor graduate credit

M E 396 Summer Internship Cr R SS *Prereq Permission of Department Chair* Summer professional work period

M E 397 Engineering Internship Cr R FS *Prereq Permission of department chair* Professional work period one semester maximum per academic year

M E 398 Cooperative Education Cr R FS SS *Prereq 298 permission of department* Second professional work period in the cooperative education program Students must register for this course before commencing work

M E 410 Mechanical Engineering Applications of Mechatronics (2 2) Cr 3 S *Prereq E E 442 448 credit or enrollment in 421* Fundamentals of sensor characterization signal conditioning and motion control coupled with concepts of embedded computer control Digital and analog components used for interfacing with computer controlled systems Mechanical system analysis combined with various control approaches Focus on automation of hydraulic actuation processes Laboratory experiences provide hands-on development of mechanical systems Nonmajor graduate credit

M E 411 Automatic Controls (2 2) Cr 3 F *Prereq 421* Methods and principles of automatic control Pneumatic hydraulic and electrical systems Representative applications of automatic control systems Mathematical analysis of control systems Nonmajor graduate credit

M E 412 Legal and Environmental Considerations in Design (3 0) Cr 3 F *Prereq Credit or enrollment in 325 senior classification in engineering* Failure modes associated with product environment Interaction between the legal profession legislative bodies standards and the design engineer using a case study approach in design applications Litigation involving designs standards and laws applicable to specific designs surveyed The influence of laws and standards upon design Nonmajor graduate credit

M E 413 Practical Fluid Power Circuits (Same as A E 413) (0 3) Cr 1 F *Prereq Credit or enrollment in 414 or A E 447* Properties of fluids Pump and motor efficiencies Analysis and assembly of fluid power systems and experimental investigation of appropriate control systems Application to hydrostatic transmissions Nonmajor graduate credit

M E 414 Hydraulic Systems and Control (3 0) Cr 3 F *Prereq 421 335* Characteristics of hydraulic motors and pumps system components system analysis feedback control and stability control circuits computer simulation Nonmajor graduate credit

M E 415 Mechanical Systems Design (0 6) Cr 3 FS *Prereq 324 325* Solution of a total design problem involving a mechanical system documenting decisions concerning form and function material specification manufacturing methods safety cost and conformance with codes and standards Solution description includes oral and written reports Nonmajor graduate credit

M E 417 Advanced Machine Design I (3 0) Cr 3 S *Prereq 325* Continuation of 325 involving some additional elements alternative viewpoints and computational considerations Analysis selection synthesis and redesign of machine elements using computer and CAD/CAM assistance Nonmajor graduate credit

M E 418 Mechanical Considerations in Robotics (2 2) Cr 3 S *Prereq 421* Three dimensional kinematics dynamics and control of robot manipulators hardware elements and sensors Laboratory experiments using industrial robots Nonmajor graduate credit

M E 419 Computer Aided Design (3 0) Cr 3 F *Prereq 325* Theory and applications of computer aided design Design theory solid modeling and finite element modeling in CAD Assembly modeling rapid prototyping and mechanism analysis Curves and surfaces and CAD/CAM data exchange Nonmajor graduate credit

M E 421 Mechanical Systems and Control (3 2) Cr 4 FS *Prereq E M 345 Math 267 E E 442 448* Modeling and simulation of mechanical systems Development of equations of motion and dynamic response characteristics Fundamentals of classical control applications including mathematical analysis and design for closed loop control systems Introduction to computer interfacing for data acquisition and control Laboratory exercises for hands on motion and control implementation Nonmajor graduate credit

M E 425 Mechanical System Optimization (3 0) Cr 3 S *Prereq 415 Engr 160* Mechanical system optimization techniques including unconstrained and constrained minimization and linear programming Both the theory of the methods and the application to mechanical system design will be presented Nonmajor graduate credit

M E 431 Nuclear RadiationTheory and Engineering (3 0) Cr 3 F *Prereq Phys 222 Math 266 or 267* Atomic and nuclear physics Radioactivity and reaction rates Cross sections Introduction to neutron diffusion theory Engineering applications of radiation theory Nonmajor graduate credit

M E 433 Alternative Energy Conversion (3 0) Cr 3 F *Prereq 332* Basic principles thermodynamics and performance of alternative energy conversion technologies such as direct energy conversion (fuel cells photovoltaics magnetohydrodynamics) wind energy biomass energy non-combustion thermal sources (ocean gradients geothermal and nuclear fusion) non conventional environmental energy sources (ocean tides and currents) and finally other alternative approaches (molecular motors cryo-engines and solar sailing) Performance analysis and operating principles of systems and components economic analysis for system design and operation Nonmajor graduate credit

M E 436 Heat Transfer (3-2) Cr 4 FS *Prereq 335* Heat transfer by conduction convection and radiation Similarity concepts in heat mass and momentum transfer Methods for determination of heat transfer coefficients Combined modes of heat transfer Heat exchangers Lab demonstrations and experiments emphasizing concepts in thermodynamics and heat transfer Written reports are required Nonmajor graduate credit

M E 441 Fundamentals of Heating Ventilating and Air Conditioning (3 0) Cr 3 F *Prereq Credit or enrollment in 436* Space conditioning and moist air processes Application of thermodynamics heat transfer and fluid flow principles to the analysis of heating ventilating and air conditioning components and systems, Performance and specification of components and systems Nonmajor graduate credit

M E 442 Heating and Air Conditioning Design (1-4) Cr 3 S *Prereq 441* Design criteria and assessment of building environment and energy requirements Design of heating ventilating and air conditioning systems System control and economic analysis Oral and written reports required Nonmajor graduate credit

M E 443 Compressed Air Systems (3 0) Cr 3 S *Prereq 332* Basic principles thermodynamics and performance of compressed air systems including various components such as compressors (reciprocating rotary centrifugal and axial) prime movers coolers intercoolers aftercoolers dryers heat recovery receivers separators filters regulators fault detectors controllers etc performance analysis and operating principles for both systems and components energy consumption and economic analysis for system design and operation Nonmajor graduate credit

M E 444 Elements and Performance of Power Plants (3-0) Cr 3 S *Prereq 332 credit or enrollment in 335* Basic principles thermodynamics engineering analysis of power plant systems Topics include existing power plant technologies the advanced energyplex systems of the future societal impacts of power production and environmental and regulatory concerns Nonmajor graduate credit

M E 445 Internal Combustion Engines (2 2) Cr 3 F *Prereq 332 credit or enrollment in 436* Basic principles thermodynamics and performance of spark ignition and compression ignition engines Engine-drive train vehicle considerations Properties of engine fuels combustion generated air pollutants Laboratory determination of engine performance Nonmajor graduate credit

M E 446 Power Plant Design (2 3) Cr 3 F *Prereq 332 credit or enrollment in 335* Design of a power plant to meet regulatory cost fuel and output needs Selection and synthesis of principal components Oral and written reports required Nonmajor graduate credit

M E 447 GasTurbines (3-0) Cr 3 F *Prereq 332 335* General principles thermodynamics and performance of gas turbine engines Engine components engine matching and selection Environmental considerations Nonmajor graduate credit

M E 448 Fluid Dynamics ofTurbomachinery (3-0) Cr 3 S *Prereq 335* Applications of principles of fluid mechanics and thermodynamics in performance analysis and design of turbomachines and related fluid system components Nonmajor graduate credit

M E 449 Internal Combustion Engine Design (3 0) Cr 3 S *Prereq 324 325 445* Thermodynamic and mechanical design of a spark ignition or compression ignition internal combustion engine to meet specified performance fuel economy and air pollution requirements Oral and written reports required Nonmajor graduate credit

M E 451 Engineering Acoustics (Same as E M 451) See *Engineering Mechanics* Nonmajor graduate credit

M E 466 Multidisciplinary Engineering Design (Same as Cpr E 466 E E 466 I E 466 Mat E 466) (1 4) Cr 3 FS *Prereq Student must be within two semesters of graduation and permission of instructor* Application of team design concepts to projects of a multidisciplinary nature Concurrent treatment of design manufacturing and life cycle considerations Application of design tools such as CAD CAM and FEM Design methodologies project scheduling cost estimating quality control manufacturing processes Development of a prototype and appropriate

documentation in the form of written reports oral presentations computer models and engineering drawings

M E 475 Modeling and Simulation (3-0) Cr 3 S *Prereq 421 credit or enrollment in 436* Introduction to computer solution techniques required to simulate flow thermal and mechanical systems Methods of solving ordinary and partial differential equations and systems of algebraic equations interpolation numerical integration finite difference and finite element methods Nonmajor graduate credit

M E 490 Independent Study Cr 1 to 6 *Prereq Senior classification* Investigation of topics holding special interest of students and faculty Election of course and topic must be approved in advance by supervising faculty
C Engineering Measurements and Instrumentation
D Heat Transfer
E Fluid Power and Controls
F Machines and Systems
G Materials and Manufacturing Processes
H Honors
J Thermodynamics and Energy Utilization
K Fluid Mechanics
L Turbomachinery
M Nuclear Engineering
N CAD/CAM

M E 498 Cooperative Education Cr R FS SS *Prereq 298 permission of department* Third and subsequent professional work periods in the cooperative education program Students must register for this course before commencing work

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

M E 511 Advanced Control Design (3-0) Cr 3 S *Prereq 411* Application of control design methods using continuous discrete and frequency based models Approaches include classical pole assignment model reference internal model and adaptive control methods Mechanical design projects

M E 513 Advanced Control of Robotic Systems (3-0) Cr 3 Alt F offered 2003 *Prereq 418* An introduction to the fundamentals of dynamics and control for a variety of robotic mechanisms This course develops control techniques for applications to multi input multi output systems using linear nonlinear and adaptive approaches Control is developed and implemented for position velocity and force commands Computer simulation is used for dynamic analysis of robotic systems and for the development and implementation of various control schemes Current methods in literature are examined and analyzed

M E 515 Advanced Machine Design II (3 0) Cr 3 F *Prereq 325* Experimental empirical and rational methods for analysis and synthesis in the solution of advanced design problems in machine elements Creep and fatigue considerations

M E 516 Kinematic Analysis and Synthesis of Mechanisms (3-0) Cr 3 Alt S offered 2004 *Prereq E M 345* Analysis and synthesis of mechanisms using graphical analytical and computational methodologies

M E 517 Contemporary Issues in Computer Aided Engineering (3 0) Cr 3 S *Prereq 325* Philosophy and applications tools of concurrent engineering Advanced CAD/CAM systems and advances in formal design methods Computer-aided software engineering and distributed information systems in business Distributed artificial intelligence and its application to concurrent engineering

M E 518 Advanced Dynamics of Machinery (3 0) Cr 3 Alt F offered 2004 *Prereq 421* Dynamic forces in machine members Dynamic response of cam-follower systems Rotating and reciprocating machine unbalance Forces transmitted and machinery isolation Computer simulation of dynamic response

M E 520 Material and Manufacturing Considerations in Design (3 0) Cr 3 F *Prereq 324 325* Advanced treatment of materials and manufacturing Applications to design Design and redesign to facilitate cost effective manufacturing Qualitative and quantitative comparisons of designs Economic considerations

M E 521 Mechanical Behavior and Manufacturing of Polymers and Composites (Same as M S E 521) (3-0) Cr 3 Alt S offered 2005 *Prereq 324 or Mat E 272 and E M 324* Effect of chemical structure and morphology on properties Linear viscoelasticity damping and stress relaxation phenomena Structure and mechanics of filler and fiber reinforced composites Mechanical properties and failure mechanisms Material selection and designing with polymers Processing of polymer and composite parts

M E 522 Computer Integrated Manufacturing (2 2) Cr 3 Alt F offered 2003 *Prereq 324 senior classification* Study of modern manufacturing techniques in the computer based environment including Computer Numerically Controlled (CNC) machine tools programmable logic controllers material handling and assembly robots injection molding machines Reverse engineering using coordinate measuring machines Rapid prototyping techniques including computer interfaces and laser application Hands-on experience with laboratory exercises using the equipment in the Engel CIM Laboratory

M E 527 Mechanics of Machining and Finishing Processes (3 0) Cr 3 Alt S offered 2005 *Prereq 324* Mechanics of material removal for ductile materials Shear zone theory Oblique cutting Heat transfer in machining Milling and grinding Mechanics of material removal for brittle materials Optimal selection and design of cutting parameters Control of machining processes Principles of precision finishing Design considerations for machining and finishing processes

M E 528 Nanomanufacturing and MEMSTechnology (2 2) Cr 3 S *Prereq 324* Introduction and scaling laws SEM/SPM/AFM microscopes top-down beam machining top-down mechanical machining synthesis of powders tubes and wires bottom up molecular manufacturing applications of molecular manufacturing and MEMS fabrication issues Laboratory exercises include projects in laser and nanoscale processing laboratory

M E 530 AdvancedThermodynamics (3 0) Cr 3 F *Prereq 332* Fundamentals of thermodynamics from the classical viewpoint with emphasis on the use of the first and second laws for analysis of thermal systems Generalized thermodynamic relationships Computer applications of thermodynamic properties and system analysis Selected topics

M E 532 Compressible Fluid Flow (Same as Aer E 532) (3-0) Cr 3 S *Prereq 335 or Aer E 541* Thermodynamics of compressible flow Viscous and inviscid compressible flow equations One dimensional steady flow isentropic flow normal shock waves oblique and curved shocks constant area flow with friction and heat transfer Linear theory and Prandtl Glauert similarity Method of characteristics Subsonic transonic supersonic and hypersonic flows

M E 536 Advanced HeatTransfer (3 0) Cr 3 S *Prereq 436* Advanced treatment of heat transmission by conduction convection and radiation

M E 538 Advanced Fluid Flow (3 0) Cr 3 F *Prereq Credit or enrollment in 436* Detailed analysis of incompressible/compressible viscous/inviscid laminar/turbulent and developing fluid flows on a particle/point control volume basis

M E 539 Fluidized Bed Processes (Same as Ch E 539) (3 0) Cr 3 F *Prereq 436 or Ch E 357* Mass momentum and energy balances applied to fluidized beds Hydrodynamics of bubbling turbulent and fast fluidized beds Heat and mass transfer Thermal and chemical processes in fluidized beds Applications

M E 540 Solar EnergyThermal Systems (3 0) Cr 3 Alt S offered 2004 *Prereq 436* Application of heat transfer and thermodynamics to the design and analysis of solar energy collectors and systems

M E 542 Advanced Combustion (3-0) Cr 3 Alt S offered 2004 *Prereq 332 or Ch E 381* Thermochemistry and transport theory applied to combustion Gas phase equilibrium Energy balances Reaction kinetics Flame temperatures speed ignition and extinction Premixed and diffusion flames Combustion aerodynamics Mechanisms of air pollution

M E 545 Thermal Systems Design (3 0) Cr 3 F *Prereq 436* Integrating thermodynamics fluid mechanics and heat transfer to model thermal equipment and to simulate thermal systems including thermodynamic cycles heat recovery systems refrigeration and space-conditioning electronics cooling alternative thermal energy sources utilization and storage and others Second law and parametric analysis cost estimation life cycle analysis and optimization

M E 546 Computational Fluid Mechanics and Heat Transfer I (Same as Aer E 546) (3-0) Cr 3 F *Prereq Credit or enrollment in 538 or Aer E 541* Introduction to finite difference and finite volume methods used in modern engineering Basic concepts of discretization consistency and stability Applications of numerical methods to selected model partial differential equations

M E 547 Computational Fluid Mechanics and Heat Transfer II (Same as Aer E 547) (3-0) Cr 3 S *Prereq 546* Application of computational methods to current problems in fluid mechanics and heat transfer Methods for solving the Navier-Stokes and reduced equation sets such as the Euler boundary layer and parabolized forms of the conservation equations Introduction to relevant aspects of grid generation and turbulence modeling

M E 549 Vehicle Dynamics (3 0) Cr 3 F *Prereq E M 345 Math 266 or 267* Analysis and evaluation of the performance of cars and trucks Computer simulation of ride braking and directional response

M E 551 Signal Processing in Mechanics (Same as E M 551) (2 2) Cr 3 S *Prereq E M 451 Math 385* Classification and measurement of time dependent phenomena in mechanics Correlation spectral and probabilistic techniques for the analysis of acoustical vibrational and unsteady fluid dynamic phenomena Selected laboratory experiments emphasizing dual channel FFT analyzer applications in mechanics

M E 557 Computer Graphics and Geometric Modeling (Same as Cpr E 557) (3-0) Cr 3 FS *Prereq Programming experience in C Math 307 or equivalent* Fundamentals of computer graphics technology Data structures Parametric curve and surface modeling Solid model representations Applications in engineering design analysis and manufacturing

M E 564 Fracture and Fatigue (Same as E M 564 M S E 564) (3 0) Cr 3 F *Prereq E M 324 and one of Mat E 211 or 272* Materials and mechanics approach to fracture and fatigue Fracture mechanics brittle and ductile fracture fracture and fatigue characteristics Fracture and fatigue tests thermal fracture mechanics and materials designed to avoid fracture and fatigue

M E 573 Random Signal Analysis and Kalman Filtering (Same as Aer E 573 E E 573 Math 573) (3 0) Cr 3 F *Prereq 370 or 411 or Aer E 331 or E E 324 or Math 341 or 395* Elementary notions of probability Random processes Autocorrelation and spectral functions Estimation of spectrum from finite data Response of linear systems to random inputs Discrete and continuous Kalman filter theory and applications Smoothing and prediction Linearization of nonlinear dynamics

M E 574 Optimal Control (Same as Aer E 574 E E 574 Math 574) (3 0) Cr 3 S *Prereq 577* The optimal control problem Variational approach Pontryagin s principle Hamilton Jacobi equation

Dynamic programming Time-optimal minimum fuel minimum energy control systems The regulator problem Structures and properties of optimal controls

M E 575 Introduction to Robust Control (Same as Aer E 575 E E 575 Math 575) (3-0) Cr 3 *Prereq 577* Introduction to modern robust control Model and signal uncertainty in control systems Uncertainty description Stability and performance robustness to uncertainty Solutions to the H2 H¥ and l1 control problems Tools for robustness analysis and synthesis

M E 576 Digital Feedback Control Systems (Same as Aer E 576 E E 576 Math 576) (3 0) Cr 3 F *Prereq 411 or 414 or Aer E 432 or E E 475 or Math 415 and Math 267* Sampled data discrete data and the z transform Design of digital control systems using transform methods root locus frequency response and direct design methods Design using state-space methods Controllability observability pole placement state estimators Digital filters in control systems Microcomputer implementation of digital filters Finite wordlength effects Linear quadratic optimal control in digital control systems Simulation of digital control systems

M E 577 Modern Control Systems I (Same as Aer E 577 E E 577 Math 577) (3-0) Cr 3 F *Prereq 414 or Aer E 331 or Math 415 and Math 307* State variable and input output descriptions of linear continuous time and discrete time systems Solution of linear dynamical equations Controllability and observability of linear dynamical systems Canonical descriptions of linear equations Irreducible realizations of rational transfer function matrices Canonical form dynamical equations State feedback State estimators Decoupling by state feedback Design of feedback systems Stability of linear dynamical systems

M E 578 Modern Control Systems II (Same as Aer E 578 E E 578 Math 578) (3 0) Cr 3 S *Prereq 577* Well posedness of nonlinear control systems Approximate analysis methods Poincaré perturbation method and describing function method Lyapunov stability theory Absolute stability of feedback systems Input output stability Large scale systems

M E 579 Adaptive Control (Same as Aer E 579 E E 579 Math 579) (3 0) Cr 3 *Prereq 577* Fundamentals of adaptive control terminology parameter identification basic adaptive controller design techniques analysis of stability parameter convergence and robustness Nonlinear adaptive control Application examples

M E 585 Radioactive Waste Management (3 0) Cr 3 Alt S offered 2004 *Prereq 431* Management of high-level low-level transuranic and mixed wastes Technical challenges related to safe handling shipment treatment and disposal Source term evaluation engineered barrier system design and performance assessment model development and evaluation

M E 590 Special Topics Cr 1 to 8
A Experimental Gas Dynamics
B Fluid Mechanics
C Heat Transfer
D Thermodynamics and Energy Utilization
E Turbomachinery
F Vehicular Propulsion Systems
G Advanced Machine Design
I Automatic Controls
J Operating and Environmental Considerations in Design
K Mechanical Behavior of Materials
L Manufacturing Processes
M Tribology
N Sensitivity Methods
O Engineering Computation
P Engineering Measurements and Instrumentation
Q Independent Literature Investigation
R Nuclear Engineering
S CAD/CAM

M E 599 Creative Component Cr var

Courses for Graduate Students

M E 600 Seminar (1 0) Cr R F

M E 625 Surface Modeling (3-0) Cr 3 S *Prereq 519 programming experience in C* Theory and implementation of contemporary parametric sculptured surface modeling technology Non uniform rational B spline (NURBS) curves and surfaces Fundamental computational algorithms Construction techniques Advanced modeling topics Computer projects

M E 632 Multiphase Flow (Same as Ch E 632) (3 0) Cr 3 Alt S offered 2005 *Prereq M E 538 (or Ch E)* Single particle mutliparticle and two-phase fluid flow phenomena (gas solid liquid solid and gas-liquid mixtures) particle interactions transport phenomena wall effects bubbles equations of multiphase flow Dense phase (fluidized and packed beds) and ducted flows momentum heat and mass transfer Computer solutions

M E 636 Conduction Heat Transfer (3 0) Cr 3 Alt F offered 2004 *Prereq 436* Techniques for analysis of problems involving steady state and transient heat conduction in solids

M E 637 Convection Heat Transfer (3-0) Cr 3 Alt S offered 2005 *Prereq 436* Heat transfer to internal or external forced convection flows under laminar or turbulent conditions Free convection Heat exchanger design considerations including augmentation

M E 638 Radiation Heat Transfer (3-0) Cr 3 Alt F offered 2003 *Prereq 436* Techniques for analysis of radiation in enclosures Radiative properties of surfaces Radiative transfer in participating media Combined modes of transfer Approximate methods of analysis

M E 639 Two Phase Flow and Heat Transfer (3 0) Cr 3 Alt S offered 2004 *Prereq 436* Hydrodynamics of adiabatic two-phase flow Pool boiling Forced convection boiling and condensation Dynamic behavior of two-phase systems Augmentation of boiling and condensing heat transfer Applications in the power and process industries

M E 646 Computational Methods for Internal and Low Speed Flows (Same as Aer E 646) (3-0) Cr 3 Alt F offered 2003 *Prereq 547* Emphasis is on algorithms suitable for low speed and internal flows at speeds up through transonic Topics include pressure based schemes pseudo-compressibility methods use of preconditioning to develop algorithms suitable for all speed regimes large eddy simulation algorithms for unstructured grids and finite elements in fluids

M E 647 Advanced High Speed Computational Fluid Dynamics (Same as Aer E 647) (3 0) Cr 3 Alt F offered 2004 *Prereq 547* An examination of current methods in computational fluid dynamics Differencing strategies Advanced solution algorithms Grid generation Construction of complex CFD algorithms Current applications Use of state of the art CFD codes

M E 690 Advanced Topics Cr var Investigation of advanced topics of special interest to graduate students in mechanical engineering Topic areas are those listed for M E 590

M E 697 Engineering Internship Cr R *Prereq Permission of Director of Graduate Education graduate classification* One semester and one summer maximum per academic year professional work period Offered on a satisfactory fail grading basis only

M E 699 Research Offered on a satisfactory fail grading basis only

Courses in History of Technology and Science

M E 280 Introduction to History of Science I (Same as Hist 280) (3 0) Cr 3 F Ideas of nature from Babylonia to the Renaissance

M E 281 Introduction to History of Science II (Same as Hist 281) (3 0) Cr 3 S Science from the seventeenth-century scientific revolution to Darwin and Einstein

M E 284 Introduction to History of Technology and Engineering (Same as Hist 284) (3 0) Cr 3 F Technology in various civilizations including from Sumer and Egypt to early 18th century Europe

M E 285 Introduction to History of Technology and Engineering (Same as Hist 285) (3 0) Cr 3 S Technology in the Western world in the nineteenth and twentieth centuries

M E 488 History of American Technology (Same as Hist 488) (3 0) Cr 3 Cravens Bix Technology in America from Industrial Revolution to present Themes include social contexts of technological change development of professional engineering ideas about technology and American life Nonmajor graduate credit

M E 489 History of American Science (Same as Hist 489) (3 0) Cr 3 Cravens Science and its social relationships since the mid nineteenth century interaction of scientific discoveries and the development of society Continuing impact of Darwinism and other scientific theories science and social thought modern medicine and public health science and industry science and agriculture the social sciences government and science science and the consumer the atomic age big science and the environmental dilemma the energy crisis the role of science in a democracy Nonmajor graduate credit

Meteorology

For description of courses see Geological and Atmospheric Sciences

Microbiology

www micro iastate edu/index

James S Dickson Chair of Department

Distinguished Professor Rothschild

University Professor Glatz

Professors Atherly Dickson Harris Hartwig Hill Loynachan Pometto

Professors (Emeritus) Durand Kraft Pattee Quinn Williams

Associate Professors Andrews Bazylinski Bonning Cunnick Dispirito

Associate Professors (Collaborators) Harp Moorman

Assistant Professor Halverson

Assistant Professors (Collaborators) Bannantine Grant Halling Parkin Quinlisk Roof Stanton Wesley Zahn

Lecturer Boury

Undergraduate Study

The department offers undergraduate study for the bachelor of science degree with a major in microbiology For the curriculum in microbiology see *Agriculture Curricula* In this department principal emphasis is placed on understanding microorganisms and their interrelationships with other organisms in nature the application of microbiology in medicine agriculture and industry and the study of fundamental life processes as exemplified by microorganisms The department of microbiology also participates in an interdepartmental undergraduate minor in emerging globaldiseases (see the department of entomology for details) Some fields of microbiology especially advanced research may require further training Undergraduate work in the department is designed to provide sound preparation for graduate study training for bachelors-level employment and admission to professional programs such as medicine veterinary medicine and dentistry

Graduates of the Department of Microbiology are able to recognize and appreciate the diversity and complexity of microbial life represented by procaryotes eucaryotes and viruses In addition to understanding fundamental principles of microbial

growth physiology genetics biochemistry and ecology the program emphasizes the impact that the microbial world has on human animal and plant health as well as on industry and biotechnology Graduates are able to design and implement experimental approaches to address specific questions In addition graduates are able to communicate scientifically using a variety of media

Graduate microbiologists find career opportunities in a wide variety of areas in hospital and clinical laboratories in federal state and local government agencies in research and development in dairy and food processing in the pharmaceutical and fermentation industries

Undergraduate programs for the major in microbiology usually include the following basic courses 302 310 402 404 430 440 450 and labs Aspects of these courses emphasize communication skills environmental issues problem solving and laboratory techniques Courses in the following areas are required as supporting work biology chemistry biochemistry genetics mathematics and physics

Preveterinary preparation may be accomplished through the curriculum major in this department (see *College of Veterinary Medicine Admission Requirements*)

Students majoring in microbiology are eligible to apply for the Cooperative Education Program with the Agricultural Research Service If selected the student will obtain full time paid work experience at either the National Animal Disease Center the National Veterinary Services Laboratory or the Soil Tilth Laboratory in Ames Other internship opportunities also are available

The department offers a minor in microbiology which may be earned by accumulating a minimum of 15 credits from the departmental offerings

Majors in microbiology must take courses in written communication (Engl 104 105 and one of 302 309 or 314) one course in oral communication (Sp Cm 212) and must meet the College of Agriculture English proficiency requirement of C or better in these courses Students must also meet the College of Agriculture requirements for credit in courses in ethics and the university diversity and multicultural requirements

Graduate Study

The department offers the degrees master of science and doctor of philosophy and a doctoral minor to students majoring in other departments

Graduates in the Microbiology program have a strong broad based general knowledge of as well as advanced knowledge in a specific aspect of microbiology Those students completing a thesis have the technical research critical thinking problem solving and computer skills to design implement and conduct research using a variety of modern molecular tools and equipment They are able to communicate research results effectively with scientific peer groups in both oral and written formats

Prerequisite to graduate study is completion of coursework in general microbiology biology biochemistry mathematical sciences and physics

The faculty also participates in the interdepartmental majors and programs in genetics immunobiology MCDB (molecular cellular and developmental biology) neuroscience technology and social change toxicology and water resources (see *Index*)

Each graduate student must demonstrate proficiency in English composition within two semesters in residence

Courses open for nonmajor graduate credit 310 330 374 406 419 420 421 and 485

Courses Primarily for Undergraduate Students

Micro 110 Orientation in Microbiology (1-0) Cr 0.5 F Orientation to the discipline of microbiology the curriculum in microbiology and educational research opportunities within the department Offered on a satisfactory fail basis only

Micro 201 General Microbiology (2 0) Cr 2 FS *Prereq One semester of college-level biology* Selected topics in microbiology with emphasis on the relationship of microorganisms to human and animal health agricultural technology and the environment With written petition students who obtain a grade of B or better may substitute 201 for 302 in advanced courses

Micro 201L Introductory Microbiology Laboratory (0-2) Cr 1 FS *Prereq Credit or enrollment in 201 or 302* Basic Microbiology Laboratory techniques for non microbiology majors

Micro 302 Biology of Microorganisms (3-0) Cr 3 FS *Prereq Biol 201 credit or enrollment in Biol 202 1 semester of chemistry* Basic cell biology physiology metabolism genetics and ecology of microorganisms with an emphasis on procaryotes and viruses as well as the roles of microorganisms in the environment disease agriculture and industry

Micro 302L Microbiology Laboratory (0 3) Cr 1 FS *Prereq Credit or enrollment in 302* Basic microbiology laboratory techniques for majors in microbiology biological sciences and related fields

Micro 310 Fundamentals of Microbial Infection and Immunity (3 0) Cr 3 F *Prereq 302* Study of pathogenic microbes mechanisms of disease and host resistance Nonmajor graduate credit

Micro 310L Medical Microbiology Laboratory (0 3) Cr 1 F *Prereq 201 or 302 201L or 302L credit or enrollment in 310* Isolation and identification of human bacterial pathogens Study of fungal and viral human pathogens using polymerase chain reaction *antibody labeling and electron microscopy*

Micro 311 Introduction to Parasitology (Same as Zool 311) See *Zoology*

Micro 330 Environmental Systems (Same as EnvS 330) See *Environmental Science* Nonmajor graduate credit

Micro 374 Insects and Our Health (Same as Ent 374) See *Entomology* Nonmajor graduate credit

Micro 402 Microbial Genetics (3 0) Cr 3 F *Prereq 302 Biol 301* The fundamental concepts of bacterial and bacteriophage genetics including mutagenesis mechanisms of both vertical and horizontal genetic information transfer gene regulation and genetic approaches to study complex cellular processes Review and discussion of research literature to examine experimental design methodology and interpretation of both historical and contemporary relevance to microbial genetics

Micro 404 Microbial Physiology (Dual listed with 504) (3 0) Cr 3 S *Prereq 302 and Chem 332* Topics in microbial physiology including bioenergetics in bacterial systems metabolic diversity life in extreme environments adaptive and developmental changes

Micro 406 Principles of Mycology (Same as Bot 406) See *Botany* Nonmajor graduate credit

Micro 407 Microbiological Safety of Foods of Animal Origins (Dual listed with 507 same as FS HN 407) (3 0) Cr 3 S *Prereq 420* Examination of the various factors in the production of foods of animal origin from animal production through processing distribution and final consumption which contribute to the overall microbiological safety of the food The two modules of this course will be 1) the procedures and processes which can affect the overall microbiological safety of the food and 2) the Hazard Analysis Critical Control Point (HACCP) system

Micro 408 Virology (Dual listed with 508) (3 0) Cr 3 F *Prereq 310* The biology of animal plant and insect viruses

Micro 419 Foodborne Hazards (Same as FS HN 419) See *Food Science and Human Nutrition* Nonmajor graduate credit

Micro 420 Food Microbiology (Same as FS HN 420 Tox 420) (3 0) Cr 3 F *Prereq 302* Effects of microbial growth in foods Methods to control detect and enumerate microorganisms in food and water Foodborne infections and intoxications Nonmajor graduate credit

Micro 421 Food Microbiology Laboratory (Same as FS HN 421) (1 6) Cr 3 F *Prereq 201 or 302 201L Credit or enrollment in 420 (FS HN 420)* Standard microbiological techniques employed in the food industry including microscopic examination of foods plate counts other enmeration methods indicator organisms of food quality and safety foodborne pathogens and molds Nonmajor graduate credit

Micro 425 Food Biotechnology (Dual listed with 525 same as FS HN 425) See *Food Science and Human Nutrition*

Micro 430 Procaryotic Diversity and Ecology (Dual listed with 530) (3-0) Cr 3 Alt S offered 2005 *Prereq 302 302L* Survey of the diverse groups of procaryotes emphasizing important and distinguishing phylogenetic morphological ecological and metabolic features of member of those groups

Micro 440 Laboratory in Microbial Physiology Diversity and Genetics (1 7) Cr 3 F *Prereq Chem 332 302* Study of the fundamental techniques and theory of studying the diversity of microbial life Experimental techniques will include isolation and physiological characterization of bacteria that inhabit different environments In addition techniques for the phylogenetic characterization physiological properties and genetic manipulation of diverse species of bacteria

Micro 450 Undergraduate Seminar Cr 1 each time taken F *Prereq Sp Cm 212* Required of all undergraduate majors in microbiology Discussion of current papers in microbiology and immunology issues in scientific conduct bioethics and career opportunities in microbiology Students present current papers in a journal club format

Micro 475 Immunology (Dual listed with 575) (3 0) Cr 3 S *Prereq 310* An examination of humoral and cellular immune function as well as the interaction of the cells and factors of the immune system that result in health and disease Micro 575L optional Credit for either 475 or 520 but not both may be applied to graduation

Micro 477 Bacterial Plant Interactions (Dual listed with 577 same as Pl P 477) (3 0) Cr 3 Alt S offered 2004 *Prereq 3 credits in microbiology or plant pathology* Focuses on plant associated bacteria in terms of their ecology diversity and the physiological and molecular mechanisms involved in their interactions with plants covers symbiotic nitrogen fixation plant pathogenesis plant growth promotion and biological control

Micro 485 Soil Microbial Ecology (Same as Agron 485) See *Agronomy* Nonmajor graduate credit

Micro 487 Aquatic and Wetland Microbial Ecology (Dual listed with 587 same as Bot 487) See *Botany*

Micro 490 Independent Study Cr 1 to 5 FS SS *Prereq A minimum of 6 credit hours of 300-level or above coursework in microbiology permission of instructor* A maximum of 6 credits of 490 may be used toward the total of 128 credits required for graduation
H Honors

Micro 495 Internship Cr 1 to 2 FS *Prereq At least 6 credits of 300 level or above coursework in microbiology approval of academic adviser Participation in the Cooperative Extension Intern Program or an equivalent work experience* Written report of activities required Offered on a satisfactory fail grading basis only

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Micro 501 Advanced Microbiology (3 0) Cr 3 F SS *Prereq Biol 202 6 credits of chemistry* Overview of microbiology and introduction to the literature Topics include procaryote structure and function physiology genetics virology and immunology Credit for 302 or 501 but not both may be applied toward graduation

Micro 504 Microbial Physiology (Dual listed with 404 same as V MPM 504) (3 0) Cr 3 S *Prereq 302 and Chem 332* Topics in microbial physiology including bioenergetics in bacterial systems metabolic diversity life in extreme environments adaptive and developmental changes

Micro 507 Microbiological Safety of Foods of Animal Origins (Dual listed with 407 same as FS HN 507) (3 0) Cr 3 S *Prereq 420* Examination of the various factors in the production of foods of animal origin from animal production through processing distribution and final consumption which contribute to the overall microbiological safety of the food The two modules of this course will be 1) the procedures and processes which can affect the overall microbiological safety of the food and 2) the Hazard Analysis Critical Control Point (HACCP) system

Micro 508 Virology (Dual listed with 408) (3 0) Cr 3 F *Prereq 310* The biology of animal plant and insect viruses

Micro 509 Plant Virology (Same as Pl P 509) See *Plant Pathology*

Micro 525 Food Biotechnology (Dual listed with 425 same as FS HN 525) See *Food Science and Human Nutrition*

Micro 530 Procaryotic Diversity and Ecology (Dual listed with 430) (3 0) Cr 3 Alt S offered 2005 *Prereq 302* Survey of the diverse groups of procaryotes emphasizing important and distinguishing phylogenetic morphological ecological and metabolic features of members of those groups

Micro 540 Livestock Immunogenetics (Same as An S 540) See *Animal Science*

Micro 575 Immunology (Dual listed with 475 same as V MPM 575) (3-0) Cr 3 S *Prereq 310* Humoral and cellular immune functions Interactions between cells and factors of the immune system that result in health and disease Credit for either 575 or 520 but not both may be applied toward graduation

Micro 575L Immunology Laboratory (1-4) Cr 1 Half semester course S *Prereq Credit or enrollment in 475 or 575* Techniques in primary culture and tumor cell growth measures of lymphocyte function and flow cytometry

Micro 577 Bacterial Plant Interactions (Dual listed with 477 same as Pl P 577) (3 1) Cr 3 Alt S offered 2004 *Prereq 3 credits in microbiology or plant pathology* Focuses on plant associated bacteria in terms of their ecology diversity and the physiological and molecular mechanisms involved in their interactions with plants covers symbiotic nitrogen fixation plant pathogenesis plant growth and biological control

Micro 585 Soil Microbiology and Biochemistry (Same as Agron 585) See *Agronomy*

Micro 586 Medical Bacteriology (Same as V MPM 586) (4-0) Cr 4 F *Prereq 310* Bacteria associated with diseases of vertebrates including virulence factors and interaction of host responses

Micro 587 Aquatic and Wetland Microbial Ecology (Dual listed with 487 same as Bot 587) See *Botany*

Micro 590 Special Topics Cr 1 to 5 each time elected FS SS *Prereq Permission of instructor*

Micro 599 Creative Component Cr arr *Prereq Nonthesis M S Option only* A written report based on laboratory research library reading or topics related to the student s area of specialization and approved by the student s advisory committee

Courses for Graduate Students

Micro 604 Seminar (1 0) Cr 1 each time taken FS Offered on a satisfactory fail grading basis only

Micro 615 Molecular Immunology (Same as BBMB 615) See *Biochemistry Biophysics and Molecular Biology*

Micro 625 Mechanisms of Bacterial Pathogenesis (Same as V MPM 625) See *Veterinary Microbiology and Preventive Medicine*

Micro 626 Advanced Food Microbiology (Same as FS HN 626) See *Food Science and Human Nutrition*

Micro 641 General Mycology (Same as Bot 641) See *Botany*

Micro 642 General Mycology (Same as Bot 642) See *Botany*

Micro 679 Light Microscopy (Same as Bot 679) See *Botany*

Micro 680 Scanning Electron Microscopy (Same as Bot 680) See *Botany*

Micro 681 Transmission Electron Microscopy (Same as Bot 681) See *Botany*

Micro 685 Advanced Soil Biochemistry (Same as Agron 685) See *Agronomy*

Micro 690 Current Topics Cr 1 to 3 each time elected FS SS *Prereq Permission of instructor* Colloquia or advanced study of specific topics in a specialized field
A Microbiology
B Immunology
C Infectious Diseases

Micro 698 Seminar in Molecular Cellular and Developmental Biology (Same as MCDB 698) See *Molecular Cellular and Developmental Biology*

Micro 699 Research

Military Science

www public iastate edu/~armyrotc/

Lt Col Marvin Meek Chair of Department

Professors Meek

Assistant Professors (Adjunct) Meyer

Instructors (Adjunct) Krohn Mayner Runyon Showers Taylor Vance

The mission of the Reserve Officer Training Corps (ROTC) is to commission the future leaders of the United States Army Since ROTC produces 65 percent of the Army s Officer Corps our task is one of the most important undertakings in the Army and our country today We seek top quality college students We train these potential leaders assess their abilities and challenge them with the highest standards of profession/professionalism Those who successfully complete the program receive a commission as a second lieutenant in the U S Army A commission as an Army officer affords the opportunity to pursue a profession in one or several of the 300 different jobs held by Army officers Students may request to serve as an officer in either the active army or part time in the Army Reserve or National Guard Regardless of the method of service officers in today s Army can be proud to know that they are doing their share in the defense of the United States of America

The ISU military science program is divided into two segments the basic program and the advanced program The basic program (courses numbered 101-210) is designed primarily for freshmen and sophomores **No military obligation is incurred by a person participating in the basic program** The basic program is designed to be informative and to acquaint students with the military as a profession The basic program or an allowed substitute is a prerequisite for the advanced program **Financial assistance is available on a competitive basis**

Persons interested in military science should visit the department located on the second floor of the Armory

Basic Program

These courses are primarily for freshman and sophomore students and except for persons with prior military Service and basic training graduates are required for entry into the advanced program No more than 10 credits in 100 and 200-level courses may be applied toward graduation Each scholarship cadet in the Basic Program receives a monthly allowance for up to 10 months The curriculum is designed to train freshmen and sophomores in individual and team skills It also helps the Professor of Military Science identify individual leader developmental needs

Advanced Program

These courses are for students who have completed the basic program (or received equivalent credit) and are mandatory for potential commissioning upon contracting at the beginning of their junior year Each cadet receives a monthly allowance for up to 10 months This stipend is given during the junior and senior years These courses are primarily taught to juniors and seniors

Successful completion normally obligates the student to military service on active or reserve duty In addition to the advanced program of study a student (cadet) will be expected to pass the Army Physical Fitness Test (precondition for commissioning) each semester and continually maintain military appearance standards in both personal grooming and uniform Physical fitness training is regularly conducted outside of class or laboratory hours Students are expected to attend and participate in these exercise activities

Professional Military Education (PME) coursework outside of the military science curriculum is also a precondition to commissioning The PME component consists of two parts completion of a bachelors degree and demonstrated proficiency in three areas American Military History Computer Literacy and Communication These standards are explained to prospective students as they consider enrollment in the advanced program Army Uniforms will be worn at least once a week The 300 level courses will prepare cadets for National Advanced Leadership Course which is a five week summer internship/training program where cadets are trained to Army standards develop leadership skills and have their officer potential evaluated The 400 level courses are the final preparation for commissioning as a second lieutenant in the U S Army Students must meet academic alignment criteria and receive basic program credit before entering the advanced program

The College of Liberal Arts and Science offers a minor in Military Studies Requirements for the minor include taking a minimum of 15 credit hours of ROTC instruction which may be taken from one or a number of the ROTC programs At least 6 credit hours must be in courses numbered 300 or above

Courses Primarily for Undergraduate Students

Basic Program

M S 101 Introduction to Military Science (1-0) Cr 1 FSS This course offers an overview of the role of the United States Army officer the U S Army organization and the Army ROTC program of instruction Students will learn about the various jobs that an officer may assume officer traditions differences in officer and enlisted rank and etiquette Also students will be provided instruction on college scholarships (Army ROTC and others) in confidence building (hands-on rappelling and marksmanship classes) leadership abilities and professional knowledge about general military topics

M S 101L Basic Leadership Laboratory (0-2) Cr 0 5 F This Lab is designed to use basic military training skills and tasks to develop confidence character and leadership in students The team approach combined with hands on instruction is the teaching methodology for the Lab Students will learn various military tasks such as marching rifle/pistol firing and tactical patrolling gain confidence by rappelling and serving in leadership positions over other students and increase professional knowledge in areas such as first aid water survival personal physical fitness and land navigation Teaching locations include the ISU Armory Camp Dodge

(National Guard Facility) Pammel Woods (ISU campus) and ISU fitness centers (Beyer Hall and Leid Recreation Center) Full participation in all events will be determined based on students physical and medical eligibility

M S 102 The United States Defense Establishment (1-0) Cr 1 S SS This course instructs students on the U S Army s Principles of Warfighting Students will gain an understanding of the applied skills proven successful required to defeat an opponent militarily athletically or in the business world Historical battles and significant military leaders will be analyzed to highlight dimensions of leadership that can be quantifiably assessed Instruction will include programs to teach students the methodology used in ROTC to assess the leadership skills of both others and of self Additional instruction will include time management decision making counseling rappelling marksmanship and confidence building tasks

M S 102L Basic Leadership Laboratory (0 2) Cr 1 S SS This Lab is designed to use basic military training skills and tasks to develop confidence character and leadership in students The team approach combined with hands-on instruction is the teaching methodology for the Lab Students will learn various military tasks such as marching rifle/pistol firing and tactical patrolling gain confidence by rappelling and serving in leadership positions over other students and increase professional knowledge in areas such as first aid water survival personal physical fitness and land navigation Teaching locations include the ISU Armory Camp Dodge (National Guard Facility) Pammel Woods (ISU campus) and ISU fitness centers (Beyer Hall and Leid Recreation Center) Full participation in all events will be determined based on students physical and medical eligibility

M S 201 Principles of Leadership (2-0) Cr 2 FSS Development of leadership skills by study of principles and traits of leadership time management values decision making communicating delegating and counseling Leadership assessment programs role playing skits and films are used to enhance and reinforce the instruction

M S 201L Basic Leadership Laboratory (0 2) Cr 1 FSS This Lab is designed to use basic military training skills and tasks to develop confidence character and leadership in students The team approach combined with hands on instruction is the teaching methodology for the Lab Students will learn various military tasks such as marching rifle/pistol firing and tactical patrolling gain confidence by rappelling and serving in leadership positions over other students and increase professional knowledge in areas such as first aid water survival personal physical fitness and land navigation Teaching locations include the ISU Armory Camp Dodge (National Guard Facility) Pammel Woods (ISU campus) and ISU fitness centers (Beyer Hall and Leid Recreation Center) Full participation in all events will be determined based on students physical and medical eligibility

M S 202 Map Reading and Land Navigation (2-0) Cr 2 S SS Characteristics and features of the earths land mass and application of methods of conducting navigation on land by use of topographical maps compasses and aerial photographs military map symbols and their practical application

M S 202L Basic Leadership Laboratory (0-2) Cr 1 S SS Basic military training related to developing confidence character and leadership The team approach in task and mission accomplishment is taught with specific emphasis on land navigation and orienteering Locations include ISU Armory Camp Dodge (National Guard Facility) Pammel Woods (ISU Campus) and ISU fitness centers (Beyer Hall and Leid Recreation Center) Certification of medical eligibility required for full participation

M S 210 Practicum in Basic Military Skills Cr 6 SS *Prereq Permission of the professor of military science* Basic military skills for students with no prior military or ROTC training Involves attendance at the six week Army ROTC Leader s Training Course Fort Knox Kentucky Completion enables students to enroll in the Advanced Course and is taken in lieu of 101 102 201 and 202 Offered on a satisfactory fail grading basis only

M S 290 Independent Study Cr 1 to 3 each time taken *Prereq Permission of instructor*

Advanced Program

M S 301 Methods of Instructing Military Skills (3 0) Cr 3 FS *Prereq Completion of the basic program* Development of military writing techniques basic educational psychology oral presentation skills use of training aids and lesson planning Students prepare presentations incorporating all phases of instruction Students engage in a series of practical opportunities to lead small groups Focus in on leadership dimensions and the seven basic Army Values Additionally the student is introduced to the Leadership Development Program and the Army Physical Fitness Program The traditions and customs of the Army as well as land navigation skills are reviewed

M S 301L Advanced Leadership Laboratory (0-4) Cr 1 FS *Prereq Completion of the basic program* On the job training and evaluation provided by the ROTC cadre Developing training programs structuring laboratories presenting classes planning various events and accepting responsibility for the leadership labs The Water Survival Test Army Physical Fitness Test and the Land Navigation test required of candidates for a commission

M S 302 Small Unit Tactics (3-0) Cr 3 FS *Prereq Completion of the basic program* Organization composition and missions of operational elements Principles of offensive and defensive combat operations with emphasis on the attack retrograde patrolling combat intelligence tactical orders troop leading procedures and combat leadership

M S 302L Advanced Leadership Laboratory (0-4) Cr 1 FS *Prereq Completion of the basic program* On the job training and evaluation provided by the ROTC cadre Developing training programs structuring laboratories presenting classes planning various events and accepting responsibility for the leadership labs The Water Survival Test Army Physical Fitness Test and the Land Navigation test required of candidates for a commission

M S 310 Field Training Exercise (0-3) Cr 1 S *Prereq Completion of the basic program* An annual military exercise that requires approximately 72 hours of planning participation and follow up plus ROTC cadre evaluation Designed primarily for the advanced ROTC cadets in preparation for being commissioned as officers in the U S Army Actual military conditions are simulated detailed instruction in weapons training and execution of a simulated Operation Order in accomplishing a specific military mission Conducted as a weekend exercise at Camp Dodge (National Guard Facility) Offered on a satisfactory fail grading basis only

M S 401 The Military Team (3-0) Cr 3 FS *Prereq Completion of the basic program* Organization and operational concepts of the military staff military units administration logistics and organizational structures within the Army division Combat operations and their various elements with emphasis on planning and coordination and an introduction to military justice

M S 401L Advanced Leadership Laboratory (0-4) Cr 1 FS *Prereq Completion of the basic program* On the job training and evaluation provided by the ROTC cadre Developing training programs structuring laboratories presenting classes planning various events and accepting responsibility for the leadership labs

M S 402 Seminar The Professional Officer (3 0) Cr 3 FS *Prereq Completion of the basic program* Management leadership and professionalism management tools practices theories and principles leadership principles traits and application

M S 402L Advanced Leadership Laboratory (0-4) Cr 1 FS *Prereq Completion of the basic program* On the job training and evaluation provided by the ROTC cadre Developing training programs structuring laboratories presenting classes planning various events and accepting responsibility for the leadership labs

M S 410 Field Training Exercise (0 3) Cr 1 S *Prereq Completion of the basic program* An annual military exercise that requires approximately 72 hours of planning participation and follow up plus ROTC cadre evaluation Designed primarily for the advanced ROTC cadets in preparation for being commissioned as officers in the U S Army Actual military conditions are simulated detailed instruction in weapons training and execution of a simulated operation order in accomplishing a specific military mission Conducted as a weekend exercise at Camp Dodge (National Guard Facility) Offered on a satisfactory fail grading basis only

M S 490 Independent Study (1-0) Cr 1 each time taken *Prereq 402 and permission of the professor of military science* Investigation of an approved topic Must result in a professional journal-worthy paper on ethics current military issues interpersonal communications or leadership development

Military Studies

(Interdepartmental Minor)

Advisory Committee K Schindele Coordinator P Ladd M Meek

The Military Studies program is designed for students interested in learning about military skills and careers The mission of the Reserve Officer Training Corps (ROTC) programs is threefold First students are developed mentally morally and physically in order to make them strong leaders Second a desire for development in mind and character is instilled in students so they may assume the highest responsibilities of command citizenship and government Finally students are imbued with the highest ideals of duty honor and loyalty in order to graduate with a basic professional background and motivation toward their careers

The Air Force Aerospace Studies Military Science and Naval Science departments accomplish this mission through detailed courses of instruction occurring throughout a typical student s college career All academic courses offered by these departments focus on the development of profes sional military skills and their application Each department offers courses unique to its branch of the military The Air Force Aerospace Studies curriculum familiarizes students with Air Force structure and doctrine Students in Army ROTC classes gain an appreciation for ground warfare and doctrine while the Naval Science program develops basic seamanship skills such as navigation and marine propulsion On a broader scale all three departments offer courses promoting leadership and sound management practices that investigate the military s role in American domestic and foreign policy and can be employed in any career path

Air Force Aerospace Studies Military Science and Naval Science courses are offered in the interdepart mental Military Studies program in the following participating departments Air Force Aerospace Studies Military Science and Naval Science

Undergraduate Study

Undergraduate study in this program provides the student with an opportunity to develop a minor in Military Studies The three Iowa State University ROTC programs offer over 64 credit hours of specialized coursework The minor in Military Studies is open to any Iowa State University student

Undergraduate students may minor in Military Studies by taking 15 credit hours of coursework from a combination of any of the three ROTC programs - regardless of whether or not a commission in the Armed Forces is tendered At least 6 of the 15 credit hours must be in courses numbered 300 or above

Courses Primarily for Undergraduate Students

Air Force Aerospace Studies - See *Air Force Aerospace Studies*

AFAS 141 The United States Air Force Today I
AFAS 142 The United States Air Force Today II
AFAS 241 The Development of Air Power I
AFAS 242 The Development of Air Power II
AFAS 341 Air Force Management and Leadership I
AFAS 342 Air Force Management and Leadership II
AFAS 441 National Security Forces in Contemporary American Society I
AFAS 442 National Security Forces in Contemporary American Society II

Military Science See *Military Science*

M S 101 Introduction to Military Science
M S 102 The United States Defense Establishment
M S 201 Principles of Leadership
M S 202 Map Reading and Land Navigation
M S 301 Methods of Instructing Military Skills
M S 302 Small Unit Tactics
M S 401 The Military Team
M S 402 The Professional Officer

Naval Science See *Naval Science*

N S 111 Introduction to Naval Science
N S 210 Naval Ship Systems I
N S 211 Naval Ship Systems II
N S 212 Seapower and Maritime Affairs
N S 311 Navigation and Naval Operations I
N S 312 Navigation and Naval Operations II
N S 321 Evolution of Warfare
N S 411 Leadership and Management I
N S 412 Leadership and Management II
N S 421 Evolution of Amphibians Warfare

Molecular, Cellular, and Developmental Biology

(Interdepartmental Graduate Major)

Program Executive Committee Janice Buss Chair L Ambrosio R Robson

Participating Faculty Jan Buss Chair L Ambrosio I L Anderson A Andreotti R E Andrews D Bassham G Beattie P Becraft J Beetham D C Beitz M Bhattacharyya D Birt A Bogdanove B Bonning J Buss S Carpenter P Chitnis C Coffman D Dobbs C F Ford R Hamilton D Hannapel E R Henderson T Hulatt T S Ingebritsen J Johansen K M Johansen R Jurenka C Komar M Lee C Link J E Mayfield M A McCloskey W A Miller F C Minion A M Myers B J Nikolau M Nilsen Hamilton A Norris D Oliver G Phillips J Powell Coffman J Reecy R M Robson S R Rodermel R F Rosenbusch D S Sakaguchi P S Schnable S S Shen M H Spalding M H Stromer R W Thornburg C K Tuggle D F Voytas E S Wurtele

Undergraduate Study

A special program in molecular cellular and developmental biology is not offered for the baccalaureate Undergraduates wishing to prepare for graduate study in molecular cellular and developmental biology should elect courses in biochemistry botany genetics microbiology and zoology mathematics through calculus chemistry through organic and one year of physics Biol 301 301L 302 and 302L are recommended to undergraduates desiring an introduction to this area

Graduate Study

Work is offered for the master of science and doctor of philosophy degrees with a major in molecular cellular and developmental biology in several cooperating departments Agronomy Animal Science Biochemistry Biophysics & Molecular Biology Biomedical Sciences Botany Entomology Food Science and Human Nutrition Horticulture Plant Pathology Veterinary Microbiology & Preventive Medicine Veterinary Pathology Zoology and Genetics

Facilities and qualified faculty are available in these departments for conducting fundamental research in the various aspects of molecular cellular and developmental biology Ongoing research projects include molecular and cellular studies of viral prokaryotic plant and animal systems

Students may enter the MCDB major in one of two ways they may apply to and be accepted into the major directly or they may formally apply to the major after being accepted by a participating department Students admitted into MCDB will take MCDB 697 in their first two semesters and choose a major professor from the participating faculty by the end of their second semester Students admitted by a department will choose a major professor from the participating faculty in that department All Ph D students take a core curriculum consisting of the following courses one year of biochemistry (BBMB 404 405 or BBMB 501 502) molecular genetics (MCDB 502 511 545 or 676) cell biology (MCDB 528 or 529 or 540) developmental biology (MCDB 512 533) and seminar in MCDB (MCDB 698) In seminar students will make journal and research presentations and attend MCDB seminars M S students take the above core but may delete either the molecular genetics cell biology or developmental biology component Additional coursework is selected to meet departmental requirements and to satisfy individual student research interests The foreign language requirement is determined by the student s major department All graduate students are required to teach as part of their training for an advanced degree

Students minoring in molecular cellular and developmental biology at the Ph D level must meet the following requirements one year of biochemistry (BBMB 404 405 or BBMB 501 502 one course in each of two of the following three areas molecular genetics (MCDB 502 511 545 or 676) cell biology (MCDB 528 or 529 or 540) developmental biology (MCDB 512 533) and a semester of MCDB 698 (seminar in MCDB) each year

Courses for Graduate Students

MCDB 502 Microbial Genetics (Same as Micro 502) See *Microbiology*

MCDB 511 Molecular Genetics (Same as Gen 511) See *Zoology and Genetics*

MCDB 512 Plant Growth and Development (Same as Bot 512) See *Botany*

MCDB 520 Genetic Engineering (Same as Gen 520) See *Zoology and Genetics*

MCDB 528 Cellular Growth and Regulation (Same as Zool 528) See *Zoology and Genetics*

MCDB 529 Plant Cell Biology (Same as Bot 529) See *Botany*

MCDB 533 Principles of Developmental Biology (Same as Zool 533) See *Zoology and Genetics*

MCDB 540 Signal Transduction (Same as Zool 540) See *Zoology and Genetics*

MCDB 545 Plant Molecular Biology (Same as Bot 545) See *Botany*

MCDB 590 Special Topics Cr arr

MCDB 645 Molecular Endocrinology, Hormones and Growth Factors (Same as BBMB 645) See *Biochemistry Biophysics and Molecular Biology*

MCDB 676 Biochemistry of Gene Expression in Eucaryotes (Same as BBMB 676) See *Biochemistry Biophysics and Molecular Biology*

MCDB 697 Graduate Research Rotation (0 3 to 0 18) Cr 1 to 6 each time taken FS Graduate research projects performed under the supervision of selected faculty members in the molecular cellular and developmental biology program

MCDB 698 Seminar in Molecular Cellular and Developmental Biology (Same as An S 698 BBMB 698 Bot 698E Gen 698 Micro 698 V MPM 698 Zool 698) (2-0) Cr 1 to 2 each time taken FS Student and faculty presentations

MCDB 699 Research

Music

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Sue Haug, Chair of Department

Professors Darlington David Haug Messenger Prater J Rodde Work Zeigler

Professors (Adjunct) Estes

Distinguished Professors (Emeritus) White

Professors (Emeritus) Bleyle Brandt Burkhalter Drexler Molison Swift Vongrabow

Associate Professors Bovinette Cox Gouran Larkin Munsen Sadilek Schilling Simonson Stuart Sturm

Associate Professors (Emeritus) Alcorn Bjurstrom

Assistant Professors Baker Creswell Deane Golemo Goodman Laycock Stone Sunderman Tam

Assistant Professors (Adjunct) Bryden Kleptach K Rodde Seebeck Trenberth

Assistant Professors (Emeritus) Waggoner

Instructors (Adjunct) Thomas

Instructors (Collaborators) Foss Kaizer Patton Tener

Lecturers Smith Tsao Lim

Undergraduate Study

The Department of Music offers a strong undergraduate music program where students study with full time faculty professionals in a supportive environment that encourages students to become their best

The curriculum of the music department provides
1 A comprehensive program of professional studies for students who wish to prepare for careers in music including teaching performance and composition and for students who plan to pursue graduate studies in music
2 Courses in music literature theory and areas of performance for all students regardless of major

The department embodies the land-grant philosophy of service to the people of the state with a faculty of active scholars teachers and artists committed to excellence in teaching creative/scholarly work and arts outreach The department is an accredited institutional member of the National Association of Schools of Music (NASM)

The Theatre Program is administered by the Department of Music (see *Index Theatre Courses*)

Bachelor of Music

For the undergraduate curriculum in music leading to the degree bachelor of music see *Liberal Arts and Sciences Curriculum* In order to receive teacher certification in music students must earn the Bachelor of Music degree

Candidates for the bachelor of music will complete the following requirements

Cr	
38-46	General education
0 5	Library
47	Music core
31-47	Area of Specialization (Students must select one of the following options music education organ piano string instruments composition voice or wind or percussion instruments)

Bachelor of Arts—Music Major

For the undergraduate curriculum in Liberal Arts and Sciences major in music leading to the degree bachelor of arts see *Liberal Arts and Sciences Curriculum*

Candidates for the degree bachelor of arts with a music major will normally complete 48 credits of music including the following required courses 119

120 219 221 222 231 232 319 331 332 337 338 383 384

Bachelor of arts students whose chief professional interest lies in research are encouraged to minor in foreign languages and literatures history literature or philosophy

Minor in Music Candidates for the minor in music will complete 19 credits in music including 6 credits in courses numbered 300 and above taken at ISU with a grade of C or better and
a one of the following 101 221 222
b one of the following 102 120 304
c either

Two consecutive semesters of one of the following ensembles 111 112 113 115 131 141 151 161 171 181 301

or

Two consecutive semesters of one applied music area (choose from 118 318 127 128 227 228 290F 327 or 133)

General Requirements

Prior to being accepted as a music major students are required to audition for applied faculty in their performance area (piano organ woodwinds strings percussion brass or voice) and must successfully demonstrate performance skills appropriate for college level instruction Once accepted a student must complete a placement examination in keyboard skills This examination will be given by members of the departmental faculty during summer orientation the week preceding the opening of classes for fall semester or by appointment

Seminars and Recitals All music majors enrolled for applied music courses will attend a weekly 1-hour seminar in their areas and departmental recitals each semester

Ensemble Requirement All bachelor of music students must register for an ensemble course each semester of full-time enrollment (except during student teaching) Students in a music education option must register for six semesters of large ensemble (111 115 141 151 161 181) and one semester of chamber music ensemble (113 161 301 321) Instrumental music education students may count one semester of 114 as a large ensemble All full time Bachelor of Music students in options other than music education must include among their ensembles at least two semesters of large ensemble (111 115 141 151 161 181) and one semester of chamber ensemble (113 161 301 321)

Continuation Examination To be approved for continuation as a music major on the junior level a student must pass a continuation examination taken normally at the end of the fourth semester Before taking this examination the student must fill out the requisite forms as well as prepare a statement of (1) his/her personal goals (2) a self-assessment of his/her progress thus far and (3) an assessment of what he/she expects to accomplish before graduation

The student taking the Continuation Examination performs for a Continuation Examination Committee Requirements include the performance of three works representing different periods or styles selected by and studied with the applied teacher a self-prepared piece and sight reading The student must display acceptable solo ability and performance techniques in at least one of the applied areas A written evaluation will be given each student following his/her performance This evaluation will include a candid assessment of the student s potential to achieve his/her goals In addition the student may arrange to meet with members of the Continuation Examination Committee at a later date to discuss the results of his/her Continuation Examination

All music majors must demonstrate proficiency in piano as a part of the continuation examination Proficiency will normally be demonstrated by completing Music 228 or for keyboard majors by completing Music 327 The student must pass all parts of the continuation examination in order to enroll in Music 319 or 419 Applied Music

Graduation Proficiency To be recommended for graduation a music student should demonstrate to the music faculty mature acquaintance with performance styles technique and repertoire All music majors will participate in departmental recitals to the satisfaction of the department Candidates for the bachelor of music degree will present a graduation recital

English proficiency requirement The department requires a grade of C– or better in each of Engl 104 and 105 (or 105H) In addition the English proficiency must be certified through one of the following options
1 Certification of writing skills by the instructor after completion of Music 120 383 384 472 473 475 490D or 490E (Passing one of these courses does not automatically satisfy the requirements for English proficiency)
2 Satisfactory completion of an advanced writing course (e g English 302 305 or 314)

Graduate Study

Courses open for nonmajor graduate credit 430 440 472 473 475 476

Courses Primarily for Undergraduate Students

Music 101 Fundamentals of Music (1 2) Cr 2 FS *Prereq Ability to read elementary musical notation* Notation recognition execution and analysis of scales intervals triads and rhythm key signatures time signatures transposition Intended for non-majors

Music 102 Introduction to Music Listening I (3-0) Cr 3 FS SS Expansion of the music listening experiences of the general student through greater awareness of differences in techniques of listening performance media and materials of the art The course focuses on the elements of music rhythm melody harmony form and style and how these elements are used in musics of different cultures and time periods Student need not be able to perform or read music Open to non majors only

Music 105 Basic Musicianship (1 4) Cr 3 S *Prereq Performing arts major classification* Beginning keyboard techniques sight-reading and sight singing skills Basic materials of music notation scales intervals key signatures time signatures rhythm and harmony

Music 111 Wind Ensemble (0 3) Cr 1 each time taken FS *Prereq Open to all students by audition* Emphasis on significant extended compositions for wind and percussion instruments Performances include formal concerts on campus and the annual tour

Music 112 Concert Band (0 2) Cr 1 each time taken FS *Prereq Open to all students who have performed on a wind or percussion instrument in high school band or orchestra* Repertoire includes the broad spectrum of band music Two concerts are presented each semester

Music 113 Jazz Ensemble (0 2) Cr 1 each time taken FS *Prereq Open to all students by audition* Designed to explore various styles and trends in contemporary jazz

Music 114 Marching and Pep Bands (0 5) Cr 1 each time taken
A Marching Band F *Prereq Open to all students who have performed on a wind or percussion instrument in high school band or orchestra* Membership determined by date of band application audition required for percussion flags and twirlers Presentation of pre-game and half time shows at each home and at least one away football game
B Pep Band S *Prereq Students selected by audition from current members of 114A* Performances at basketball games

Music 115 Symphonic Band (0 3) Cr 1 each time taken FS *Prereq Open to all students by audition* Stresses high quality wind literature Performances include formal concerts on campus

Music 118 Applied Music Non-majors (5-0 or 1 0) Cr 1 or 2 each time taken FS SS *Prereq Audition permission of instructor* Applied music for the general student Will not satisfy applied music requirements for music majors
A Voice
B Piano
C Organ
D Strings
E Carillon
F Woodwinds
G Brass
I Percussion
K Harpsichord

Music 119 Applied Music Majors (5 2 or 1 2) Cr 1 to 3 each time taken FS SS *Prereq Audition permission of instructor restricted to music majors* Minimum weekly practice of 5 hours per credit is expected Weekly seminar required
A Voice
B Piano
C Organ
D Strings
E Carillon
F Woodwinds
G Brass
I Percussion
K Harpsichord

Music 120 Introduction to Music Literature and Styles (3-0) Cr 3 S *Prereq 221* Directed studies via aural analysis for music majors with emphasis on the materials of music form and aesthetic issues Introduction to style and literature of the major performance media in context of historical chronology Fundamentals of score reading and performance terminology

Music 127 Class Study in Piano I (0 2) Cr 1 FS *Prereq 101 or audition and permission of instructor* Beginning keyboard technique repertory and sightreading skills

Music 128 Class Study in Piano I (0 2) Cr 1 FS *Prereq 127 or audition and permission of instructor* Continuation of beginning keyboard technique repertory and sightreading skills

Music 131 Vocal Jazz Ensemble "Off the Record" (0 2) Cr 1 each time taken *Prereq Open by audition and permission of instructor concurrent enrollment in one of the following 151 161 171* Small mixed chorus specializing in advanced vocal jazz techniques Performances on and off campus

Music 133 Basic Voice Techniques (0 2) Cr 1 each time taken FS *Prereq Permission of instructor* Class study in voice Techniques of vocal production respiration phonation resonation articulation and performance

Music 141 Lyrica Women's Choir (0 3) Cr 1 each time taken FS *Prereq Open to all female students by audition* Large chorus emphasis on fundamental vocal and choral skills wide variety of literature Campus concerts each semester

Music 146 Summer Band (0 2) Cr 5 each time taken SS *Prereq Open to all students who have performed on a wind or percussion instrument in band or orchestra* One concert presented in SS

Music 151 Oratorio Chorus (0-3) Cr 1 each time taken FS *Prereq Open to all students by audition* Advanced skills required high quality literature Campus concerts each semester some concerts in conjunction with orchestras Men s and women s choirs separately and in combination
A Cantamus Women s Choir
B Statesmen Men s Choir

Music 156 Summer Chorus (0 2) Cr 5 each time taken SS Open to students staff and community

Music 161 Iowa State Singers (0 5) Cr 1 each time taken FS *Prereq Open to all students by audition* Concert choir specializing in performance of advanced music literature Renaissance through contemporary Campus concerts annual spring tour

Music 171 Chamber Singers (0 3) Cr 1 each time taken *Prereq Open to all students by audition* Several appearances annually by a select group capable of advanced study performing music literature appropriate for small vocal ensemble Renaissance through contemporary

Music 181 Symphony Orchestra (0-4) Cr 1 each time taken FS *Prereq Open to all students by audition* Reading preparation and performance of standard repertoire Five or six concerts annually plus occasional off-campus appearances

Music 219 Applied Music Majors (5 2 or 1 2) Cr 1 to 3 each time taken FS SS *Prereq Audition permission of instructor restricted to music majors* Minimum weekly practice of 5 hours per credit is expected Weekly seminar required
A Voice
B Piano
C Organ
D Strings
E Carillon
F Woodwinds
G Brass
I Percussion
K Harpsichord

Music 221 Introduction to Music Theory (3-0) Cr 3 F Fluent identification and application of the elements of music and music notation The study of two voice species counterpoint as an introduction to voice-leading principles in common practice period music

Music 222 Introduction to Aural Theory and Music Technology (0-4) Cr 2 F Aural discrimination of musical elements and patterns as demonstrated by proficiency in ear training sight singing and related musicianship skills Introduction to technological equipment and software used in the study of music

Music 227 Class Study in Piano II (0 2) Cr 1 FS *Prereq 128 or audition and permission of instructor* Intermediate keyboard technique repertory and sightreading skills Introduction to score reading hymn playing and accompanying at the piano

Music 228 Class Study in Piano II (0-2) Cr 1 FS *Prereq 227 or audition and permission of instructor* Continuation of intermediate keyboard technique repertory and sightreading skills Introduction to score reading hymn playing and accompanying at the piano

Music 231 Materials of Music I (3 0) Cr 3 S *Prereq 221* Harmonic melodic and rhythmic materials of the common practice period Application of these materials in analysis and writing Techniques of melodic construction formal design and harmonization

Music 232 Aural Theory I (0 3) Cr 1 S *Prereq 222* Development of sight singing ear training and related musical skills with emphasis on melodic harmonic and rhythmic materials from the common practice period

Music 248 Introduction to Music Technology (2 1) Cr 2 S *Prereq 101 or 221 and 222 and permission of instructor* Introduction to the history and current use of technology in music education and the music industry Hands-on work with MIDI/computer music software recording studio equipment

Music 265 Music in Elementary Education (3 0) Cr 3 FS *Prereq HD FS 226 or Psych 230* Experiencing and understanding the fundamentals of music through singing playing classroom instruments body movement reading notation listening and creative activities Developing lesson plan strategies and sequence exploring multicultural musics integrating music with other subjects in the elementary classroom and evaluating aspects of musical learning

Music 266 Introduction to Music Education (1-2) Cr 2 F *Prereq Concurrent enrollment (5 cr) in LAS 480K* Required for second year majors in music education Historical philosophical and social foundations of music education music curricula overview including goals of the music program and contemporary and international curriculum development psychology of teaching music including discipline techniques Preparation for required observations in area schools

Music 290 Special Problems Cr var FS SS *Prereq Permission of instructor A through F 12 credits in music approval of department head H approval of department head*
A Education
B Theory
C Composition
D History
E Literature
F Applied Music
H Honors
G Conducting

Music 301 Opera Studio Cr 1 to 3 each time taken FS *Prereq Permission of instructor* Study of selected opera scenes and chamber operas Basic stagecraft role interpretation production

Music 302 Advanced Music Listening (3 0) Cr 3 S *Prereq Music 102 junior classification* Study of the evolution of music styles through history with emphasis on listening Primarily European music with some non-Western music providing a global perspective Individual composer s unique approaches to timbre texture rhythm and melody General trends in the progress of style and form Concert reports and papers in addition to examinations Ability to read music recommended but not required Open to non majors only

Music 304 History of Rock n Roll (3 0) Cr 3 S *Prereq 101 102 221 or 222* Rock n Roll from the mid 1950s through the 1990s focusing on the development of rock styles from its roots in blues folk country and pop Expansion of listening experience through study of song forms musical instruments of rock and the socio-political significance of song lyrics Examinations research paper or in class presentation required Student need not be able to perform or read music

Music 318 Applied Music Non majors (5 0 or 1 0) Cr 1 or 2 each time taken FS SS *Prereq Audition permission of instructor* Applied music for the general student Will not satisfy applied music requirements for music majors
A Voice
B Piano
C Organ
D Strings
E Carillon
F Woodwinds
G Brass
I Percussion
K Harpsichord

Music 319 Applied Music Majors (5 2 or 1 2) Cr 1 to 3 each time taken FS SS *Prereq Audition permission of instructor restricted to music majors* Minimum weekly practice of 5 hours per credit is expected Weekly seminar required
A Voice
B Piano
C Organ
D Strings
E Carillon
F Woodwinds
G Brass
I Percussion
K Harpsichord

Music 321 Advanced Ensemble (0 3) Cr 1 each time taken FS *Prereq Advanced proficiency and performing ability permission of director and department head* Performance in ensembles that demand high proficiency Open to a limited number of undergraduate and graduate students
A Voice
B Piano
C Organ
D Strings
E Musica Antiqua
F Woodwinds
G Brass
I Percussion
J Mixed

Music 324 English and Italian Diction for Singing (2 0) Cr 2 Alt F offered 2004 *Prereq Credit or enrollment in 118A or 119A* The international phonetic alphabet and its application to correct pronunciation of English and Italian in singing

Music 325 French and German Diction for Singing (2-0) Cr 2 Alt S offered 2005 *Prereq Credit or enrollment in 118A or 119A* The international phonetic alphabet and its application to correct pronunciation of French and German in singing

Music 327 Functional Piano (0 3) Cr 2 S *Prereq 228 or audition and permission of instructor* Emphasis on sight reading three and four part score reading improvisation accompanying and advanced harmonization
A Keyboard majors
B Vocal/choral majors

Music 331 Materials of Music II (3-0) Cr 3 F *Prereq 231* Harmonic melodic and rhythmic materials of the common practice period Application of these materials in analysis and writing Techniques of melodic construction formal design and harmonization

Music 332 Aural Theory II (0 2) Cr 1 F *Prereq 232* Development of sight singing ear training and related musical skills with emphasis on melodic harmonic and rhythmic materials from the eighteenth and nineteenth centuries

Music 337 Materials of Music III (3 0) Cr 3 S *Prereq 331* Writing and analysis based on musical styles since 1900

Music 338 Aural Theory III (2 0) Cr 1 S *Prereq 332* Development of sight singing ear training and related musical skills with emphasis on melodic harmonic and rhythmic materials from the nineteenth and twentieth centuries

Music 350 Instrumental Techniques Strings (0-2) Cr 1 F *Prereq Concurrent enrollment in 358B* Techniques and skills required for teaching of instruments Examination of materials for school use For the instrumental music specialist

Music 351 Instrumental Techniques Clarinet Flute Saxophone (1-2) Cr 2 S *Prereq Concurrent enrollment in 358B* Techniques and skills required for teaching of instruments Examination of materials for school use For the instrumental music specialist

Music 352 Instrumental Techniques Oboe Bassoon (0 2) Cr 1 F *Prereq Concurrent enrollment in 358B* Techniques and skills required for teaching of instruments Examination of materials for school use For the instrumental music specialist

Music 353 Instrumental Techniques Trumpet, Horn (0 2) Cr 1 S *Prereq Concurrent enrollment in 358B* Techniques and skills required for teaching of instruments Examination of materials for school use For the instrumental music specialist

Music 354 Instrumental Techniques Trombone Baritone Tuba (0-2) Cr 1 F *Prereq Concurrent enrollment in 358B* Techniques and skills required for teaching of instruments Examination of materials for school use For the instrumental music specialist

Music 355 Instrumental Techniques Percussion (0 2) Cr 1 S *Prereq Concurrent enrollment in 358B* Techniques and skills required for teaching of instruments Examination of materials for school use For the instrumental music specialist

Music 356 Instrument Maintenance and Repair (0-2) Cr 1 F *Prereq Permission of instructor* Techniques and skills required for basic maintenance and repair of wind and percussion instruments Examination of commercial repair methods and facilities For the instrumental music specialist

Music 358 Lab Ensemble (0-1) Cr R Review and selection of appropriate literature for ensembles of differing levels and abilities conducting and rehearsal experience

A Choral F 2003 S 2005 Sight singing conducting and accompanying experience in conjunction with 362A Required of all vocal music education majors in every semester offered
B Instrumental FS Performance on secondary instruments Includes experiences with singing and vocal techniques Required of all instrumental music education majors in those semesters when enrolled in 350 351 352 353 354 or 355

Music 360 Vocal Pedagogy (2 0) Cr 2 Alt S offered 2005 *Prereq 319A or vocal proficiency examination* Physical acoustical and musical properties of the vocal instrument including a survey of important texts and articles on singing and voice production

Music 361 Conducting I (1-2) Cr 2 F *Prereq 231 232* Introduction to conducting score reading and analysis Conveying musical ideas through appropriate gestures Leadership role of the conductor

Music 362 Conducting II (1 2) Cr 2 *Prereq 361*
A Choral techniques Alt S offered 2005 *Prereq Concurrent enrollment in 358A* Advanced baton technique score preparation and interpretation of choral repertoire
B Instrumental techniques S Advanced baton technique Score preparation Specific problems of large instrumental ensembles Concurrent enrollment in 358B

Music 364 Music in Early Childhood Education (3-1) Cr 3 *Prereq HD FS 226 or Psych 230* Objectives teaching strategies and materials for guiding musical growth in children ages 3 to 7 Identifying musical characteristics of children establishing a musical environment and the utilization of classroom instruments folk songs movement and creative activities in conceptual teaching and learning Observation of and participation in early childhood settings

Music 366 Methods of Music Education (2-0) Cr 2 F *Prereq Concurrent enrollment (1 cr) in LAS 480K 266 and admission into teacher education* Music education strategies and materials including development of appropriate objectives and plans for general music classes utilizing traditional and multicultural musics evaluating musical learning overview of Orff Schulwerk Kodaly and Dalcroze approaches music in special education required teaching in lab settings and observations in area schools

Music 367 Choral Literature (2 0) Cr 2 Alt S offered 2004 *Prereq 361 recommended* Overview of choral repertoire from the sixteenth century to the present including accessible works for the young conductor

Music 368 Marching Band and Jazz Ensemble Techniques (2-0) Cr 2 Alt S offered 2005 *Prereq Credit or enrollment in 362B recommended* Techniques and materials for teaching marching band in the high school philosophy computer assisted drill design music analysis band set up and other related skills Jazz style articulation phrasing materials and teaching techniques for secondary school jazz ensembles

Music 369 String Pedagogy (0 2) Cr 1 *Prereq 319D or 350* Practical examination of current teaching methods and materials Intended for string instrumental music education majors

Music 383 History of Music (3-0) Cr 3 F *Prereq 120* History of the stylistic and cultural development of music Middle Ages through Baroque

Music 384 History of Music (3 0) Cr 3 S *Prereq 383* History of the stylistic and cultural development of music Classical through contemporary music

Music 417 Literature and Pedagogy in Applied Music Cr 1 to 4 each time taken FS SS *Prereq Permission of instructor* Includes experience in technology relative to the particular discipline
A Voice
B Piano
C Organ
D Strings
E Carillon
F Woodwinds
G Brass
I Percussion
J Jazz Pedagogy and Performance

Music 419 Applied Music Majors (5-2 or 1 2) Cr 1 to 3 each time taken FS SS *Prereq Audition permission of instructor restricted to music majors* Minimum weekly practice of 5 hours per credit is expected Weekly seminar required
A Voice
B Piano
C Organ
D Strings
E Carillon
F Woodwinds
G Brass
I Percussion
K Harpsichord

Music 430 Seminar in Analysis for Performance (3-0) Cr 3 each time taken *Prereq 337 338* Analysis and performance of selected works appropriate to student s performance medium Examination of structural rhythmic harmonic and textural aspects of the music selected Literature will vary according to the needs of the class Nonmajor graduate credit

Music 440 Seminar in MusicTheory (3-0) Cr 3 each time taken *Prereq 337 338* Various topics in music theory including counterpoint arranging pedagogy and psychology of music Content will vary Contact the Department of Music for the current year offering Nonmajor graduate credit

Music 448 Electronic Music Synthesis (3-0) Cr 3 Alt F offered 2004 *Prereq 248 for music majors non majors permission of instructor* Techniques of electronic music production recording mixing Advanced computer applications including MIDI digital synthesis in hardware and software and digital signal processing Emphasis on applications to music and creative work

Music 464 Instrumental Administration, Materials, and Methods (2-0) Cr 2 Alt S offered 2004 *Prereq Credit or enrollment in 362B recommended* Instructional materials and methods appropriate for teaching instrumental music in elementary middle school and high school music programs Required observations in area schools

Music 465 Choral Materials and Methods (2 0) Cr 2 Alt F offered 2003 *Prereq Concurrent enrollment in 358A* Instructional materials and methods appropriate for teaching choral music in the secondary school Emphasis on pedagogy and rehearsal techniques Required observations in area schools For the vocal music education specialist

Music 466 Program Development and Evaluation in Music Education (2 1) Cr 2 F *Prereq 362 366 concurrent enrollment (5 cr) in C I 480K successful completion of continuation exam* Developing a rationale for music education music program development evaluation of music curricula programs and facilities professional growth of the teacher preparation for student teaching and the job market Required observations in area schools

Music 471 TheTones of Florence A Study of Humanism (Same as U St 471) Cr 3 SS *Prereq Application through the Study Abroad Program interview with instructor sophomore classification* A survey of the masterpieces of music literature painting sculpture architecture mathematics and theology that made Florence the major European center of humanism in the Renaissance

Music 472 History of American Music (3-0) Cr 3 *Prereq Ability to read music 9 credits from music American literature American history art history* Serious and popular currents that have influenced development in American music and its relation to transcendentalism mass culture and other intellectual social and cultural trends in the history of America Nonmajor graduate credit

Music 473 Music of the Baroque and Classical Eras (3 0) Cr 3 *Prereq 383 384* Detailed survey of instrumental vocal choral and keyboard music from 1600 to 1825 Nonmajor graduate credit

Music 475 Music of the Romantic Era (3-0) Cr 3 *Prereq 383 384* Detailed survey of instrumental vocal choral and keyboard music from 1825 to 1910 Nonmajor graduate credit

Music 476 Music of theTwentieth Century (3 0) Cr 3 *Prereq 383 384* Detailed survey of instrumen tal vocal choral and keyboard music from 1900 to the present Nonmajor graduate credit

Music 490 Independent Study Cr var FS SS *Prereq Permission of instructor A through F 12 credits in music approval of department head* No more than 9 credits of Music 490 may be counted toward graduation
A Education
B Theory
C Composition
D History
E Literature
F Applied Music
H Honors
G Conducting

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Music 590 SpecialTopics Cr var FS SS *Prereq Permission of instructor approval of department head*
A Education
B Theory
C Composition
D History
E Literature
F Applied Music
G Conducting

Music 593 Workshops Cr var each time taken
A Foundations of Music Learning
B Music in Early Childhood
C Junior High School Music Programs
D Instrumental Teaching Techniques
E Research in Music Education
F Vocal/Choral Teaching Techniques
G General & Contemporary Music Methodologies
H Music and Technology

Natural Resource Ecology and Management

J Michael Kelly, Chair of Department

University Professors Atchison

Professors Best Clark Downing Hall Harrington Jungst Kelly Menzel Schultz Summerfelt Wray

Professors (Collaborators) Brandle Isebrands Otis Riemenschneider

University Professors (Emeritus) Hinz McNabb

Professors (Emeritus) M Bachmann R Bachmann Bensend Clark Countryman Dinsmore Downing Hart Manwiller Moorman Prestemon

Professors (Collaborator Emeritus) Klaas

Associate Professors Colletti Danielson Debinski Kuo Mize Morris Rule

Associate Professors (Collaborators) Tomer

Assistant Professors Asbjornsen Miller Pease Stokke Thompson

Assistant Professors (Adjunct) Isenhart Negreros Castillo Pritchard Stafford

Assistant Professors (Collaborators) Hohman Koford Pierce

The department addresses a broad spectrum of natural resource and environmental issues in a holistic approach to learning discovery and engagement Our vision of natural resources is that

informed protection and management of natural resources involves an integration of biological economic and social considerations Such an integrated and comprehensive approach to the education of future generations of natural resource managers and scientists is needed in order to sustain viable landscapes facilitate strong communities and produce desired goods services and functions from our natural resources

Undergraduate Study

The Department of Natural Resource Ecology and Management offers work for the bachelor of science degree with majors in animal ecology or forestry (see *College of Agriculture Curricula*) The department participates in interdisciplinary programs in biology environmental studies international studies pest management and plant health and protection By proper selection of free and restricted elective courses students can obtain a minor or a second major in these programs or other disciplines

The Department provides several scholarships application information is available in the departmen tal Student Services Center

Animal Ecology (A Ecl)

The animal ecology curriculum provides its majors with an understanding of ecological principles and processes and their applications to natural resource management It is oriented toward students desiring a general and flexible program in environmental biology and for those planning graduate study Students may select from six options Aquaculture Ecology Fisheries and Aquatic Sciences Interpreta tion of Natural Resources Preveterinary and Wildlife Care or Wildlife Graduates find employment as aquaculturists wildlife biologists fisheries biologists and ecologists for industry environmental consulting firms natural resource and environmental agencies and organizations zoos and as educators

Graduates of the Animal Ecology program understand the basic principles of animal biology ecology and management and relevant aspects of scientific communication basic mathematics and sciences computing applications and personal and profes- sional development Six specific options prepare students for careers in aquaculture fisheries and aquatic sciences ecology wildlife interpretation of natural resources wildlife care and veterinary sciences Each option has specific outcomes expectations that include (1) the scope of the specialization and its relationships to broader aspects of animal ecology biotic resource management and other allied scientific disciplines and professions (2) career opportunities and requirements and (3) knowledge and skills appropriate for employment at technical and practitioner levels in each discipline Graduates are able to communicate and work effectively in the multidisciplinary arena of ecology and natural resource management

This curriculum requires three months of relevant work experience or study at a biological station prior to graduation The latter may be accomplished at the university s affiliate field stations Iowa Lakeside Laboratory at West Lake Okoboji and Gulf Coast Research Laboratory at Ocean Springs Mississippi Information on these laboratories is available from the department s Student Services Center

Preveterinary medicine preparation may be achieved while satisfying degree requirements in animal ecology

Additional education and training can lead to other opportunities in such areas as research and management natural resources planning and administration teaching and environmental consulting among others Graduate training is necessary for many specialized positions within the fields of animal ecology Majors preparing for graduate study should consult with their academic adviser concerning appropriate coursework

Students seeking certification to teach biology in secondary schools must meet requirements of the College of Education as well as those of the Animal Ecology curriculum In addition they must apply formally for admission to the teacher education program (see *Index Teacher Education Program*) Students with an interest in careers in outdoor writing are encouraged to obtain a minor or a second major in journalism (see *Index Journalism and Mass Communication Courses and Programs*) Students who wish to pursue a job as a conservation officer may wish to minor in criminal justice (see *Index Criminal Justice Studies)*

The department offers a minor in animal ecology that may be earned by taking 15 credits in the department including 310 312 NREM 120 plus five additional credits of Animal Ecology courses at the 300 level or above

Forestry (For)

The forestry curriculum offers courses that are concerned with the management of forest ecosys tems for multiple benefits including wood and fiber products biodiversity recreation water wilderness and wildlife Conservation and preservation of natural resources are emphasized The department offers work for the bachelor of science degree with a major in forestry and options in forest ecosystem management urban and community forestry natural resource conservation or wood products All options lead to a professional degree in forestry (Bachelor of Science) and have been accredited by the Society of American Foresters (SAF) since 1935 The SAF is a specialized accrediting body recognized by the Council on Post Secondary Accreditation and the U S Department of Education as the accrediting body for forestry education in the United States The primary goal of the undergraduate curriculum in forestry is to educate foresters to be capable of scientifically managing the nation s forest lands The purpose of the undergraduate curriculum in forestry is to prepare students for professional employment in management and utilization of natural resources and to equip them to function effectively in a complex society

Graduates understand and can apply scientific principles associated with forests forest ecosystem management and wood and non wood products Graduates are able to communicate effectively and work well in teams They are capable of preparing and delivering effective oral and written communication of scientific and technical decisions to professional and lay audiences They are proficient in technical skills such as measurements computers inventory economic analysis data and situation analysis and ecosystem assessment They recognize the importance of ethics in forestry and are sensitive to cultural diversity and broad environmental concerns

Graduates of the forest ecosystem management option are skilled at understanding how forests function and how forests can be managed to produce desired goods (wood fiber recreation wildlife habitat) and services (clean water carbon sequestration wilderness) in the long run They are skilled at interpretation of interactions and effects of abiotic and biotic factors in forests and quantification of bio- physical social and economic outputs from forest ecosystems They are skilled at complex decision making involving private and public forest resources where ethical legal social economic and ecological dimensions are explicitly considered

Graduates of the urban and community forestry option are able to combine biological social legal and economic expertise to effectively manage trees or forests in an urban setting They are skilled at decision making related to site assessment and long term management of urban trees and forests to achieve multiple goals

Graduates of the natural resource conservation option are skilled at assessing the natural functions of the environment and human impacts They are skilled at interpretation of forest and other natural environments and making decisions relating to their conservation and preservation

Graduates of the wood products option understand the anatomical physical and chemical properties of wood and know wood processing operations involved in drying machining gluing and chemical treatment of wood They are skilled at applying their knowledge in the development of products and processes They are able to provide scientific and technical problem solving and marketing decisions for customers of wood products

Elective courses related to the forest ecosystem management option can be selected to emphasize forest ecology wildlife wilderness and recreation management water quality and erosion protection quantitative analytical techniques business and marketing and other areas related to natural resource management Elective courses in the urban and community forestry option can be selected to emphasize plant health policy and planning ecology hydrology sociology business administration or horticulture/design Elective courses related to the natural resource conservation option can be selected to emphasize ecology wildlife recreation nature interpretation landscape design sociology and ethics of conservation and preservation Similarly elective courses in the wood products option can be selected to emphasize wood production wood fiber business and marketing and quality assurance

Many private firms as well as national regional state and local agencies seek forestry graduates to fill positions in management of natural resources for commodity and non commodity multiple benefits Graduates in forestry are prepared to be involved with evolving forestry systems such as agroforestry and urban forestry Wood processing industries such as composite products plywood particle board lumber and pulp and paper offer professional opportunities in production product development quality control and marketing

With advanced graduate study the range of professional job opportunities for a person with a B S in forestry is expanded Opportunities include research and education as well as more specialized managerial and administrative positions with private firms and public agencies

During fall semester of the second year of study (sophomore year typically) forestry students are required to enroll in the department s integrated forestry modules consisting of 201 202 203 204 205 and 206 That semester consisting entirely of forestry coursework is designed to give students an early understanding of the many aspects of forestry and how they are interrelated In addition to work in the classroom students will spend time in laboratory and field work each week A 3 week off campus fall camp during the semester will reinforce concepts learned both in the classroom and during laboratory/ field sessions Transfer students should check with the department for counsel on timing their completion of the integrated forestry modules

The department offers a minor in forestry which can be earned by completion of a minimum of 15 credits in forestry courses Students wishing to emphasize management and environmental aspects of forestry must select at least 15 credits from the following courses 302 451 NREM 120 301 310 345 390 and 407 Students wishing to emphasize wood products and wood utilization must complete 280 and an additional 12 credits from the following courses 481 483 485 486 487

Graduate Study

The Department of Natural Resource Ecology and Management offers work for the degrees master of science and doctor of philosophy with majors in animal ecology fisheries biology and wildlife biology A non thesis masters degree is available for students desiring a general degree program without thesis research Students may also major in interdepartmen- tal graduate majors in ecology and evolutionary biology genetics plant physiology sustainable agriculture toxicology or water resources (see *Index*)

Animal Ecology

Graduates have a broad understanding of the basic principles of animal biology ecology and manage

ment and relevant aspects of basic mathematics and natural sciences computing applications and personal and professional development They are able to execute rigorous independent research have developed problem solving and critical thinking skills and can communicate effectively with scientific colleagues and the general public in both formal and informal settings

Personnel of the Biological Resources Division of the U S Geological Survey through the Iowa Cooperative Fish and Wildlife Research Unit and the Iowa Department of Natural Resources contribute to the graduate programs of the department

No more than two dual listed animal ecology courses may be applied for major graduate credit Additional work is expected of students taking a dual listed course for credit at the 500 level

Forestry

The department offers programs leading to the degrees of master of science and doctor of philosophy with a major in forestry and minor work to students taking major work in other departments Areas of specialization for the M S degree are forest administration and management forest biology forest biometry forest economics and marketing and wood science Areas of specialization for the Ph D are forest biology wood science forest biometry and forest economics

Graduates are skilled at defining a research problem in forestry applying scientific principles and appropriate methods and analyzing the results They are capable of understanding the many facets of forest and wood science and are very knowledgeable in specific areas in forestry They are able to deal with complex forestry problems and where appropriate they are *capable of blending ecological social* ethical legal and economic factors in the research process They are very skilled at communicating both in written and oral form research results to professional and lay audiences They are sensitive to cultural diversity and work effectively with peers natural resource professionals and the public

The graduate program is open to and suitable for students who have majored in forestry or related natural resource fields A non thesis master s option is available All students are required to teach and conduct research as part of their training for the Ph D degree

The department participates in the Masters in Business Administration (M B A) with specialization in the agriculture program administered by the College of Business providing an opportunity to obtain an M B A degree while taking advanced courses in forestry and maintaining contact with the profession of forestry The department also participates in interdepartmental majors in ecology and evolutionary biology plant physiology genetics and water resources (see *Index*)

Courses open for nonmajor graduate credit A Ecl 350 410 410L 411 413 419I 430 451 455 For 302 342 402 416 451 452 453 454 475 476 481 483 485 486 487 NREM 301 345 390 407 and 460

Animal Ecology

Courses Primarily for Undergraduate Students

A Ecl 130 Wildlife and Agriculture (2 0) Cr 2 S Survey of the ecology and management of fish and wildlife resources in areas of intensive agriculture with emphasis on Iowa Wildlife conservation and management practices for private agricultural lands Designed for nonmajors

A Ecl 211 Careers in Animal Ecology (2 0) Cr 1 FS Second half semester *Prereq Sophomore classifica tion* Career planning and opportunities in animal ecology Offered on a satisfactory fail grading basis only

A Ecl 301I Iowa Natural History (Same as Ia LL 301I) See *Iowa Lakeside Laboratory*

A Ecl 303I Undergraduate Internship (Same as Ia LL 303I) See *Iowa Lakeside Laboratory*

A Ecl 310 Vertebrate Biology (3 2) Cr 4 F *Prereq Biol 202 202L* Evolution biology and classification of fish amphibians reptiles birds and mammals Emphasis on a comparative analysis of the structure and function of organ systems Laboratory exercises concentrate on morphology and identification of orders of vertebrates

A Ecl 312 Ecology (Same as Biol 312) See *Biology*

A Ecl 312I Ecology (Same as Ia LL 312I) See *Iowa Lakeside Laboratory*

A Ecl 321 Fish Biology (Dual listed with 521) (2-3) Cr 3 S *Prereq 310* Anatomy physiology behavior and ecology of fishes

A Ecl 326I Ornithology (Same as Ia LL 326I) See *Iowa Lakeside Laboratory*

A Ecl 330 Interpretation of Natural Resources (2 3) Cr 3 S *Prereq 6 credits in biological sciences* History objectives forms and techniques of natural resources interpretation in the settings of county state and national parks

A Ecl 350 Ecological Methods and Analyses (2 2) Cr 3 S *Prereq 312 NREM 120 Stat 101 or 104* Quantitative techniques used in management of natural resources with emphasis on inventory and manipulation of habitat and animal populations Nonmajor graduate credit

A Ecl 361 Natural History of Fishes (0-3) Cr 1 F *Prereq 310 312* Natural history and ecology of Midwest fishes including identification survey methods habitat requirements foods and feeding reproduction communities and other ecologcial factors which affect species well being

A Ecl 362 Natural History of Reptiles and Amphibians (0 3) Cr 1 S *Prereq 310 312* Natural history and ecology of Midwest reptiles and amphibians including identification survey methods habitat requirements foods and feeding reproduc tion communities and other ecological factors which affect species well-being

A Ecl 363 Natural History of Birds (0 3) Cr 1 S *Prereq 310 312* Natural history and ecology of Midwest birds including identification habitat requirements distribution foods and foraging and reproduction

A Ecl 364 Natural History of Mammals (0 3) Cr 1 FS *Prereq 310 312* Natural history and ecology of Midwest mammals including identification survey methods habitat requirements foods and feeding reproduction communities and other ecological factors which affect species well being

A Ecl 401 Introductory Aquatic Animal Health and Medicine (Same as VDPAM 401) See *Veterinary Diagnostic and Production Animal Medicine*

A Ecl 404I Behavioral Ecology (Same as Ia LL 404I) See *Iowa Lakeside Laboratory*

A Ecl 410 Aquatic Ecology (Same as Bot 410 EnSci 410) (3-0) Cr 3 F *Prereq Biol 312 EnSci 330 or NREM 301* Structure and function of aquatic ecosystems with application to fisheries and pollution problems Emphasis on lacustrine riverine and wetland ecology Nonmajor graduate credit

A Ecl 410L Aquatic Ecology Laboratory (Same as Bot 401L EnSci 410L) (0-3) Cr 1 F *Prereq Concurrent enrollment in 410* Field trips and laboratory exercises to accompany 410 Hands-on experience with aquatic research and monitoring techniques and concepts Nonmajor graduate credit

A Ecl 411 Identification of Aquatic Organisms (Same as Bot 411) (0 3) Cr 1 FS *Prereq Credit or enrollment in 410L* On line taxonomic and identifica tion exercises to accompany 410 Instruction with aquatic research and monitoring techniques and concepts Nonmajor graduate credit

A Ecl 413 Community Ecology and Management (2 2) Cr 3 S *Prereq Biol 312* The effect of interspecific interactions on the structure and dynamics of natural and managed communities including concepts of guild structure and trophic web dynamics and their importance to the productivity diversity stability and sustainability of communities The implications of interspecific interactions in the management of wild species will be emphasized with illustrative case histories of interactions between plants invertebrates and vertebrates Nonmajor graduate credit

A Ecl 419I Vertebrate Ecology and Evolution (Same as Ia LL 419I) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

A Ecl 420I Amphibians and Reptiles (Same as Ia LL 420I) See *Iowa Lakeside Laboratory*

A Ecl 425 Aquatic Insects (*Dual listed with* 525 same as Ent 425) See *Entomology*

A Ecl 430 MediaTechniques in Natural Resources Interpretation (3 0) Cr 3 Alt F offered 2003 *Prereq 330* Media techniques used by interpreters for teaching the public about natural resources Nonmajor graduate credit

A Ecl 440 Fishery Management (Dual listed with 540) (2 3) Cr 3 F *Prereq 312 NREM 120 credit or enrollment in 410 Stat 101 or 104* Biological basis of fishery management fishery problems and management practices for freshwater anadromous and marine fisheries

A Ecl 442 Aquaculture (Dual-listed with 542) (2 3) Cr 3 S *Prereq 410 410L credit or enrollment in 321* Concepts related to the culture of aquatic organisms including culture systems water quality nutrition genetics and diseases

A Ecl 451 Wildlife Management (2 3) Cr 3 F *Prereq 350* Problems of managing wildlife habitat and populations Case studies and group projects Nonmajor graduate credit

A Ecl 455 International Wildlife Issues (3 0) Cr 3 S *Prereq 310 312 or graduate standing NREM 120* Biological political social and economic factors affecting the management of international wildlife resources Nonmajor graduate credit

A Ecl 490I Undergraduate Independent Study (Same as Ia LL 490I) See *Iowa Lakeside Laboratory*

Courses Primarily for Graduate Students, open to qualified undergraduate students

A Ecl 508I Aquatic Ecology (Same as Ia LL 508I) See *Iowa Lakeside Laboratory*

A Ecl 513 Ecological Toxicology (Same as EnSci 513 Tox 513) (3 0) Cr 3 Alt F offered 2003 *Prereq Biol 312* Effects of contaminants on aquatic and terrestrial ecosystems and community structure and processes Environmental flow and fate of contami nants Ecological risk assessment

A Ecl 514 Evolutionary Ecology (3-0) Cr 3 Alt F offered 2003 *Prereq 588 Biol 303 graduate standing* Relationships between animals and their environment with major emphasis on adaptive strategies and evolutionary mechanisms

A Ecl 515 Ecology of Freshwater Invertebrates (Same as Zool 515) (1 6) Cr 3 Alt S offered 2004 *Prereq Biol 312 Stat 101 or 104* Identification natural history and ecological relationships of free-living freshwater invertebrates Emphasis on community structure function and sampling techniques

A Ecl 516 Avian Ecology (3-0) Cr 3 Alt S offered 2004 *Prereq 310 312 or graduate standing* Current topics and theories including avian breeding and foraging ecology community structure habitat selection field methodologies and data interpreta tion Strong evolutionary emphasis

A Ecl 518 Stream Ecology (*Same as EnSci* 518) (3-0) Cr 3 Alt S offered 2004 *Prereq 410* Biological chemical physical and geological processes that determine the structure and function of flowing water ecosystems Current ecological theories as well as applications to stream manage ment for water quality and fisheries

A Ecl 520 Fish Ecology (3-0) Cr 3 Alt S offered 2005 *Prereq 312 321* Relationships of fish with biotic and abiotic components of their environment and the functional role of fish in stream lake reservoir and marine ecosytems Course will focus on current conceptual developments and primary literature

A Ecl 520l Fish Ecology (Same as Ia LL 520l) See *Iowa Lakeside Laboratory*

A Ecl 521 Fish Biology (Dual listed with 321) (2 3) Cr 3 S *Prereq 310* Anatomy physiology behavior and ecology of fishes

A Ecl 525 Aquatic Insects (Dual listed with 425 same as Ent 525) See *Entomology*

A Ecl 526l Advanced Field Ornithology (Same as Ia LL 526l) See *Iowa Lakeside Laboratory*

A Ecl 531 Conservation Biology (3-0) Cr 3 Alt S offered 2005 *Prereq 312 Biol 301or graduate standing* Examination of conservation issues from a population and a community perspective Population level analysis will focus on the role of genetics demography and environment in determining population viability Community perspectives will focus on topics such as habitat fragmentation reserve design biodiversity assessment and restoration ecology

A Ecl 531l Conservation Biology (Same as Ia LL 531l) See *Iowa Lakeside Laboratory*

A Ecl 535 Restoration Ecology (Same as EnSci 535) (2 3) Cr 3 F *Prereq Bot 306 or 484 or graduate standing* Theory and practice of restoring animal and plant diversity structure and function of disturbed ecosystems Restored freshwater wetlands forests prairies and reintrpduced species populations will be used as case studies

A Ecl 535l Restoration Ecology (Same as Ia LL 535l) See *Iowa Lakeside Laboratory*

A Ecl 540 Fishery Management (Dual-listed with 440) (2-3) Cr 3 F *Prereq 120 312 credit or enrollment in 410 Stat 101 or 104* Biological basis of fishery management fishery problems and practices for management of freshwater anadromous and marine fisheries

A Ecl 542 Aquaculture (Dual listed with 442) (2 3) Cr 3 S *Prereq 410 410L credit or enrollment in 321* Concepts related to the culture of aquatic organisms including culture systems water quality nutrition genetics and diseases

A Ecl 544 AquaticToxicology (Same as EnSci 544 Tox 544) (3-0) Cr 3 Alt F offered 2004 *Prereq 410* Environmental chemistry and the biochemical physiological behavioral and population level effects of contaminants on aquatic organisms

A Ecl 551 Wildlife Behavioral Ecology (2-2) Cr 3 Alt S offered 2004 *Prereq 312 a course in wildlife management recommended* Examination and synthesis of social organizational and behavioral concepts important for wildlife conservation Game and non hunted wildlife species of the world treated

A Ecl 560 Ecological Resource Management (2 3) Cr 3 Alt S offered 2005 *Prereq Biol 202 202L 312 Stat 101 or 104 or graduate standing* Ecological and economical management of sustainable biological resources Unifying current management concepts and models in wildlife fisheries water quality forestry recreation and agriculture Research problems

A Ecl 570 Landscape Ecology (Same as Bot 570) (2 3) Cr 3 Alt F offered 2005 *Prereq 588 permission of instructor a course in calculus* The study of ecological and evolutionary processes within a spatial context with emphasis on behavior population and community dynamics

A Ecl 573 Techniques for BiologyTeaching (Same as Ia LL 573) Cr 1 or 2 each time taken SS The development and implementation of laboratory exercises suitable for inclusion in elementary middle high school and community college biology and environmental courses Exercises will be built around common organisms and ecosystems in Iowa Field trips
A Animal Biology (Same as Ia LL 573A)
G Limnology (Same as Ia LL 573G)
H Animal Behavior (Same as Ia LL 573H)
W Project WET (Same as Ia LL 573W)

A Ecl 580 Research Methods in Ecology (2 0) Cr 2 F *Prereq 20 credits in biological sciences and a course in statistics* Research design proposal preparation technical writing and professional presentations

A Ecl 588 Population Ecology (Same as Bot 588) (2 2) Cr 3 F *Prereq 312 Stat 401 a course in calculus* Concepts and theories of population dynamics with emphasis on models of growth predation competition and regulation

A Ecl 590l Graduate Independent Study (Same as Ia LL 590l) See *Iowa Lakeside Laboratory*

A Ecl 599 Creative Component Cr arr *Prereq Nonthesis M S option only*

Courses for Graduate Students

A Ecl 600 Seminar (2 0) Cr 1 each time taken May be taken more than once for graduation credit FS Current topics in ecological research fish and wildlife management and environmental problems related to fish or wildlife resources

A Ecl 611 Analysis of Populations (2 2) Cr 3 Alt F offered 2003 *Prereq 312 Stat 401 a course in calculus* Quantitative techniques for analyzing vertebrate population data to estimate parameters such as density and survival Emphasis on statistical inference and computing

A Ecl 698 Animal EcologyTeaching Practicum Cr 1 to 3 each time taken FS SS *Prereq Graduate classification in animal ecology and permission of instructor* Graduate student experience in the animal ecology teaching program Offered on a satisfactory fail grading basis only

A Ecl 699 Research

A Ecl 699l Research (Same as Ia LL 699l) See *Iowa Lakeside Laboratory*

Courses Offered at the Gulf Coast Research Laboratory (GCRL), Ocean Springs, Mississippi

The Gulf Coast Research Laboratory is affiliated with the University of Southern Mississippi Iowa State students may register for the following University of Southern Mississippi/GCRL courses and transfer them to their ISU degree programs Written permission of the ISU coordinator for the GCRL 201 Bessey is required for this arrangement Inquire at 201 Bessey for further information

MAR 405 Marine Ecology Cr 3 SS *Prereq 16 hours of biological sciences including general zoology general botany and invertebrate zoology* A consideration of the relationship of marine organisms to their environment including the effects of temperature salinity light nutrient concentration currents and food on their abundance and distribution

MAR 405L Marine Ecology Lab Cr 2 SS Lab to accompany MAR 405

MAR 407 Marine Aquaculture Cr 3 SS *Prereq General zoology or invertebrate zoology* A lecture laboratory and field course designed to introduce aquatic and marine biology students to the history principles problems and procedures relating to the culture of commercially important crustaceans fish and mollusks along the Gulf Coast

MAR 407L Marine Aquaculture Lab Cr 3 SS Lab to accompany MAR 407

Forestry

Courses Primarily for Undergraduate Students

For 201 Forest Biology (2-0) Cr 2 F *Prereq Concurrent enrollment in 202 203 204 205 and 206* Discussion of ecological concepts individual tree structure and growth variation and diversity in tree populations Physical environment of trees and forests ecological processes in forest communities and introduction to different regional forest communities

For 202 Wood Utilization (2-0) Cr 2 F *Prereq Concurrent enrollment in 201 203 204 205 and 206* Best management practices (BMPs) for controlling soil erosion associated with harvesting Environmen tal aspects of materials usage by society Processing of wood and wood fiber into products

For 203 Resource Measurements/Evaluation (2 0) Cr 2 F *Prereq Concurrent enrollment in 201 202 204 205 and 206 Math 140* Survey techniques involved in quantification valuation and evaluation of tree and stand growth and other variables in the forest environment (e g recreational use water quantity and quality wildlife habitat value biomass and solid wood)

For 204 Forest Ecosystem Decision Making (2 0) Cr 2 F *Prereq Concurrent enrollment in 201 202 203 205 and 206* Methods of decision making related to forest ecosystems including communica tions teams and conflict resolution Current issues relating to public private and urban forests quantification of processes services and goods produced by the forest and expected by the public such as wildlife water range recreation wilderness biodiversity as well as wood and fiber products

For 205 Integrated Forestry Laboratory (0 8) Cr 3 F *Prereq Concurrent enrollment in 201 202 203 204 and 206* Field and laboratory exercises integrating the evaluation and management of forest goods services and the processing of wood products

For 206 Fall Forestry Camp Cr 4 F *Prereq Concurrent enrollment in 201 202 203 204 and 205* Three week field camp to address topics and issues covered in 201 202 203 204 and 205

For 280 Wood Anatomy and Properties (3 3) Cr 4 S Consideration of the anatomy and properties of wood and how they relate to its successful use Comparative anatomical characteristics and identification of commercially important North American woods

For 283 Pesticide Application Certification (Same as Ent 283) See *Entomology*

For 290 Special Problems Cr 1 to 3 *Prereq Freshman or Sophomore classification permission of instructor* A maximum of 4 credits of 290 may be used toward the total credits required for graduation
A Leadership in Forestry Teams (LIFT) Learning Community
B Forest Ecosystem Management
C Natural Resource Conservation
D Urban and Community Forestry
E Wood Science and Technology

For 302 Silviculture (2 3) Cr 3 S *Prereq 201* Manipulation of forest vegetation based on ecological principles for the production of goods and services Nonmajor graduate credit

For 342 Dynamics of Forest Stands (2 3) Cr 3 F *Prereq 203 Stat 101* Examination of factors affecting individual tree and forest growth Estimation of growth and yield of even aged and all aged stands Examination of ways to assess site quality and competition Review of simple random sampling and introduction to stratified random sampling and other sampling techniques Nonmajor graduate credit

For 356 Dendrology (Same as Bot 356) See *Botany*

For 402 Watershed Hydrology and Surficial Processes (Same as Agron 402 EnSci 402 Geol 402) (3 3) Cr 4 F *Prereq Credit or enrollment in EnSci 330 or Geol 100 or 201 Math 165 or 181* Burras Simpkins Examination of watersheds as systems wherein biological and physical factors control hydrology soil formation and nutrient transport Laboratory emphasizes field investigation of watershed scale processes Nonmajor graduate credit

For 416 Forest Pest Management (Same as Pl P 416) See *Plant Pathology* Nonmajor graduate credit

For 451 Forest Resource Economics and Quantitative Methods (3 3) Cr 4 S *Prereq 203 Econ 101 Math 150* Application of economic principles to forest resource management Methods of identifying and specifying problems in the management and use of forest resources Application of mathematical and statistical models to the solution of managerial problems Nonmajor graduate credit

For 452 Forest Ecosystem Management (2 3) Cr 3 F *Prereq 451* Principles of planning regulating and decision making associated with public and private forests Optimization of multiple-goal forestry with resource and policy constraints Integrated forest resources management and evaluation of ecosystem management models Nonmajor graduate credit

For 453 Forest Resource Policy and Administration (3 0) Cr 3 S *Prereq 451* Forest resource policy - processes participants programs and conflict resolution Contemporary forest resource policies and issues Forest resources for administration Functions of administration personnel management and use of PERT/CPM in project administration Ethics in forestry Nonmajor graduate credit

For 454 Forestry Practicum (1-4) Cr 3 S *Prereq 20 credits in student s major at 300 level or above* Integrated decision making related to the conserva tion management and preservation of private and public forests wildlands urban/community forests and/or the production and utilization of wood products Student teams work with a client and develop management plans that incorporate ecological social economic ethical and institutional/ political factors Effective teamwork written/oral/ *visual communication and problem solving stressed* Multiple trips to project site and client Nonmajor graduate credit

For 460 Agroforestry Systems (Dual-listed with 560 same as Agron 460) (2 3) Cr 3 Alt F offered 2004 *Prereq 6 credits in biological science at 300 level or above* Concepts of sustainable land use agroecological dynamics and component interactions of agroforestry systems Agroforestry systems in temperate and tropical regions Design and evaluation techniques for agroforestry systems Ecological socioeconomic and political aspects of agroforestry

For 475 CommunityTree Management (Same as Hort 475 Pl HP 475) (2 3) Cr 3 F *Prereq Junior or senior classification 3 credits in biology* Discussion of establishment and management of woody perennials in community-owned urban greenspaces consideration of urban site and soil characteristics plant physiology plant culture urban forest valuation inventory methods species selection urban forest maintenance (health care and pest management) urban forest administration legal and political issues and landscape ecology (including wildlife) of the urban forest Nonmajor graduate credit

For 476 Urban Forest Resource Planning and Policy (2 0) Cr 2 Alt S offered 2005 *Prereq Senior classification For 475* Analysis of natural resource administration policy and planning in an urban context Legal and political issues and policies influencing natural resource use decisions in densely populated areas Nonmajor graduate credit

For 481 Chemical Conversion of Wood (2-3) Cr 3 Alt F offered 2004 *Prereq 280* Chemical properties of wood Pulp and paper technology Other fiber products Cellulose derivatives Nonmajor graduate credit

For 483 Wood Deterioration and Preservation (Same as Ent 483 Pl P 483) (2-3) Cr 3 Alt F offered 2003 *Prereq 280* Deterioration by biological and physical agents of wood in use Wood preservation and fire retardant treatments Nonmajor graduate credit

For 485 Adhesive Bonded Wood Products (2-3) Cr 3 Alt F offered 2004 *Prereq 280* Production of laminated wood plywood wafer boards particleboard and medium density fiberboard Includes wood variables adhesives processes use of wood residues and combining wood with other materials Nonmajor graduate credit

For 486 Wood Moisture Relations (2 3) Cr 3 Alt S offered 2004 *Prereq 280* Movement of liquids and gases in wood Seasoning techniques shrinkage and swelling of wood Nonmajor graduate credit

For 487 Mechanical Properties of Wood (3 3) Cr 4 Alt S offered 2004 *Prereq 280* Mechanical thermal electrical and acoustical properties of wood lumber grading and stress rating Nonmajor graduate credit

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

For 501 Genecology (3 0) Cr 3 Alt F offered 2003 *Prereq Gen 320 or Biol 301* Genecology principles as they apply to natural and improved populations of plants and animals Genetic systems as they interact with long term natural selection to produce clinical or ecotypic variation The impact of current environments and genetic modifications of domesticated organisms on short-term selection pressures Special coverage of species of interest to students enrolled in the course

For 504 Advanced Forest Ecology and Silviculture (3 3) Cr 4 Alt F offered 2004 *Prereq 301* Detailed analysis of factors and processes underlying forest and stand growth and development Applications of this knowledge to forest culture to support a diversity of use and protection objectives Discussions of regional silviculture tropical forests and experimen tation in forest biology

For 550 Advanced Quantitative Methods in Forestry (2 3) Cr 3 Alt S offered 2004 *Prereq Stat 401 and one course in quantitative analysis or systems analysis or forest biometry* Applied problems in forest biometry and mathematical programming and other modeling techniques as applied to modern forestry problems

For 560 Agroforestry Systems (Dual-listed with 460 same as Agron 560) (2-3) Cr 3 Alt F offered 2004 *Prereq 6 credits in biological science at 300 level or above* Concepts of sustainable land use agroecological dynamics and component interactions of agroforestry systems Agroforestry systems in temperate and tropical regions Design and evaluation techniques for agroforestry systems Ecological socioeconomic and political aspects of agroforestry

For 570 Resource Allocation in Forestry (2 2) Cr 3 Alt S offered 2005 *Prereq 451 or two courses in economics* Analytical approach to economic aspects of forest resource management problems Theory and application of economic decision making criteria to traditional and modern forest resource management issues Current problems in the allocation of forest resources

For 580 Sustainable Agriculture Seminar (Same as An S 580) See *Animal Science*

For 587 AdvancedTopics in Wood Science (2 0) Cr 2 Alt F offered 2003 *Prereq 280* Recent contributions of research and technology to product development Areas of emphasis in basic and applied research

For 599 Creative Component Cr 1 to 8
A Forest Biology
B Forest Biometry
C Forest and Recreation Economics
D Forest Management and Administration
E Wood Science

Courses for Graduate Students

For 603 Tree Growth and Development (4-0) Cr 4 Alt S offered 2004 *Prereq 301 or a course in plant physiology* Structure and function of individual trees and shrubs Emphasis is on factors that make woody plants different from herbaceous plants Response of individuals to such environmental factors as radiation temperature water stress flooding and compaction air pollution fire and wind

For 654 AdvancedTopics in Forest Economics (1 0) Cr 1 May be taken twice for credit Alt S offered 2005 *Prereq Permission of instructor* Discussion and presentation of advanced forest economic problems with particular attention to recent theories and applications Emphasis on applications of micro and macroeconomic principles to forest resource allocation and long range planning

For 696 Seminar in Plant Physiology and Molecular Biology (Same as Bot 696) See *Botany*

For 699 Research Cr 1 to 9
A Forest Biology—Wood Science
B Forest Biometry
C Forest Economics
D Forest Management and Administration
E Wood Science
F Plant Physiology

Natural Resource Ecology and Management

Courses Primarily for Undergraduate Students

NREM 104 Practical Work Experience Cr R Three months of relevant work experience in natural resources animal ecology or forestry Study at a summer biological station may be applicable See adviser for specific requirements and approval process

NREM 110 Orientation in Natural Resource Ecology and Management (1-0) Cr R F Orientation to the University and to the Department of Natural Resource Ecology and Management Discussion of the importance of work experience and development of desired resume Career opportunities

NREM 120 Introduction to Renewable Resources (*Same as Agron 120 AST 120 Env S 120*) (3 0) Cr 3 FS Overview of soil water plants and animals as renewable natural resources in an ecosystem context History and organization of resource management Concepts of integrated resource management

NREM 301 Forest Ecology and Soils (Same as EnSci 301 Pl HP 301) (3 3) Cr 4 F *Prereq Biol 201 201L For 201 or a second course in biology* Effects of environmental factors on ecosystem structure and function Special emphasis is given to soil forming factors and the role of soil in nutrient and water cycling and ecosystem dynamics Additional emphasis is given on human influences on natural ecosystems Nonmajor graduate credit

NREM 303 Internship Cr 1 to 3 FS SS *Prereq Permission of instructor and sophomore standing* Placement with county conservation boards camps zoos parks etc for experience as interpreters rangers and technicians A total of 6 credits may be used toward degree requirements

NREM 305 Seminar (2 0) Cr 1 each time taken may be taken more than once for graduation credit FS *Prereq Permission of instructor* Current topics in natural resources or related issues

NREM 310 Natural Resource Management on Small Properties (3-0) Cr 2 S Techniques of resource management with emphasis on small private holdings Non forestry majors only Course terminates at the end of 11 weeks

NREM 345 Natural Resource Photogrammetry and Geographic Information Systems (Same as EnSci 345) (2 3) Cr 3 F *Prereq Junior classification* Use of aerial photos and remotely sensed imagery in resource management Training in techniques of photo measurement interpretation and use of Geographic Information Systems (GIS) Principles of remote sensing Nonmajor graduate credit

NREM 390 Fire Ecology and Management (3-0) Cr 3 F Characteristics and role of fire in forest ecosystems Major topics covered include fuels fire weather fire behavior fire danger rating systems fire control and prescribed burning Nonmajor graduate credit

NREM 407 Watershed Management (Same as Env S 407) (3 3) Cr 4 S *Prereq A course in general biology* Managing human impacts on the hydrologic cycle Field and watershed landscape best management practices for modifying the impacts on water quality quantity and timing are discussed Field project includes developing a management plan using landscape buffers Nonmajor graduate credit

NREM 446 Integrating GPS and GIS for Natural Resource Management (Dual listed with 546 same as EnSci 446) (2 3) Cr 3 S *Prereq 12 credits in student s major at 300 level or above* Emphasis on the use of GPS as a data collection tool for GIS Basic theory of GPS Use of Global Positioning System technology for spatial data collection and navigation Post processing and real time correction of GPS data GPS data transfer to GIS for mapping applications Use of GIS to construct waypoints for use in GPS navigation

NREM 460 Controversies in Renewable Resource Management (3 0) Cr 3 F *Prereq 120 and A Ecl 312 or For 301 Junior classification* Analysis of controversial renewable resource issues using a case approach that considers uncertainty and adequacy of information and scientific understanding Ecological social political economic and ethical implications of each issue will be analyzed Nonmajor graduate credit

NREM 465 Landscape Change and Conservation (Dual listed with 565 same as L A 465) See *Landscape Architecture*

NREM 490 Independent Study Cr 1 to 4 each time elected *Prereq Junior or senior classification permission of instructor* A maximum of 6 credits of 490 may be used toward degree requirements
A Animal Ecology
B Forestry
H Honors Program

NREM 493 Workshop Cr 1 3 *Prereq Permission of instructor* Ecological concepts and management practices for landowners teachers and others Not for students majoring in animal ecology or forestry May be taken more than once for graduation credit

NREM 496 Travel Course (Dual listed with 596) Cr 1-3 May be repeated *Prereq Permission of instructor* Limited enrollment Extended field trips to study ecological and management topics in varied environments Location and duration of trips will vary Pre-trip sessions arranged Trip expenses paid by students
A International
B Domestic

NREM 498 Cooperative Education Cr 1 3 *Prereq Permission of departmental chair* Required of all cooperative education students Students must register prior to commencing each work period

Courses Primarily for Graduate Students, open to qualified undergraduate students

NREM 505 Seminar (2-0) Cr 1 each time taken may be taken more than once for graduation credit FS *Prereq Permission of instructor or graduate classification* Current topics in natural resources research and management

NREM 510 Methods for Presenting Scientific Results (2-0) Cr 2 S *Prereq Permission of instructor* Techniques of proper platform presentation Discussion of effective audio/visual techniques for presentation of research findings Practice in development of overheads and slides Use of computer generated and projected visuals Practice in oral presentation with critical review

NREM 532 Human Dimensions of Natural Resource Management (3-0) Cr 3 Alt F offered 2004 *Prereq A Ecl 312 or equivalent plus 6 credits of biological sciences permission of instructor* Exploration of institutions that help shape fish and wildlife management and policies Current research on interaction of humans with wildlife resources Roles of social forces politics and economics in wildlife management

NREM 542 Introduction to Molecular Biology Techniques (Same as Zool 542) See *Zoology and Genetics*

NREM 546 Integrating GPS and GIS for Natural Resource Management (Dual-listed with 446) (2-3) Cr 3 S *Prereq 12 credits in student s major at 300 level or above* Emphasis on the use of GPS as a data collection tool for GIS Basic theory of GPS Use of Global Positioning System technology for spatial data collection and navigation Post processing and real time correction of GPS data GPS data transfer to GIS for mapping applications Use of GIS to construct waypoints for use in GPS navigation

NREM 565 Landscape Change and Conservation (Dual listed with 465 same as L A 565) See *Landscape Architecture*

NREM 590 Special Topics Cr 1 to 4 each time elected *Prereq Permission of instructor*
A Animal Ecology
B Forestry

NREM 593 Workshop Cr 1 to 3 *Prereq Graduate classification* May be taken more than once for graduation credit

NREM 596 Travel Course (Dual listed with 496) Cr 1-3 May be repeated *Prereq Permission of instructor Limited enrollment* Extended field trips to study ecological topics in varied environments Location and duration of trips will vary Pre trip sessions arranged Trip expenses paid by students
A International
B Domestic

NREM 599 Creative Component Cr arr

NREM 600 Seminar (2 0) Cr 1 each time taken May be taken more than once for graduation credit FS Current topics in natural resources research and management

NREM 699 Research Cr 1-9

Naval Science

www iastate edu/~navy

Col Paul Ladd, Chair of Department

Professors Ladd

Assistant Professors (Adjunct) Hoffer

Instructors (Adjunct) Freeborn Ukeiley Woodard

The function of the Navy and Marine Corps officer education program is to provide by a permanent system of education in essential naval science and other academic subjects at civil education institu tions a source from which qualified officers may be available for the Navy and the Marine Corps and their reserve components

Students who enter the Navy and Marine Corps officer education program may apply for either of two programs the NROTC scholarship program (full scholarship which includes books tuition laboratory fees uniforms and a monthly stipend) or the college program (nonscholarship limited financial assis tance) Applicants for the scholarship program are selected through comprehensive nationwide competitive procedures Applicants for the college program are selected by the Professor of Naval Science from among students already in attendance at or selected for admission by the university This program involves financial assistance for each of the last two academic years NROTC students pursue their studies like other students except that they meet certain requirements that will prepare them to serve as naval officers after graduation A scholar ship program student incurs a minimum 4 year active duty military obligation as a commissioned officer after graduation a college program student incurs a 3 year active duty obligation If a scholarship student fails to earn a degree or if a commission is not tendered (for other than physical reasons) the student may incur a 2 year obligation in an enlisted grade or may be required to reimburse the government for scholarship costs This obligation is not incurred during the freshman year Information is available from the Professor of Naval Science Iowa State University

While in the program students will participate in summer at-sea training cruises with pay Students are also exposed to regular and extracurricular activities that teach leadership principles and help them decide which field of the Navy or Marine Corps they wish to enter These activities include a weekly leadership laboratory three cruises for scholarship and one for nonscholarship students and several student societies

Undergraduate Study

Naval science courses are primarily for those students in the NROTC program However other university students may also enroll in naval science courses

All students enrolled in the NROTC program must fulfill the following requirements

1 N S 111 210 211 212 311 312 411 412 Marine option students will substitute N S 321 and 421 for the 300 and 400 series listed above Hist 389 or Hist 390 may be substituted for N S 212 Mgmt 370 may be substituted for N S 411

2 All NROTC students must complete one course in American military history or national security policy A computer science course is required of all Navy option students

3 All Navy option scholarship students must successfully complete Math 165 and 166 Math 165 and 176 or Math 181 and 182 by the end of the sophomore year Phys 221 and 222 or Phys 111 and 112 by the end of the junior year

4 In addition to the normal naval science courses all NROTC students are required to participate in laboratory periods that supplement the various academic courses emphasize human relations principles teach basic military formations movements commands courtesies and honors and provide practice in unit leadership

5 Navy option scholarship students are encouraged to major in engineering and physical sciences to meet the technological requirements of the modern Navy however Navy-option students and Marine Corps option students may pursue any major leading to a bachelor s degree

6 The College of Liberal Arts and Sciences offers a minor in military studies Requirements for the minor include taking a minimum of 15 credit hours of ROTC instruction which may be taken from one or a number of the ROTC programs At least 6 credit hours must be in courses numbered 300 or above

For basic undergraduate curriculum requirements see *Liberal Arts and Sciences Curriculum or Engineering Curricula*

Courses Primarily for Undergraduate Students

N S 111 Introduction to Naval Science (3-0) Cr 3 F Introduction to the organization regulations and capabilities of the Navy with emphasis on mission and principal warfare components

N S 210 Naval Ship Systems I (Engineering) (3 0) Cr 3 S An introduction to naval engineering with emphasis on the equipment and machinery involved in the conversion of energy for propulsion and other purposes aboard the major ship types of the U S fleet Basic concepts of the theory and design of steam gas turbine diesel and nuclear propulsion Introduction to ship design stability hydrodynamic forces compartmentation electrical and auxiliary systems damage control

N S 211 Naval Ship Systems II (Weapons) (3 0) Cr 3 F Introduction to the theory and principles of operation of naval weapon systems Includes coverage of types of weapons and fire control systems capabilities and limitations theory of target acquisition identification and tracking basics of

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Naval Science

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Col Paul Ladd, Chair of Department

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N S 211 Naval Ship Systems II (Weapons) (3 0) Cr 3 F Introduction to the theory and principles of operation of naval weapon systems Includes coverage of types of weapons and fire control systems capabilities and limitations theory of target acquisition identification and tracking basics of

naval ordnance

N S 212 Seapower and Maritime Affairs (3-0) Cr 3 S Development of concept of seapower including the Merchant Marine role of various warfare components of the Navy in supporting the Navy s mission implementation of seapower as an instrument of national policy a comparative study of U S and Soviet naval strategies

N S 311 Navigation and Naval Operations I (3-0) Cr 3 F Study of the fundamentals of marine navigation used by ships at sea includes practical exercises in piloting using visual and electronic means In-depth discussion of laws that govern conduct of vessels in national/international waters Course is supplemented with review/analysis of case studies involving actual navigation incidents

N S 312 Navigation and Naval Operations II (3 0) Cr 3 S Study of tactical naval operations employs practical use of maneuvering boards together with shiphandling principles to arrive at tactical shipboard maneuvering solutions for single ship and formation operations Study also of command and control leadership and ethics issues associated with surface naval operations

N S 321 Evolution of Warfare (3 0) Cr 3 Alt F offered 2003 Evolution of warfare from 3500 B C to contemporary times analysis of the impact of historical precedents on modern military thought and action emphasis on the historical development of military tactics strategy and technology

N S 411 Leadership and Management I (3-0) Cr 3 F Experiential approach to learning the principles of leadership and management by examining business management theories and their applications Skills are developed in the areas of communication counseling control direction management and leadership through active guided participation

N S 412 Leadership and Management II (3 0) Cr 3 S *Prereq Senior classification* Basic background concerning the duties and responsibilities of the junior naval officer and division officer in the areas of integrity and ethics human resources management personnel management material management and the administration of discipline Preparation for responsibilities encountered immediately upon commissioning

N S 421 Evolution of Amphibious Warfare (3-0) Cr 3 Alt F offered 2004 Defines the concept of amphibious operations origins development from 600 B C

N S 440 Senior Naval Science Seminar (1-0) Cr 1 F Graduating Midshipmen only Current leadership issues in the Navy which will challenge the newly commissioned officer Opportunities to analyze provide solutions and discuss actions related to a variety of real world situations

N S 490 Independent Study Cr 1 to 3 each time taken *Prereq Senior classification and prior approval of Naval Science Department Chair 6 credits in naval science* No more than 9 credits of N S 490 may be counted toward graduation

Neuroscience

(Interdepartmental Graduate Program)

Supervisory Committee T Day U Kim A Kanthasamy S Mallapragada

Participating Faculty L Anderson T Baker J Bloedel V Bracha J Buss A Cleary E Cooper J Cunnick T Day C Drewes D Emery S Ford H Greenlee V Honavar W Hsu S Jeftinija J Johnansen K Johansen A Kanthasamy U Kim VS Lin S Mallapragada R J Martin M O Boyle J Ourednik V Ourednik M Randic R Robson D Sakaguchi C Scanes S Shen A Smiley Oyen M Stromer E Uemura A Vellareddy

Graduate Study

Work is offered for the master of science and doctor of philosophy degrees with a major in neuroscience Cooperating departments include Animal Science Biochemistry Biophysics and Molecular Biology Biomedical Sciences Chemical Engineering Chemistry Computer Science Entomology Health and Human Resources Microbiology Psychology and Zoology and Genetics

Facilities and faculty are committed to research in the following areas neuronal membrane functions signal transduction neuroanatomy neurodegenerative diseases neuroendocrinology neurotoxicology neuropathology developmental neurobiology neurogenetics computational neuroscience neural networks and behavioral neuroscience

An undergraduate or advanced degree in the sciences is ordinarily a prerequisite for admission to the program A student majoring in neuroscience will select a major professor from the faculty participating in the program

All students take a core curriculum consisting of Neuro 556 557 660 690 696 BBMB 404 and Stat 401 All students are also expected to take elective neuroscience courses from the following Com S 474 E E 545 Psych 511 517 519 BMS 507 511 565 V Pth 555 Zool 540

Courses for Graduate Students

Neuro 556 Neurobiology (Same as Zool 556) (3 0) Cr 3 to 4 F *Prereq Zool 355 or Psych 310 physics recommended* Integration coding plasticity and development in nervous systems

Neuro 557 Advanced Neuroscience Techniques (Same as Zool 557) (0-6) Cr 2 S *Prereq 556* Research methods and techniques exercises and/or demonstrations representing individual faculty specialties

Neuro 660 Current Topics in Neurobiology and Behavior (Same as Zool 660) Cr 2 to 3 each time taken *Prereq Permission of instructor* Topics may include communication computational neuroscience hormones and behavior neural integration developmental neurobiology neuroanatomy and ultrastructure sensory biology social behavior techniques in neurobiology and behavior

Neuro 690 Journal Club in Neuroscience (1 0) Cr 1 each time taken FS *Prereq 556* Students are required to attend and make at least one presentation at a weekly journal club focusing on current topics

Neuro 696 Neuroscience Seminar (1-0) Cr 1 each time taken FS *Prereq 556* Presentations and discussion of research by students faculty and visiting scholars

Neuro 699 Research

Officer Education Programs

Iowa State University offers Reserve Officers Training Corps (ROTC) programs for the professional training of officers for the Army Air Force Navy and Marines

The purpose of these programs is to provide an avenue for interested students to become reserve or regular officers in one of the United States military services and the university regards this training as the foundation for possible careers in the military The Air Force and the Navy require a period of active duty service upon completion of the ROTC program Graduates from Army ROTC serve in either active Army the Army Reserve or the National Guard

All students enrolled in advanced ROTC programs receive financial allowances which are described under Student Financial Aid Scholarships are also available for all services as outlined in the section on financial aid

For specific courses and programs see also *Air Force Aerospace Studies Military Science and Naval Science*

Pest Management

(Interdepartmental Undergraduate Program)

Advisory Committee Jon Tollefson Chair Hall Gibson Minner Pease

The pest management program is designed for students with a career interest in the science and technology of pest management Students in the program conduct inter-disciplinary studies with plant diseases insects weeds and other pests emphasizing the development of management systems that are ecologically and economically sound as well as sustainable The interdisciplinary nature of the program is reflected in the departmental sponsors—Agronomy Animal Ecology Plant Pathology Entomology Forestry and Horticulture

Pest management is an undergraduate secondary major that may be taken only in conjunction with a primary major For example the student may wish to take a primary major in agronomy forestry entomology or some other life science and use elective credits to satisfy the requirements of the pest management major Graduates have a broad knowledge of agricultural horticultural forest pests as well as those of man and animals Graduates can diagnose pest problems and recommend ecologically and economically sound systems to alleviate these problems They are well versed on the pest concept are able to identify pests and symptoms of pest injury and understand the economics of decision making Moreover graduates are aware of technologically advanced pest management tactics and are skilled in applying these Students educated in pest management may find employment opportunities with governmental agencies (state and federal) agricultural chemical companies food processing firms consulting agencies urban pest control companies timber companies and other concerns that produce process and market the nation s food and fiber

Students wishing to enroll in the pest management curriculum must register with the chair of the advisory committee After consultation with the chair a pest management adviser will be assigned depending on the interests of the student The student should indicate interest in pest management as early as possible in order that requirements of the program be effectively integrated with those of the primary major

A pest management minor may be earned by completion of at least 15 credits of pest management or related courses taken at ISU The courses that must be taken for a minor are Agron 317 Ent 376 PL P 407 The remainder of the 15 credits are to be selected from the following Ent 374 PL P 416 P M 491 499 Courses required in a student s major may not be applied toward the pest management minor Contact the pest management chair for more details

Courses open for nonmajor graduate credit 376 407 416

Courses Primarily for Undergraduate Students

P M 283 Pesticide Applicator Certification (Same as Ent 283) See *Entomology*

P M 317 Principles of Weed Science (Same as Agron 317) See *Agronomy*

P M 376 Fundamentals of Entomology and Pest Management (Same as Ent 376) See *Entomology* Nonmajor graduate credit

P M 407 Principles of Plant Pathology (Same as PL P 407) See *Plant Pathology* Nonmajor graduate credit

P M 416 Forest Pest Management (Same as PL P 416) See *Plant Pathology* Nonmajor graduate credit

P M 490 Independent Study Cr 1 to 3 each time taken *Prereq Junior or senior classification 3 credits in pest management permission of instructor and written plan of study approved by pest management curriculum chair* A maximum of 6 credits of 490 may

be used toward the total of 128 credits required for graduation

P M 491 Pest Management Experience Cr 2 *Prereq 6 credits in pest management permission of instructor* Practical experience (internship) in management of plant diseases insect populations weeds and other pests Diagnosis problem assessment and control procedures are emphasized For majors and advanced students

P M 499 Pest Management Seminar Cr 1 F *Prereq Senior classification* Current topics of interest to pest management

Philosophy and Religious Studies

Michael A Bishop, Chair of Department

University Professors Kupfer

Professors Hollinger Hunter Kirschenmann Robinson Smith Wilson

Professors (Emeritus) Hollenbach Van Iten

Associate Professors Avalos Baum Bishop Holmgren Sanford Sawyer

Assistant Professors Butler Davidson de Laplante Fehr Geirsson Gross Vranas Wunderlich

Lecturers Torrago

Philosophy

Undergraduate Study

Philosophy tries to make sense of human experience and reality through critical reflection and argument It deals with the kinds of questions that engage all reflective people but which do not obviously belong to any of the empirical sciences It asks questions such as the following Are there objective standards for deciding what is right and wrong or is morality merely a subjective matter? Do we have a moral obligation to obey the law? How can goods be justly distributed? Am I free if my actions are conse quences of my past and the laws of nature? How does language relate to the world? Does God exist? Can machines think? Do I have a mind and if so how does it relate to my body?

Philosophy engages in constructive give and take with other fields of study including the various sciences Philosophers for example probe the assumptions and implications of social sciences natural sciences religion psychology and law

The study of philosophy provides several benefits It emphasizes rigourous understanding of problems together with careful analysis of the strengths and weaknesses of the available solutions It encourages clarity in the presentation of one s own ideas as well as sensitivity in the consideration of the ideas of others The study of philosophy therefore encourages one to develop skills and habits that are useful not only in philosophy but in non philosophical areas as well Philosophy students historically do well for example in law and medical schools

However one should not think of the study of philosophy only in terms of career benefits Philosophical questions arise in many areas of family business and civic life and so the philosophy major prepares one for appreciating and responding to a lifetime of intellectual challenges

The degree program in philosophy requires a minimum of 33 credits The following courses compose the core program of the major from which 15 credits shall be chosen Additionally two courses at the 400 level or above are required

a Ethical theory One course required Choose from 330 (Ethical Theory) 335 (Social and Political Philosophy)

b History 310 (Ancient Philosophy) is required and either 314 (17th Century Philosophy) or 315 (18th Century Philosophy)

c Metaphysics and Epistemology One course required Choose from 364 (Metaphysics God Minds and Matter) 380 (Philosohy of Science)

d Logic 207 (Introduction to Symbolic Logic) is required

The department offers a minor in philosophy which may be earned by completing a total of 15 credits in philosophy At least 9 credits must be in courses numbered 300 or above Students may want to emphasize specific areas by taking 15 hours of courses chosen from the following

Philosophy of Science 201 206 or 207 314 315 380 381 480 483 485

History of Philosophy 201 310 314 315 316 317 318 460

Social Values and Policy 230 235 331 332 333 335 336 338 343 430

English proficiency requirement The department requires a grade of C+ or better in each of Engl 104 and 105 (or 105H) and approval of writing by instructor of one history of philosophy course (310 318) to be designated by the student

Graduate Study

The department offers a graduate minor in philosophy For those taking the M A or M S the minor requirement is two courses above 300 (but not 490) taken in conjunction with 590 For those taking the Ph D the requirement is four courses above 300 at least one of which is above 400 (but not 490) all taken in conjunction with 590 Interested students should ask the chair to assign a minor adviser

The department participates in the interdepartmental program in general graduate studies (See *Index*)

Courses open for nonmajor graduate credit All 300 and 400 level courses except 490

Courses Primarily for Undergraduate Students

Phil 201 Introduction to Philosophy (3 0) Cr 3 FS SS It has been rumored that the unexamined life is not worth living Philosophy is an attempt to begin examining life by considering such questions as What makes us human? What is the world ultimately like? How should we relate to other people? Is there a god? How can we know anything about these questions? Understanding questions of this kind and proposed answers to them is what this course is all about

Phil 206 Introduction to Logic and Scientific Reasoning (3-0) Cr 3 FS SS Basic principles of critical reasoning and argument evaluation A consideration of basic forms of argumentation in science and everyday life Application to contempo rary issues and controversies

Phil 207 Introduction to Symbolic Logic (Same as Ling 207) (3 0) Cr 3 S Introduction to fundamental logical concepts and logical symbolism Development of natural deduction through first order predicate logic with identity Applications to arguments in ordinary English and to philosophical issues Majors should take 207 as early as possible

Phil 230 Moral Theory and Practice (3 0) Cr 3 FS SS Investigation of moral issues in the context of major ethical theories of value and obligation e g punishment abortion economic justice job discrimination world hunger and sexual morality Emphasis on critical reasoning and argument analysis

Phil 235 Ethical Issues in A Diverse Society (3-0) Cr 3 S This course will examine a range of arguments on diversity issues Topics will include the social status of women the moral status of sexuality and homosexuality the nature and role of racism in contemporary society the relationship between biology gender roles and social status and various proposals for change from a variety of political perspectives

Phil 310 Ancient Philosophy (Same as Cl St 310) (3 0) Cr 3 F *Prereq 201* Survey of the principal philosophers of the ancient world the pre Socratics Plato Aristotle the Stoics and the Epicureans Questions concerning being knowledge language and the good life are treated in depth Nonmajor graduate credit

Phil 314 17th Century Philosophy (3 0) Cr 3 Alt S offered 2004 *Prereq 201* Readings from philosophers such as Hobbes Descartes Spinoza Leibniz and Locke Changing conceptions of knowledge self and deities in response to Galileo s new science and post reformation challenge to ecclesiastical authority Nonmajor graduate credit

Phil 315 18th Century Philosophy (3 0) Cr 3 Alt S offered 2005 *Prereq 201* Readings from philosophers such as Berkeley Hume and Kant Development of Enlightenment thought Issues include idealism causation freedom and knowledge regarding science ethics and deities Nonmajor graduate credit

Phil 316 19th Century Continental Philosophy (3 0) Cr 3 Alt F offered 2003 *Prereq 201* The thought of Hegel Marx Nietzsche and their contemporaries Various perspectives on the philosophy of history the nature of reason and subjectivity the contrast between dialectical and nondialectical philosophy and the relationship between philosophy and society Nonmajor graduate credit

Phil 317 20th and 21st Century Continental Philosophy (3-0) Cr 3 Alt F offered 2004 *Prereq 201* An examination of 20th century continental philosophy against the background of the 19th century continental tradition Movements covered include Phenomenology Marxism Postmodernism Post structuralism Feminism Focus on attempts to develop history society and politics debates about the crisis of reason and culture political issues surrounding such debates Nonmajor graduate credit

Phil 318 20th Century Anglo American Philosophy (3 0) Cr 3 S *Prereq 201* Major movements in recent philosophy such as realism logical positivism ordinary language philosophy and naturalism Russell Wittgenstein Quine and other leading figures Topics include knowledge of the material world mind language values and philosophical method Nonmajor graduate credit

Phil 320 Existentialism and Its Critics (3 0) Cr 3 Alt F offered 2003 *Prereq 201* An investigation of Existentialism and its critics in historical and cultural context Emphasis on existential phenomenology and French existentialism and on criticisms Existential Marxism and Heidegger s later philosophy Nonmajor graduate credit

Phil 330 Ethical Theory (3-0) Cr 3 F *Prereq 201 or 230* Major theories in normative ethics and metaethics Includes such views as relativism emotivism and absolutism Comparison of ethics with science and how moral judgments are justified Nonmajor graduate credit

Phil 331 Moral Problems in Medicine (3-0) Cr 3 Alt S offered 2004 *Prereq 230 or junior classification* In-depth study of some of the central moral problems arising in medicine e g abortion euthanasia patients rights health care profession als duties and responsibilities allocation of medical resources Major moral theories will be examined and applied Nonmajor graduate credit

Phil 332 Philosophy of Law (Same as CJ St 332) (3 0) Cr 3 FS *Prereq 201 or 230* Extent of our obligation to obey the law what constitutes just punishment how much of the immoral should be made illegal? Relation of these questions to major theories of law and the state Discussion of such concepts as coercion equality and responsibility Nonmajor graduate credit

Phil 333 Family Ethics (3-0) Cr 3 Alt S offered 2004 *Prereq 3 credits in philosophy* Moral dimensions of marriage and love parent-child relations domestic work and moral education Can parents and children be friends? What do children

owe their parents? Is there a feminist mode of moral thinking? Nonmajor graduate credit

Phil 334 Environmental Ethics (Same as Env S 334) (3 0) Cr 3 F *Prereq 3 credits in philosophy or junior classification* Thorough study of some of the central moral issues arising in connection with human impact on the environment e g human overpopulation species extinction forest and wilderness management pollution Several world views of the proper relationship between human beings and nature will be explored Nonmajor graduate credit

Phil 335 Social and Political Philosophy (3 0) Cr 3 Alt S offered 2004 *Prereq 201 or 230* Foundations of social and political life Metaphysical and epistemological grounds in classical and recent thinkers The basis of political organization the nature of social and political institutions rights and authority justice and the character of distinctly political action Original texts Nonmajor graduate credit

Phil 336 Bioethics and Biotechnology (3-0) Cr 3 Alt S offered 2005 *Prereq Phil 201 or 230 or 235* In-depth study of some central moral issues in the life sciences e g genetic screening and testing genetically engineered plants and animals risk analysis biotechnology patents research ethics *biodiversity the impact of biotechnology on society* and the environment Major moral theories will be discussed and applied (Phil 336 contains almost no similarities to Phil 331) Nonmajor graduate credit

Phil 338 Feminist Philosophy (3 0) Cr 3 S *Prereq 3 credits in philosophy recommended* This course critically examines the work that oppositions such as sex/gender self/other subjectivity/objectivity and nature/nurture does in philosophy and in our culture more generally In particular we will consider historical *and contemporary that feminism engages issues of* sexual orientation political equality race biology violence and pornography as it works toward the personal and political emancipation of women Nonmajor graduate credit

Phil 340 Aesthetics (3 0) Cr 3 F *Prereq 201 or 230* Is liking all there is to appreciating works of art or natural beauty? We will examine our appreciative experiences talk about such experiences (e g art criticism) and what makes them valuable Do the different *arts have common values? How are their* differences important? Nonmajor graduate credit

Phil 343 Philosophy of Technology (Same as T SC 343) (3 0) Cr 3 FS *Prereq 6 credits of social science or T SC 341 and 3 credits of social science* Conditions under which technological innovations contribute to human emancipation relationship of technology and democracy utility and limits of technical rationality and problems of ensuring that benefits of technological advance are communally shared Issues discussed with reference to contemporary developments in microelectronics technology transfer to the Third World etc Nonmajor graduate credit

Phil 350 Philosophy of Religion (Same as Relig 350) (3-0) Cr 3 F *Prereq 201* The value and truth of religious life and belief Mystical experience religious faith and language arguments for God s existence the problem of evil miracles and religion and morality Historical and contemporary readings from both the western and eastern traditions Nonmajor graduate credit

Phil 364 Metaphysics God, Minds and Matter (3 0) Cr 3 S *Prereq 3 credits in philosophy* A survey of classical and contemporary views on some basic metaphysical issues Issues discussed include Does God exist? Do you have a mind and if so how does it relate to your body? What is the nature of cause and effect? Do objects have any essential properties? How can we account for properties objects have in common? Nonmajor graduate credit

Phil 380 Philosophy of Science (3 0) Cr 3 F *Prereq 201 or 6 credits in a science* Introduction to the philosophy of science A variety of basic problems common to the natural and social sciences the nature of explanation the structure of theories the unity of science and the distinction between science and nonscience Nonmajor graduate credit

Phil 381 Philosophy of the Social and Behavioral Sciences (3 0) Cr 3 S *Prereq 201 or 6 credits in the social sciences* Methodological ideological and doctrinal issues about the social and behavioral sciences against the background of influence of the natural sciences Focus is on the historical and cultural background of 19th and 20th century western thought Nonmajor graduate credit

Phil 398 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator junior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period Nonmajor graduate credit

Phil 430 Value Theory (3-0) Cr 3 each time taken maximum of 6 credits S *Prereq 230* Theoretical and normative issues in ethics aesthetics religious thought or political philosophy Topics vary each time offered Nonmajor graduate credit

Phil 450 Free Will, Fate, and Moral Responsibility (3 0) Cr 3 F *Prereq 3 credits in philosophy 207 strongly encouraged* Are we free if all our actions are inevitable consequences of our past and the laws of nature or if God exists and is omniscient? Examines what sorts of facts constitute threats to human freedom Issues of time truth causation and agency are treated in depth Nonmajor graduate credit

Phil 460 Epistemology and Metaphysics (3 0) Cr 3 each time taken maximum of 6 credits Alt S offered 2004 *Prereq 201 and at least one course in the history of philosophy* Issues in epistemology and metaphysics Topics vary each time offered Nonmajor graduate credit

Phil 465 Brains, Minds and Computers (3 0) Cr 3 F *Prereq 201* Examination of concepts such as computability intelligence programming and free will and of arguments about whether any human capacity is forever beyond realization in a machine Nonmajor graduate credit

Phil 480 Controversies in Science (3 0) Cr 3 each time taken S *Prereq 3 credits in philosophy or 6 credits in a natural or social science* Philosophical treatment of a branch of science that has (or has had) significant social political religious and/or moral implications Possible topics include the IQ debate implications of Darwinism the Galileo affair the role of values in science critical analysis of current science policy (e g the Human Genome Project) Topics will be arranged to meet the needs of interested students Often team taught by a philosopher and a scientist from the relevant discipline Nonmajor graduate credit

Phil 483 Philosophy of Biology (3 0) Cr 3 *Prereq 3 credits in philosophy or 3 credits in biology* S Biology is powerful both as a science and in its effects on our culture Philosophy of biology evaluates this power Possible topics include What makes sciences such as evolutionary theory ecology or molecular biology so good at explaining things? What is life? Can evolution account for design? What role does chance play in evolution? Has there been progress in the evolution of life on earth? What can sociobiology tell us about human nature behavior and culture? Nonmajor graduate credit

Phil 485 Philosophy of Physics (3 0) Cr 3 *Prereq 3 credits in Philosophy or 3 credits in Physics* S Conceptual and philosophical issues relating to the interpretation of theories in classical and modern physics May include one or more of the following topics the relationship between mathematics and the physical world Newtonian physics (determinism and predictability) thermodynamics and statistical physics (the nature of probability entropy and the direction of time) relativistic physics (indeterminism realism and nonlocality consciousness and the role of the observer) Nonmajor graduate credit

Phil 490 Independent Study Cr 1 to 4 each time taken *Prereq 6 credits in philosophy permission of instructor approval of chairman* No more than 9 credits of Phil 490 may be counted toward graduation Guided reading and research on special topics selected to meet needs of advanced students H *Honors*

Courses Primarily for Graduate Students for minor credit, open to qualified undergraduates

Phil 535 Contemporary Political Philosophy (Same as Pol S 535) (3-0) Cr 3 Alt S offered 2005 *Prereq 6 credits of philosophy or political science* Examination of theories of justice proposed by contemporary political philosophers Analysis of the philosophical foundations of perspectives such as liberalism libertarianism communitarianism socialism feminism Normative assessments of socio political institutions

Phil 590 Special Topics in Philosophy Cr 2 to 4 each time taken *Prereq Permission of instructor 9 credits in philosophy*
A History of Philosophy
B Epistemology and Metaphysics
C Value Theory
D Logic and Philosophy of Science

Religious Studies (Relig) Undergraduate Study

Religious studies gives students the opportunity to investigate and reflect on the world s religions in an objective critical and appreciative manner Though there is emphasis in religious studies on the wide variety of religious phenomena as well as on the various methods in the study of religion the aim is to help students develop their own integrated *understanding of the nature of religion and its role in* individual and social life

Graduates of the religious studies program have knowledge of the religious diversity in the United States and the world They have the ability to interpret religion empathetically and critically and to compare and contrast historical and contemporary differences and similarities of religious systems They understand ways in which religion influences and is influenced by the historical social and cultural contexts in which *religious systems function Graduates often pursue* careers in non profit community organizations apply to professional schools or graduate programs or enter seminaries to prepare for ministry

The program provides students with the following opportunities to major or minor in religious studies to fulfill group requirements to take religious studies courses that are integrated into another major to take religious studies courses as electives and to develop an interdisciplinary studies major (See the professor in charge of the religious studies program for *advice*)

The major in religious studies seeks to provide both breadth and depth Breadth is provided through the exploration of the world s various religious traditions and through exposure to a variety of theoretical approaches and methodologies in the academic study of religion Depth is achieved through specialized courses in particular religious traditions and particular issues in the study of religions culminating in research seminars The objective is to expose the student to various components of the discipline of Religious Studies and by doing so develop skills that are valuable in a number of careers and that provide the necessary foundation for pursuing graduate studies

Students are required to take courses in three clusters of religious traditions 1 Western religions (religions originating in Southwest Asia the Mediterranean Basin or in Europe) 2 Asian religions (religions originating in South Asia Southeast Asia or East Asia) and 3 Indigenous religions (religions among the indigenous peoples of Africa the Americas Australasia and Siberia) One additional course should focus on religion within North America

Students pursuing a major in religious studies must complete a minimum of 33 credits including the following requirements

1 Three credit hours in each of the three clusters of religious traditions for a total of nine hours
2 Three credit hours in a course that primarily focuses on religion in North America (The course used to meet the North American religions require ment may not be used simultaneously to meet the cluster requirement described in number 1 above)
3 Theories and Methods in the Study of Religion - Religious Studies 385
4 Six hours of Seminar (475)

The following courses may be used to fulfill the requirements in the areas of Western Asian Indigenous and North American Religions Note that some courses cannot be used to meet these requirements but are general electives for the Religious Studies Major

I Western Religious Traditions
Relig 210 Religion in America
Relig 220 Introduction to the Bible
Relig 233 Introduction to Judaism
Relig 242 History of Christianity
Relig 280 Introduction to Catholicism
Relig 321 Old Testament
Relig 322 New Testament
Relig 323 Science and Religion
Relig 334 African American Religious Experience
Relig 338 Latino/a Religious Experience
Relig 354 Islamic Civilization
Relig 367 Christianity in the Roman Empire
Relig 376 Classical Archaeology

II Asian Religions
Relig 352 Religious Traditions of India
Relig 353 Buddhism

III Indigenous Religions
Relig 328 American Indian Religions
Relig 356 African Religions

IV Religion in North America (while courses may be listed in more than one category the same course may not be used to meet both requirements)
Relig 210 Religion in America
Relig 328 American Indian Religions
Relig 334 African American Religious Experience
Relig 338 Latino/a Religious Experience

The program offers a minor which may be earned by completing a total of 15 credits in religious studies including course work in three of the four areas that have been previously described Nine hours must be in courses at the 300 level or above (no more than 3 hours of seminar and no more than 3 hours of independent study)

English proficiency requirement The department requires a grade of C or better in each of English 104 and 105 (or 105H) and requires one 300 level course in religious studies in which writing is evaluated as acceptable

Students may choose to do a senior thesis under the supervision of a religious studies faculty adviser This option may earn 3-6 credits toward the completion of the major

Graduate Study

The program offers courses for graduate minor work in religious studies as supporting work for other fields Religious studies may also be one of the three areas required for the general graduate studies master s degree

Courses open for nonmajor graduate credit 321 322 328 334 336 338 350 352 353 354 356 365 367 370 377 385 475

Courses Primarily for Undergraduate Students

Relig 105 Introduction to World Religions (3 0) Cr 3 FS SS An introduction to the academic study of religions including myths beliefs rituals values social forms Examples chosen from oral cultures and major religions of the world

Relig 210 Religion in America (3-0) Cr 3 FS SS Introductory study of the major beliefs practices and institutions of American Judaism Catholicism Protestantism and Islam with emphasis on the diversity of religion in America and attention to issues of gender race and class

Relig 220 Introduction to the Bible (3 0) Cr 3 FS Basic overview of the contents of the Old and New Testament in light of their ancient socio-historical background and with attention to a variety of interpretations and relevance to modern American society

Relig 233 Introduction to Judaism (3 0) Cr 3 An introduction to basic Judaism Special attention is given to Jewish sacred texts rituals social practices and modern forms

Relig 242 History of Christianity (3 0) Cr 3 FS SS An introduction to Christian thought and practice from an historical point of view stressing the development of belief spirituality and organization and the continuities and changes involved in these developments

Relig 260 Religious Ethics (3 0) Cr 3 Investigates different religious ethical theories and traditions of reasoning about practical moral issues (e g abortion the just distribution of wealth environmental ethics) Explores in detail the relationship between religious beliefs and moral practice

Relig 280 Introduction to Catholicism (3 0) Cr 3 F An introduction to Catholic belief and practice The Catholic ethos will be located in the context of other world religions and special stress will be placed on the central beliefs of the Creed as understood by Catholics and on sacramentality as the distinguishing mark of the Catholic worldview

Relig 321 Old Testament (3-0) Cr 3 F An in-depth study of the literature and religion of ancient Israel in light of recent archaeological discoveries research about the ancient Near East and a variety of interpretations Nonmajor graduate credit

Relig 322 New Testament (3 0) Cr 3 A detailed survey of the sacred scriptures of Christianity in light of recent archaeological discoveries and historical research about their Greco-Roman and Jewish background Nonmajor graduate credit

Relig 323 Science and Religion (Same as Hist 323) See *History*

Relig 328 American Indian Religions (Same as Am In 328) (3-0) Cr 3 An introduction to the beliefs and rituals of Native American religious traditions with attention to cultural and historical contexts and implications Nonmajor graduate credit

Relig 334 African American Religious Experience (Same as Af Am 334) (3 0) Cr 3 Alt F offered 2004 Examination of the African American experience from the perspective of black religion and the black church with attention to political economic and social as well as spiritual concerns Nonmajor graduate credit

Relig 336 Women and Religion (Same as W S 336) (3 0) Cr 3 F *Prereq 105 210 or W S 201 recom mended* Examines the status of women in various religions feminist critiques of religious structures and belief systems and contemporary women s spirituality movements Nonmajor graduate credit

Relig 338 Latino/a Religious Experience (3 0) Cr 3 S A survey of Latino/a religious experience including religious traditions as they are reflected in the literature of Mexican Americans Puerto Ricans Cubans and other groups of Latinos living in the United States Nonmajor graduate credit

Relig 340 Magic Witchcraft, and Religion (Same as Anthr 340) See *Anthropology*

Relig 350 Philosophy of Religion (Same as Phil 350) See *Philosophy* Nonmajor graduate credit

Relig 352 Religious Traditions of India (3-0) Cr 3 F Examines the religious traditions of India including Hinduism Jainism and Sikhism through text ritual and contemporary practice Nonmajor graduate credit

Relig 353 Buddhism (3-0) Cr 3 S The various Buddhist paths to realize enlightenment and freedom Special attention to meditation and yoga and their relationship to altered states of consciousness and to social contexts Nonmajor graduate credit

Relig 354 Islamic Civilization (3 0) Cr 3 S An introduction to Islamic religion culture and society from 700 to the present Nonmajor graduate credit

Relig 356 African Religions (3-0) Cr 3 An introduction to the teachings practices and history of the religions that originated in Africa and other religions which have gained substantial followings among African peoples Nonmajor graduate credit

Relig 367 Christianity in the Roman Empire (Same as Cl St 367) (3-0) Cr 3 An historical introduction to the rise of Christianity in the Roman empire with special attention to the impact of Greco Roman culture on the thought and practice of Christians and the interaction of early Christians with their contemporaries Nonmajor graduate credit

Relig 370 Religion and Politics (Same as Pol S 370) (3 0) Cr 3 Alt S offered 2004 *Prereq 105 or 210 recommended* The interaction of religion and politics in the U S from both an historical and contemporary perspective as well as the role of religion in politics internationally Nonmajor graduate credit

Relig 376 Classical Archaeology (Same as Cl St 376) See *Classical Studies*

Relig 377 Social Dimensions of Religion (Same as Soc 377) (3 0) Cr 3 Alt S offered 2005 *Prereq 210 or Soc 130 or 134 recommended* The influence of religion in society both as a conservator of values and as a force for social change Nonmajor graduate credit

Relig 385 Theory and Method in Religious Studies (3 0) Cr 3 *Prereq 105* Examines the variety of theories and methods employed in the study of religion Application of these methods to various religions of the world Nonmajor graduate credit

Relig 475 Seminar Issues in the Study of Religion (3 0) Cr 3 each time taken maximum of 6 credits *Prereq 6 credits in religious studies* Topic changes each time offered Closed to freshmen Sophomores must have approval of instructor Nonmajor graduate credit

Relig 490 Independent Study Cr 1 to 3 each time taken *Prereq 6 credits in religious studies and permission of instructor approval of professor in charge of program* No more than 9 credits of Relig 490 may be counted toward graduation Guided reading and research on special topics selected to meet the needs of advanced students
H Honors

Relig 491 Senior Thesis Cr 3 Written under the supervision of a Religious Studies faculty advisor

Relig 494 Special Studies in Religious Research Languages Cr 2 to 3 each time taken *Prereq 6 credits in Religious Studies and permission of instructor*

Relig 499 Peace and Justice Internship Cr var maximum of 6 *Prereq 3 credits in religious studies permission of faculty internship coordinator* Supervised placement with a peace and justice agency structured reflection on the relation of religion and practical social issues Offered on a satisfactory-fail grading basis only

Relig 590 Special Topics in Religious Studies Cr 1 to 3 each time taken *Prereq Permission of instructor 9 credits in religious studies*

Physics and Astronomy

www physics iastate edu/

Eli I Rosenberg, Chair of Department

Distinguished Professors Harmon Ho Johnston

University Professors Willson

Professors Anderson Borsa Canfield Carter Lewis Crawley Goldman Hauptman Hill Hodges Kawaler Lassila Luban Qiu Rosenberg Shinar Soukoulis Stassis Struck Tringides Vary Whisnant Wolford Young

Professors (Adjunct) Meyer

Professors (Collaborators) Lin Womersley

Distinguished Professors (Emeritus) Clem Finnemore Lynch Ruedenberg Swenson Zaffarano

Professors (Emeritus) Barnes Bowen Firestone Fuchs Kelly Lamb Leacock Peterson Pursey Ross Stanford Stewart Weber Williams Wohn

Associate Professors Krennrich Rosati Schmalian Valencia

Associate Professors (Adjunct) Antropov Biswas Kogan Shabalovskaya

Assistant Professors Cochran Gonzalez Lajoie Meltzer Modler Ogilvie Prell Travesset Casas

Assistant Professors (Adjunct) Atwood Morris Vaknin

Instructors (Adjunct) Le Bohec

Lecturer Atwood

Undergraduate Study

For the undergraduate curriculum in liberal arts and sciences major in physics leading to the degree bachelor of science see *Liberal Arts and Sciences Curriculum*

Physics and astronomy are basic natural sciences which attempt to describe and provide an understand ing of both our world and our universe Physics serves as the underpinning of many different disciplines including the other natural sciences and technological areas Graduates are proficient in the methods of rigorous scientific analysis relevant mathematical techniques and modern computational and laboratory methods They have a broad knowledge of physics including mechanics electricity and magnetism thermodynamics and modern physics They are able to communicate clearly and effectively at general and technical levels They are prepared to pursue a wide range of careers as a professional physicist astronomer or science educator They are also prepared to pursue advanced studies and careers in areas as diverse as engineering medicine law and business administra tion

Many opportunities exist for students who terminate their studies with a bachelor s degree especially when combined with technology studies in other areas Students who meet the necessary scholastic standards often continue their studies in a graduate college exploring and contributing to new develop- ments in the field

The department normally expects each student majoring in physics to complete at least the following courses Phys 221 222 232 321 321L 322 322L 304 306 361 364 and three credits of laboratory work chosen from 310 311 311T 470L or Astro 344L All students are required to earn at least 5 credits in laboratory work in physics in addition to the laboratory components of Phys 221 and 222 These 5 credits must be in courses numbered 300 or higher or in approved substitutions All students must earn at least 20 credits in physics and astronomy courses numbered 304 or higher The basic list of expected courses is not a rigid requirement and changes in this basic list will be approved by the department curriculum committee on recommendation of the student s advisor when such changes will better serve the student s needs In particular students planning a physics major and also seeking certification for high school teaching may with the approval of their adviser follow a significantly different program designed to meet their particular needs these students should consult the department for further information Further information concerning programs of study including sample degree programs is available from the department

The department also offers a major in applied physics in cooperation with several other departments This major consists of a physics core plus more specialized studies in a physics related technology area and is designed to prepare students to work in high technology industry or continue their studies in a graduate program in applied science or engineering Normally students in this major will be expected to complete a physics core consisting of the following courses Phys 221 222 321 321L 361 364 and six credits of laboratory work chosen from Phys 310 311 and 470L At least 3 credits of the laboratory must be in Phys 470L In additions a minimum of 12 credits in a specialized topic area must be obtained in a cooperating department A minimum of 6 credits of additional physics courses are required at the 300 level or above Specific requirements and recommen dations for course selection depend on the area of specialization and guidelines may be obtained from the Department of Physics and Astronomy In summary the major usually requires a minimum of 32 credits of physics and 12 credits in a specialized topic area

Students majoring in physics who wish an emphasis in astronomy or astrophysics should consider a minor in astronomy (see below) Those planning graduate work in physics astronomy or astrophysics should add to the basic list the courses Phys 362 365 480 481 and 496 One or more of Astro 405 Phys 511 524 or 537 may also be added according to interest

The department offers a minor in physics which may be earned by completing 20 credits in physics courses chosen as follows Phys 221 222 321 at least one credit of laboratory chosen from 321L 322L 310 311 and 311T Other acceptable courses are 304 306 322 361 362 364 365 480 481 and 496

The department offers a minor in astronomy which may be earned by completing 15 credits chosen as follows a total of 12 or more credits in Astro courses (must include Astro 344L and may include one of the courses Astro 120 Astro 150 or Astro 250) with the remaining 3 credits (if applicable) chosen from among Physics 304 321 361 362 364 365 480 481 or 496 12 or more credits must be at the 300 level or higher Note that the same course may not be used to satisfy both the requirements of a physics major and an astronomy minor

English proficiency requirement The department requires a grade of C or better in each of Engl 104 and 105 (or 105H) and a C– or better in Engl 302 305 309 or 314 Students are also encouraged to study at least one foreign language

Graduate Study

The department offers studies for the degrees master of science and doctor of philosophy with majors at both levels in applied physics astrophysics condensed matter physics high energy physics nuclear physics and physics and minor credit courses for students majoring in other departments

Facilities of various research groups of the department the Ames Laboratory and the Applied Science Center including the Microelectronics Research Center are available for research

Students with bachelor s degrees in physics or astronomy from other institutions ordinarily will qualify for graduate study at Iowa State provided they have satisfactorily completed course work similar to that suggested for undergraduate majors here intending to go on to graduate school In some cases additional instruction at the intermediate level may be required

Graduates have a broad understanding of physical science as well as mastery of state-of the-art methods in their area of specialization They are able to communicate effectively to a wide range of audiences from the general public to research colleagues Their skills in rigorous scientific thinking prepare them for leadership in the broader commu nity They are skilled in carrying out research communicating research results and soliciting research support They have considerable teaching experience They have developed problem solving skills that prepare them for careers in either industry or academia

All candidates for an advanced degree in physics are expected to complete Phys 571 572 591 and either 531 or 564 Candidates for an advanced degree in applied physics are expected to complete Phys 571 591 470L (6 cr) 699 (3 cr) and either 572 or 531

Except for the applied physics major where a thesis is always required the degree master of science is offered both with and without thesis

For all areas of study except applied physics the basic requirements for the M S are the same At least 30 credits of acceptable graduate work must be completed not less than 21 of which must be in physics or astronomy Students must complete not less than 6 credits from outside their major area with 3 credits being required from outside the department and 3 credits from a 500 or 600 level course in another area of specialization

Students choosing a degree with thesis may apply up to 8 credits of 699 but no credits of 599 toward the minimum 30 credits Students choosing a degree without thesis should apply 2 credits of 599 but may not apply any credits of 699 toward the minimum 30 credits

Students whose major area is applied physics must complete at least 30 credits of acceptable graduate work and not less than 19 credits of these must be in the required courses listed above the remaining 11 credits of the 30 credit minimum may be chosen freely either from within the student s major area or from without and either from the department or outside but it should be noted that not more than 3 credits of Phys 699 may be applied toward the 30 credit minimum

In addition to the list of basic courses above all candidates for the doctor of philosophy degree except those in astrophysics must also complete Phys 592 Individual areas may impose additional requirements In addition to course work in the major area of study a candidate must complete 12 credits from outside this area Of these 6 must be taken from other departments and 6 must be taken from the department with the additional constraint that this latter 6 must include at least one 500 or 600 level introductory course in another area of specialization Each candidate for the doctor of philosophy degree is required to teach one year of elementary physics or astronomy

Graduate students interested in a physics minor should contact the department for requirements

Courses open for nonmajor graduate credit Phys 304 310 311 361 362 364 365 480 481 496 and Astro 342 344L 346

Astronomy and Astrophysics (Astro) Courses Primarily for Undergraduate Students

Astro 120 The Sky and the Solar System (3-0) Cr 3 F S SS For the nonscientist The sky constellations motions of the sun moon and planets seasons and the calendar eclipses The solar system origin and evolution characteristics of the sun planets satellites comets meteorites and asteroids Extensive use of the planetarium is included

Astro 125L The Sky and the Solar System Laboratory (0 2) Cr 1 FS *Prereq Concurrent or previous enrollment in Astro 120* Laboratory course to accompany Astro 120 Students carry out practical exercises involving naked eye and telescopic observing to explore and reinforce ideas covered in Astro 120 Activities based on a sky simulation computer program and other computer-based exercises are also included

Astro 150 Stars Galaxies and Cosmology (3 0) Cr 3 FS For the nonscientist Observational aspects of stellar astronomy motions distances sizes spectra types of stars variability binary systems Stellar evolution the birth life and death of stars including supernovae neutron stars and black holes The Milky Way Galaxy clouds of matter in space the structure and evolution of our galaxy Other galaxies clusters of galaxies quasars Theories of the origin of the universe

Astro 250 Astronomy Bizzare (3-0) Cr 3 S *Prereq 120 or 150* For the nonscientist New and exciting topics in modern astronomy Galaxy and star formation Black holes and pulsars Colliding galaxies Quasars Cosmology the Big Bang and the future of the universe Prospects and searches for extraterrestrial life

Astro 290 Independent Study Cr 1 to 4 each time taken *Prereq Permission of instructor*

Astro 342 Introduction to Solar System Astronomy (3 0) Cr 3 F *Prereq Phys 222* Analytical and comparative studies of solar system objects—planets satellites rings asteroids comets meteoroids and interplanetary dust—with emphasis on the physical processes affecting them their interactions and their evolution Orbital mechanics including perturbations stability and resonances Tidal forces and effects Radiation laws and thermal physics with applications Brief study of the sun as a star and of stellar evolution Origin and evolution of the solar system Detection of other planetary systems Nonmajor graduate credit

Astro 344L Astronomy Laboratory (1 6) Cr 3 F *Prereq Phys 222* Experiments in optical astronomy Observational techniques ranging from stellar photometry to astrophotography Available instruments include 8 Meade 14 Celestron and Schmidt cameras Class meets at Fick Observatory south of Boone Nonmajor graduate credit

Astro 346 Introduction to Astrophysics (3 0) Cr 3 S Prereq *Phys 222* Basic radiation theory spectra Observational determination of stellar properties spectral classification Binary systems Stellar structure and evolution White dwarfs neutron stars black holes The Galaxy structure and composition the interstellar medium Other galaxies active galaxies cosmology Nonmajor graduate credit

Astro 405 Astrophysics (Dual listed with 505) (3 0) Cr 3 F *Prereq 342 or 346 Math 266* Survey of astrophysics at an advanced level Physics of stars galaxies and the universe Stellar spectra structure and evolution Origin of the elements Black holes neutron stars and white dwarfs Large scale structure of the universe dark matter Big Bang Cosmology

Astro 450 Undergraduate Research Cr 1 to 6 each time taken FS SS *Prereq Permission of instructor* Research under supervision of astronomy faculty

Astro 450L Undergraduate Research Cr 1 to 6 each time taken FS SS *Prereq 344L and permission of instructor* Laboratory or observational project under supervision of astronomy faculty

Astro 490 Independent Study Cr 1 to 4 *Prereq 6 credits in astronomy permission of instructor* No more than 9 credits of Astro 490 may be counted toward graduation
H Honors

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Astro 505 Astrophysics (Dual listed with 405) (3-0) Cr 3 F *Prereq 342 or 346 Math 266 permission of instructor* Survey of astrophysics at an advanced level Physics of stars galaxies and the universe Stellar spectra structure and evolution Origin of the elements Black holes neutron stars and white dwarfs Large scale structure of the universe dark matter Big Bang Cosmology

Astro 510 Observational Astrophysics (2 3) Cr 3 Alt F offered 2004 *Prereq 405 or 505* Techniques in optical and near IR astronomy including spectroscopy and photometry with both single channel and 2 dimensional array detectors Emphasis on projects involving proficiency in the use of research telescopes and modern instrumentation Project topics range from spectroscopic and photometric studies of pulsating and binary star systems to deep photographic and CCD imaging of faint nebulae and galaxies

Astro 575 RadiativeTransfer Stellar Atmospheres and Spectroscopy (3 0) Cr 3 Alt F offered 2003 *Prereq 405 or 505* Radiative transfer with applications to stellar interiors atmospheres and the interstellar medium Interaction of radiation and matter line and continuum processes Statistical equilibrium Line profiles Interpretation of stellar spectra temperature pressure and abundance determinations Dynamic and extended atmospheres chromospheres coronae and stellar winds

Astro 580 Stellar Structure and Evolution (3 0) Cr 3 Alt S offered 2004 *Prereq 405 or 505* Stellar structure equations and constitutive relations energy generation energy transport by radiation and convection equation of state Solutions to the equations general theorems analytic approximations numerical techniques and results Stellar evolution from formation to final phases Nucleosynthesis recycling of material to the interstellar medium Evolution in interacting binaries Variable stars

Astro 590 Special topics Cr var

Astro 599 Creative Component Cr var *Prereq Permission of instructor* Individually directed study of research level problems for students electing the nonthesis M S option in astronomy

Courses for Graduate Students

Astro 615 Galactic and Extragalactic Astronomy (3 0) Cr 3 Alt S offered 2005 *Prereq 405 or 505* Galactic structure dynamics of external galaxies evolution and classification of galaxies extragalactic radio sources quasars cosmological models

Astro 650 Advanced Seminar (1 0) Cr 1 each time taken FS Topics of current interest in astronomy and astrophysics Offered on a satisfactory fail grading basis only

Astro 660 AdvancedTopics in Astronomy and Astrophysics Cr 1 to 3 each time taken FS Topics in stellar galactic and extragalactic astronomy including stellar evolution solar physics variable stars compact objects the interstellar medium active galaxies and quasars formation and evolution of galaxies cosmology high energy astrophysics advanced observational techniques and astrophysical applications of hydrodynamics

Astro 699 Research

Physics (Phys)

Courses Primarily for Undergraduate Students

Phys 101 Physics for the Nonscientist (3 0) Cr 3 FS Survey of the principal areas of both classical and modern physics Emphasis on the nature of the physical universe and the application of physical principles to life in the modern world

Phys 106 The Physics of Common Experience (4-2) Cr 4 FS Elementary topics from mechanics heat electricity sound and light emphasizing the use of basic principles to understand everyday experience Includes practical problem exercises and a coordinated laboratory

Phys 111 General Physics (4 2) Cr 4 FS SS *Prereq 11/2 years of high school algebra 1 year of geometry 1 semester of trigonometry* General background in physical concepts principles and methods for those who do not plan advanced study in physics or engineering Mechanics fluids heat and thermodynamics vibrations waves sound

Phys 112 General Physics (4 2) Cr 4 FS SS *Prereq 111* General background in physical concepts principles and methods for those who do not plan advanced study in physics or engineering Electricity and magnetism ray and wave optics topics in modern physics

Phys 198 Physics of Music (2 2) Cr 3 F Introductory level course on sound for nonphysics majors Properties of pure tones and harmonics human perception of sound room acoustics scales production and analysis of musical by voice string woodwind brass and percussion instruments

Phys 199 Introductory Seminar (1-1) Cr R F Survey of recent scientific breakthroughs and current research of physics and astronomy faculty Discussion of careers based on a major in physics Offered on a satisfactory fail grading basis only

Phys 221 Introduction to Classical Physics I (4 5 1) Cr 5 FS SS *Prereq Credit or enrollment in Math 166* For engineering and science majors 3 hours of lecture each week plus 3 recitations and 1 laboratory every 2 weeks Elementary mechanics including kinematics and dynamics of particles work and energy linear and angular momentum conservation laws rotational motion oscillations gravitation Electric forces and fields Electrical currents DC circuits
H Honors FS

Phys 222 Introduction to Classical Physics II (4 2) Cr 5 FS SS *Prereq 221 Math 166 3 hours of lecture each week plus 1 recitation and 1 laboratory each week* Magnetic forces and fields LR LC LCR circuits Maxwell s equations waves and sound ray optics and image formation wave optics heat thermodynamics kinetic theory of gases topics in modern physics
H Honors FS

Phys 232 Computational Skills of Physics (0 2) Cr 1 S *Prereq 222* Development of skills in the use of software and computational equipment essential to physicists and other scientists Students work at their own pace Programming experience is helpful but not necessary

Phys 290 Independent Study Cr 1 to 4 each time taken *Prereq Permission of instructor*

Phys 298 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator sophomore classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Phys 302 The Challenge of Contemporary Physics (3 0) Cr 3 S *Prereq Sophomore classification* A largely nonmathematical but intellectually challenging exploration of physics which assumes no previous work in the field Selected material from classical and modern physics establishes the conceptual framework for the study of a major area of contemporary physics culminating in the discussion of topics at the frontier of present knowledge Research topics may vary from year to year and may include new particles quarks superconductivity lasers nuclear fusion liquid crystals solid state devices gravitational waves

Phys 304 Thermal Physics (3-0) Cr 3 F *Prereq 222 Math 266* Concepts of temperature entropy and other characteristic thermodynamic functions with application to macroscopic properties of matter The laws of thermodynamics Introduction to statistical mechanics including quantum statistics Application to black body radiation crystalline vibrations magnetic ions in solids electronic heat capacity of metals Phase transformations and chemical reactions Nonmajor graduate credit

Phys 306 Physics of Wave Motion (3 0) Cr 3 S *Prereq 222 credit or enrollment in Math 267* Oscillating systems including damped and forced

oscillations fluids geometric optics water waves the wave equation Fourier and Laplace transforms non uniform media cylindrical and spherical waves polarization interference and diffraction transmission lines non linear waves

Phys 310 Electronic Instrumentation for Experimental Physics (2 4) Cr 4 F *Prereq 222 Math 166* Common electrical instruments power supplies transducers passive and active devices analog integrated circuits including filters and amplifiers digital integrated circuits signal transmission and enhancement Nonmajor graduate credit

Phys 311 Intermediate Laboratory (0 3) Cr 1 or (0 6) Cr 2 each time taken S *Prereq 322 or 324* Experiments in classical and modern physics performed independently by each student Nonmajor graduate credit

Phys 311T Intermediate Laboratory (0 6) Cr 3 each time taken S *Prereq 112 or 222* Experiments in classical and modern physics performed independently by each student For students preparing for a career in high school teaching

Phys 321 Introduction to Modern Physics I (3 0) Cr 3 S *Prereq 222 credit or enrollment in Math 266* Quantum nature of matter photons Bohr model of hydrogen deBroglie wavelength of matter Schrodinger wave equation in one dimension energy quantization detailed solutions for potential steps barriers and wells One-electron atoms spin and transition rates x ray and optical excitations of multi electron atoms

Phys 321L Introductory Laboratory in Modern Physics (0 2) Cr 1 S *Prereq Credit or enrollment in 321 and credit or enrollment in 232 or equivalent experience* Experiments related to the foundations of modern physics The dual wave and particle character of electrons and photons statistics interferometry and x-ray spectroscopy

Phys 322 Introduction to Modern Physics II (3-0) Cr 3 F *Prereq 321* Quantum statistics lasers physics of molecules Properties of solids including electron band structure superconductivity and magnetism Nuclear physics including nuclear sizes and masses stability decay modes reactions fission and fusion Elementary particles including strangeness charm and quarks Fundamental forces of nature

Phys 322L Introductory Laboratory in Modern Physics II (0 2) Cr 1 F *Prereq Credit or enrollment in 322* Experiments related to the foundations of modern physics Radioactive decay elementary particles Hall effect spectroscopy and instrumentation

Phys 361 Classical Mechanics (3-0) Cr 3 F *Prereq 222 Math 265 266* Newtonian mechanics including forced oscillations central forces and orbital motion collisions moving frames of reference Lagrange s equations Nonmajor graduate credit

Phys 362 Intermediate Mechanics (3 0) Cr 3 S *Prereq 361* Rigid body motion small oscillations normal modes Special relativity including length contraction time dilation simultaneity Lorentz transformation 4 vector covariant formalism relativistic mechanics Nonmajor graduate credit

Phys 364 Electricity and Magnetism I (3 0) Cr 3 S *Prereq 222 Math 385 or Math 395* Static electric and magnetic fields potential theory electromagnetism Maxwell s equations Nonmajor graduate credit

Phys 365 Electricity and Magnetism II (2 0) Cr 2 F *Prereq 364* Relativistic electromagnetic theory radiation and propagation of electromagnetic waves interaction with matter Nonmajor graduate credit

Phys 389 Seminar (1 0) Cr R S Required of all *junior physics majors Career opportunities* graduate school programs and application job placement alternative careers basic skills needed for the job market competition Offered on a satisfactory fail grading basis only

Phys 398 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator junior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Phys 399 Seminar on Secondary School Physics Cr 1 to 2 maximum of 2 FS *Prereq Permission of instructor* Review of materials and curricula for secondary school physics presented and discussed by members of the class Required for approval to teach physics in secondary schools

Phys 450 Undergraduate Research Cr 1 to 6 each time taken FS SS *Prereq Permission of instructor* Theoretical research under supervision of physics faculty

Phys 450L Undergraduate Research Cr 1 to 6 each time taken FS SS *Prereq 311 permission of instructor* Laboratory project under supervision of physics faculty

Phys 470L Applied Physics Laboratory Cr 2 5 each time taken FS SS *Prereq 322 or 324 and permission of instructor* Studies in modern experimental techniques via experimentation and simulation in various areas of applied physics e g superconductivity optical spectroscopy nuclear magnetic resonance electron spin resonance x ray diffraction and computation of electronic and structural properties of matter

Phys 480 Quantum Mechanics I (3-0) Cr 3 F *Prereq 322 Math 385* First semester of a full-year course A systematic development of the formalism and applications of quantum mechanics Solutions to the time independent Schrodinger equation for various one-dimensional potentials including the harmonice oscillator operator methods Heisenberg picture angular momentum the hydrogen atom spin symmetry properties Nonmajor graduate credit

Phys 481 Quantum Mechanics II (3-0) Cr 3 S *Prereq 480* Continuation of 480 Addition of angular momentum charged particles in electromagnetic fields time independent perturbation theory variational principles WKB approximation interaction picture time-dependent perturbation theory adiabatic approximation scattering selected topics in radiation theory quantum paradoxes Nonmajor graduate credit

Phys 489 Tutorial Seminar (1-0) Cr 1 each time taken FS *Prereq Permission of instructor* For junior and senior physics majors Topics of interest in physics discussed in small groups Offered on a satisfactory-fail grading basis only

Phys 490 Independent Study Cr 1 to 4 *Prereq 6 credits in physics permission of instructor* No more than 9 credits of Phys 490 may be counted toward graduation
H Honors

Phys 496 Modern Optics (3-0) Cr 3 Alt S offered 2004 *Prereq Credit or enrollment in 321 and 365* Review of wave and electromagnetic theory topics selected from reflection/refraction interference geometrical optics Fourier analysis dispersion coherence Fraunhofer and Fresnel diffraction holography quantum optics nonlinear optics Nonmajor graduate credit

Phys 498 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator senior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Phys 500 Introductory Research Seminar (1 1) Cr R F Discussion by research staff of their research areas expected thesis research work and opportunities in the field For graduate physics majors only Offered on a satisfactory fail grading basis only

Phys 501 Oral Communication of Physics Seminar (2 0) Cr 1 each time taken F *Prereq Graduate classification* Practice in communication of physics and astronomy in typical college classroom settings and professional meetings Skills emphasized include selection of physical examples and analogies presentation styles of topics scientific dialogue organization of physics topics and classroom technique The teaching proficiency of each student is evaluated in detail For graduate physics majors only Offered on a satisfactory-fail grading basis only

Phys 511 Condensed Matter Physics I (3 0) Cr 3 S *Prereq 304 322* First semester of a full year course Free electron model crystal symmetry band theory of solids transport properties Fermi surface phonons semiconductors crystal surfaces magnetism superconductivity

Phys 512 Condensed Matter Physics II (3 0) Cr 3 F *Prereq 511* Continuation of 511 Free electron model crystal symmetry band theory of solids transport properties Fermi surface phonons semiconductors crystal surfaces magnetism superconductivity

Phys 524 Nuclear Physics (3 0) Cr 3 S *Prereq 480* Basic properties and structure of atomic nuclei introduction to nuclear models nuclear reactions decay and stability accelerators nuclear astrophysics and relativistic heavy ion collisions

Phys 531 Statistical Mechanics (3 0) Cr 3 F *Prereq 304 Math 465 credit or enrollment in Math 365 or 426* Thermodynamic properties of systems of many particles obeying Boltzmann Fermi Dirac and Bose Einstein statistics microcanonical canonical and grand canonical ensembles and their application to physical problems density matrices introduction to phase transitions renormalization group theory kinetic theory and fluctuations

Phys 535 Physics of Semiconductors (Same as E E 535) See *Electrical Engineering*

Phys 536 Physics of Semiconductor Devices (Same as E E 536) See *Electrical Engineering*

Phys 537 High Energy Physics (3-0) Cr 3 S *Prereq 480* Survey of particle physics covariant kinematics and Lagrangians the Standard Model and the Higgs mechanism W± and Z0 production and decay hadron spectroscopy structure functions running coupling constants the CKM matrix selected topics beyond the Standard Model such as supersymmetry and grand unification

Phys 541 General Relativity (3 0) Cr 3 Alt S offered 2004 *Prereq 362 or Math 465* Tensor analysis and differential geometry developed and used to formulate Einstein field equations Schwarzschild and Kerr solutions Other advanced topics may include gravitational radiation particle production by gravitational fields alternate gravitational theories attempts at unified field theories cosmology

Phys 551 Computational Physics (0-4) Cr 2 S *Prereq 365 480* Use of modern computational techniques to analyze topics in classical and modern physics Offered on a satisfactory fail grading basis only

Phys 564 Advanced Classical Mechanics (3-0) Cr 3 F *Prereq 361 Math 426 465* Variational principles Lagrange s equations Hamilton s canonical equations canonical transformations Hamilton Jacobi theory infinitesimal transformations classical field theory

Phys 571 Advanced Electricity and Magnetism (3-0) Cr 3 F *Prereq 365 Math 426* Electrostatics magnetostatics boundary value problems Maxwell s equations wave phenomena in macroscopic media wave guides

Phys 572 Advanced Electricity and Magnetism (3-0) Cr 3 S *Prereq 571* Special theory of relativity least action and motion of charged particles in electromagnetic fields radiation collisions between charged particles multipole fields radiation damping

Phys 590 Special Topics Cr var *Prereq Permission of instructor* Topics of current interest
A Nuclear Physics
B Condensed Matter Physics

C High Energy Physics
D Physics
E Applied Physics

Phys 591 Quantum Physics I (4 0) Cr 4 F *Prereq 481* First semester of a full year course Postulates of quantum mechanics time dependent and time independent Schrodinger equations for one two- and three-dimensional systems theory of angular momentum Rayleigh Schrodinger time independent perturbation theory

Phys 592 Quantum Physics II (4 0) Cr 4 S *Prereq 591* Continuation of 591 Variational theorem and WKB method time-dependent perturbation theory method of partial waves and Born approximation for scattering by central potentials identical particles and symmetry Dirac and Klein Gordon equation for free particles path integral formalism

Phys 599 Creative Component Cr var *Prereq Permission of instructor* Individually directed study of research level problems for students electing the nonthesis M S degree option

Courses for Graduate Students

Phys 611 Quantum Theory of Condensed Matter (3-0) Cr 3 S *Prereq 512 681* Quasiparticles in condensed matter phonons magnons photons electrons Quantum theory of interacting many body systems Green s functions and diagrammatic techniques

Phys 624 Advanced Nuclear Physics (3-0) Cr 3 Alt F offered 2004 *Prereq 524 and 592* Microscopic few-body and many body theory theory of effective Hamiltonians relativistic nuclear physics nuclear effects in hadron nucleus lepton nucleus and nucleus nucleus reactions

Phys 625 Physics of Strong Interactions (3 0) Cr 3 Alt S offered 2005 *Prereq 681* Quark model Quantum Chromodynamics (QCD) perturbation methods for QCD effective field theories for pions and nucleons finite temperature field theories quark-gluon plasma phase transitions in QCD

Phys 632 Semiconductor Physics (3 0) Cr 3 Alt S offered 2004 *Prereq 480 481 511* Band structure statistical mechanics of electrons and holes galvano magnetic effects magnetoresistivity cyclotron resonance transport properties principles of junctions and heterostructures optical properties amorphous semiconductors quantum well structures

Phys 637 Elementary Particle Physics (3 0) Cr 3 Alt F offered 2003 *Prereq 537* First semester of a full year course Properties of leptons bosons and quarks and their interactions quantum chromodynam ics Glashow-Weinberg Salam model grand unification theories supersymmetry modern theoretical techniques and tests of the Standard Model

Phys 638 Elementary Particle Physics (3 0) Cr 3 Alt S offered 2004 *Prereq 637* Continuation of 637 Properties of leptons bosons and quarks and their interactions quantum chromodynamics Glashow-Weinberg Salam model grand unification theories supersymmetry and superstring theory modern theoretical techniques

Phys 650 Advanced Seminar (1 0) Cr 1 each time taken FS Topics of current interest Offered on a satisfactory fail grading basis only
A Nuclear Physics
B Condensed Matter Physics
C High Energy Physics
D Physics
E Applied Physics

Phys 660 Advanced Topics in Physics Cr 1 to 3 each time taken FS Courses on advanced topics and recent developments
A Nuclear Physics
B Condensed Matter Physics
C High Energy Physics
D Physics
E Applied Physics

Phys 674 Applications of GroupTheory to Physics Condensed Matter Physics (3 0) Cr 3 Alt F offered 2003 *Prereq 592* Theory of groups and group representations point space and rotation groups applications to molecular and crystal structures crystal field and spin-orbit interactions energy bands and phonon dispersion relations Applications to modern materials

Phys 675 Applications of GroupTheory to Physics Nuclear and High Energy Physics (3 0) Cr 3 Alt S offered 2004 *Prereq 592* Theory of Lie groups Lie algebras and their representations Survey of the Lorentz group Poincaré group SU(N) and other Lie groups of physical importance Applications to nuclear and elementary particle physics

Phys 681 Quantum FieldTheory I (3 0) Cr 3 F *Prereq 592* Quantization of fields (canonical and path integral) Feynman rules introduction to gauge theories Quantum Electrodynamics radiative corrections renormalization and renormalization group

Phys 682 Quantum FieldTheory II (3 0) Cr 3 Alt S offered 2004 *Prereq 681* Continuation of 681 Systematics of renormalization renormalization group methods symmetries spontaneous symmetry breaking non abelian gauge theories the Standard Model and beyond special topics

Phys 699 Research

Plant Health and Protection

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Interdepartmental Undergraduate Program)

Advisory Committee Ed Braun Chair Burras Flynn Jurenka Martinson Taber Wray

Undergraduate Study

For undergraduate major in plant health and protection leading to the degree bachelor of science see *Agriculture Curricula*

Plant Health and Protection is an interdepartmental major administered by the departments of Plant Pathology Entomology Agronomy Horticulture and Forestry The program emphasizes a holistic approach to plant health maintenance encompassing soil fertility and plant nutrition genetics and plant breeding cultural practices and protection from pests such as insects weeds and the microorganisms that cause plant diseases Graduates understand the principles of plant structure and function and the ways in which plants are affected by biotic and abiotic stress factors They are skilled in diagnosing plant health problems and in developing and implementing plant health management strategies to reduce plant stress with minimal environmental impact Graduates are able to communicate clearly and work effectively with others on complex plant health problems They understand the ethical and environmental dimensions of problems and issues facing agricultural and natural resource professionals

Plant Health and Protection is a broad based curriculum in biological and agricultural sciences Students take courses in the basic biological and physical sciences plant fertility management entomology weed science plant pathology and plant production systems (agronomy horticulture and forestry) Cooperative practical work experience/ internships with industry and governmental agencies are available to qualified students Students also have a large number of free elective credits for courses that they can use to individualize their degree program

Plant health professionals are employed by agribusiness firms such as seed companies agricultural chemical companies farm management and crop consulting businesses producer coopera tives food processors greenhouses nurseries and landscape businesses Graduates are also employed by governmental agencies like the EPA USDA Extension Service and state departments of agriculture The curriculum in plant health and protection provides an excellent preparation for graduate study in the crop protection disciplines and related fields such as agronomy horticulture plant breeding genetics microbiology molecular biology botany and environmental science

A minor in plant health and protection may be earned with 15 or more credits in 206 391 and additional courses selected from an approved list available from the chair of the Plant Health and Protection advisory committee At least 9 of the 15 credits may not be used to satisfy other department college or university requirements

Courses open for nonmajor graduate credit 301 320 354 376 407 416

Courses Primarily for Undergraduate Students

PI HP 110 Orientation in Plant Health and Protection (1 0) Cr R F *Prereq Required of students in the plant health and protection curriculum* Requirements and career opportunities in the fields of plant health and protection

PI HP 206 Plant Health Biology (3 0) Cr 3 S *Prereq Biol 109 or 201* Introduction to issues in plant health biology plant productivity and food supply soils and plant health plant biotechnology integrated pest management plant health and sustainable agriculture

PI HP 283 Pesticide Application Certification (Same as Ent 283) See *Entomology*

PI HP 301 Forest Ecology and Soils (Same as NREM 301) See *Natural Resource Ecology and Management* Nonmajor graduate credit

PI HP 317 Principles of Weed Science (Same as Agron 317) See *Agronomy*

PI HP 320 Plant Nutrition (Same as Hort 320) See *Horticulture* Nonmajor graduate credit

PI HP 354 Soils and Plant Growth (Same as Agron 354) See *Agronomy* Nonmajor graduate credit

PI HP 354L Soils and Plant Growth Laboratory (Same as Agron 354L) See *Agronomy*

PI HP 376 Fundamentals of Entomology and Pest Management (Same as Ent 376) See *Entomology* Nonmajor graduate credit

PI HP 391 Practical Plant Health (Same as PI P 391) (0-4) Cr 2 F *Prereq 6 credits in biological sciences* Diagnosis of all types of plant health problems caused by diseases insects weeds nutrient deficiencies and toxicities herbicide injury and environmental stress Emphasis is on acquiring practical skills Students will gain experience in written and oral communications Field trips

PI HP 392 Plant Health and Protection Work Experience Cr R FS SS *Prereq 6 credits in plant health and protection permission of advisor* Practical work experience in a plant health discipline For majors and advanced students

PI HP 407 Principles of Plant Pathology (Same as PI P 407) See *Plant Pathology* Nonmajor graduate credit

PI HP 416 Forest Pest Management (Same as PI P 416) See *Plant Pathology* Nonmajor graduate credit

PI HP 475 CommunityTree Management (Same as For 475) See *Forestry*

PI HP 490 Independent Study Cr 1 to 3 FS SS *Prereq Junior or senior classification 6 credits in plant health and protection permission of instructor* A maximum of 6 credits of 490 may be used toward the total of 128 credits required for graduation
A Plant Health and Protection
H Honors

PI HP 498 Plant Health Management (2 3) Cr 3 S *Prereq 391* Exploration of issues in plant health management from multiple perspectives Technical and socioeconomic dimensions of problems will be analyzed through case studies guest speakers field trips and other resources Problem solving and communications skills will be emphasized

Plant Pathology

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Charlotte R Bronson Chair of Department

Professors Braun Bronson Gleason Harrington Hill McGee Miller Nutter Tylka

Professors (Collaborators) Wise

Distinguished Professors (Emeritus) Tiffany

University Professors (Emeritus) McNabb

Professors (Emeritus) Durand Epstein Hodges Norton Stewart

Associate Professors Baum Munkvold Yang

Assistant Professors Beattie Bogdanove Whitham

Assistant Professors (Collaborators) Block

Undergraduate Study

The department participates in the undergraduate major and minor in plant health and protection see *Agriculture Curricula*

For a second major in pest management see *Agriculture Curricula*

Graduate Study

The department offers studies for the degrees master of science and doctor of philosophy with a major in plant pathology and minor work for students majoring in other departments or programs A master of science nonthesis option is available The department also participates in the interdepartmental majors in toxicology genetics plant physiology molecular cellular and developmental biology ecology and evolutionary biology and sustainable agriculture

Students entering graduate programs in the department need a sound background in the physical biological and mathematical sciences as well as adequate preparation in English

Graduates have a broad understanding of the biology and management of plant pathogenic microorganisms and the interactions of pathogens with their host plants They understand the relationship between plant pathology and allied disciplines and are able to communicate effectively with scientific colleagues and the general public in both formal and informal settings Graduates are able to address complex plant disease problems facing agricultural and bioscience professionals taking into account the related ethical social legal and environmental issues They are skilled in research procedures communicating research results and writing concise and persuasive grant proposals

Courses open for nonmajor graduate credit 407 416 483

Courses Primarily for Undergraduate Students

PI P 391 Practical Plant Health (Same as PI HP 391) See *Plant Health and Protection*

PI P 407 Principles of Plant Pathology (Same as PI HP 407 P M 407) (2 3) Cr 3 FS *Prereq 8 credits in biological sciences including Biol 202* Braun Principles underlying the nature diagnosis and management of plant diseases Laboratory comple ments lecture topics and provides experience in plant disease diagnosis Nonmajor graduate credit

PI P 416 Forest Pest Management (Same as For 416 PI HP 416 P M 416) (2-3) Cr 3 S *Prereq 8 credits in biological sciences including Biol 201* Harrington Nature of insects and pathogens of forest and shade trees their role in the dynamics of natural and managed forest ecosystems and the manage ment of indigenous and exotic pests Nonmajor graduate credit

PI P 452 Integrated Management of Diseases and Insect Pests of Turfgrasses (Dual listed with 552 same as Ent 452 Hort 452) (3 0) Cr 3 Alt S offered 2004 *Prereq Hort 351* Gleason Lewis D Identifica tion and biology of important diseases and insect pests of turfgrasses Development of integrated pest management programs in various turfgrass environments

PI P 477 Bacterial-Plant Interactions (Dual listed with 577 same as Micro 477) (3-0) Cr 3 Alt S offered 2004 *Prereq 3 credits in microbiology or plant pathology* Beattie Focuses on plant associated bacteria in terms of their ecology diversity and the physiological and molecular mechanisms involved in their interactions with plants

PI P 483 Wood Deterioration and Preservation (Same as For 483) See *Forestry* Nonmajor graduate credit

PI P 490 Independent Study Cr 1 to 3 FS SS *Prereq Junior or senior classification 7 credits in biological sciences permission of instructor* A maximum of 6 credits of 490 may be used toward the total of 128 credits required for graduation
A Plant Pathology
H Honors

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

PI P 503 Biology of Plant Pathogens (3 3) Cr 4 F *Prereq Biol 202 Biol 301* Bogdanove Hill Bronson Tylka Biology ecology and taxonomy of organisms that cause plant disease Laboratory experience emphasizes techniques in working with fungi bacteria nematodes and viruses Field trips

PI P 506 Plant Pathogen Interactions (2 0) Cr 2 S *Prereq 407 or 416 or 503 Biol 301* Baum Whitham Introduction to mechanisms of plant parasite interaction Genetics and molecular genetics of plant disease resistance and pathogenicity

PI P 507 Epidemiology and Disease Management (2 0) Cr 2 S *Prereq 407 or 416 or 503* Nutter Principles of pathogen population dynamics as affected by environment and host/pathogen genetics modeling biotic plant stress on crop productivity Principles and practices employed for disease control and their utilization for management applications of disease management and epidemiological principles to specific diseases through case studies

PI P 509 Plant Virology (Same as Micro 509) (2 6) Cr 4 Alt S offered 2005 *Prereq 407 or 503 Bot 404 BBMB 405 Chem 211* Hill Plant viruses and the diseases they cause Emphasis on epidemiology and control Structure function and biochemical biophysical properties of plant viruses

PI P 511 Integrated Management of Tropical Crops (Same as Ent 511 Hort 511) (3 0) Cr 3 Alt S offered 2005 *Prereq 407 or 416 or 503 or Ent 370 or 376 or Hort 221* Gleason Lewis Applications of Integrated Crop Management principles (including plant pathology entomology and horticulture) to tropical cropping systems Familiarization with a variety of tropical agroecosystems and Costa Rican culture is followed by 10-day tour of Costa Rican agriculture during spring break then writeup of individual projects Tour expenses paid by students

PI P 530 Ecologically Based Pest Management Strategies (Same as Agron 530 Ent 530 SusAg 530) (3 0) Cr 3 Alt F offered 2004 *Prereq SusAg 509* Durable least toxic strategies for managing weeds pathogens and insect pests with emphasis on underlying ecological processes

PI P 543 Plant Disease Epidemiology (2-4) Cr 4 Alt F offered 2004 *Prereq 407 or 416 or 503* Nutter Theory and practice relating to the quantification of biotic plant stress as affected by the temporal and spatial interaction of host and pathogen populations Analysis of environmental ecological and host and pathogen genetic factors that alter the course of plant disease epidemics Risk assessment theory and modeling the impact of biotic plant stresses on yield and quality

PI P 552 Integrated Management of Diseases and Insect Pests of Turfgrasses (Dual listed with 452 same as Ent 552 Hort 552) (3 0) Cr 3 Alt S offered 2004 *Prereq Hort 351* Gleason Lewis D Identifica tion and biology of important diseases and insect pests of turfgrasses Development of integrated pest management programs in various turfgrass environments

PI P 565 Professional Practice in the Life Sciences (Same as Agron 565 An S 565 BCB 565 Gen 565 Hort 565 V MPM 565) Cr 0 5 per module S *Prereq Graduate classification* Professional discourse on the ethical and legal issues facing life science researchers Offered in modular format each module is four weeks
A Professional Practices in Research Good scientific practices and professional ethics in the life sciences
B Intellectual Property and Industry Interactions Ethical and legal issues facing life scientists involved in research interactions with industry
C Life Science Ethics Basic principles of moral theory and ethical issues about the environment biotechnology and the appropriate role of scientific experts in public moral debate
D Ethics in Plant Breeding and Plant Genetic Resource Conservation Ethical issues facing scientists involved in crop improvement plant conservation and plant biotechnology

PI P 574 Plant Nematology (2 3) Cr 3 Alt F offered 2004 *Prereq 407 or 416 or 503* Baum Morphology anatomy identification control and life cycles of common plant-parasitic nematodes host parasite interactions Caenorhabditis elegans

PI P 577 Bacterial Plant Interactions (Dual-listed with 477 same as Micro 577) (3 1) Cr 3 Alt S offered 2004 *Prereq 3 credits in microbiology or plant pathology* Focuses on plant associated bacteria in terms of their ecology diversity and the physiological and molecular mechanisms involved in their interactions with plants

PI P 590 Special Topics Cr 1 to 3 each time taken FS SS *Prereq 10 credits in biological sciences permission of instructor*

PI P 591 Plant Disease Control (3 0) Cr 3 Alt F offered 2003 *Prereq 407 or 416 or 503* Gleason Principles and practices of disease control Use of biological control cultural practices resistance and chemical control in disease management

PI P 594 Seed Pathology (2 3) Cr 3 Alt S offered 2005 *Prereq 407 or 503* McGee Significance of diseases on the major phases of seed production growing harvesting conditioning storing and planting seed Pathogens considered include fungi bacteria viruses nematodes and abiotic agents Emphasis on control epidemiology host parasite relationships and seed health testing

Courses for Graduate Students

PI P 608 Molecular Virology (Same as V MPM 608) See *Veterinary Microbiology and Preventive Medicine*

PI P 643 Natural Toxins (Same as Tox 643) See *Toxicology*

PI P 691 Field Plant Pathology (0-6) Cr 2 each time taken Alt SS offered 2004 *Prereq 407 or 416 or 503* Diagnosis of plant diseases plant disease assessment methods and the integration of disease management into commercial crop production practices Objectives are to familiarize students with common diseases of Midwest crops and landscape plants and to provide experience in disease diagnosis Field trips include commercial operations agricultural research facilities and ornamental plantings

PI P 692 Molecular Biology of Plant Pathogen Interactions (3-0) Cr 3 Alt S offered 2005 *Prereq 506 or BBMB 405 or Gen 411 or Micro 402 or course in molecular biology* Miller Molecular and physiologi cal mechanisms of plant disease and resistance Host pathogen recognition and response resistance gene function signal transduction Agrobacterium virus host interactions

PI P 694 Colloquium in Plant Pathology (2 0) Cr 2 each time taken FS *Prereq 407 or 416 or 503 permission of instructor* Advanced topics in plant pathology including biological control cultural control risk assessment of resistance gene deployment

genetic engineering for disease resistance chemical control tropical diseases fungal genetics insect vector biology and professional communications

PI P 698 Seminar Cr 1 each time taken FS

PI P 699 Thesis and Dissertation Research Cr var FS SS

Plant Physiology

(Interdepartmental Graduate Major)

Supervisory Committee D Hannapel Chair M James P Scott M Westgate E Wurtele

Work is offered for the degrees master of science (thesis option only) and doctor of philosophy with a major in plant physiology in the following participating departments Agronomy Biochemistry Biophysics and Molecular Biology Botany Forestry Horticulture Plant Pathology and Zoology and Genetics In the Interdepartmental Plant Physiology Major at Iowa State University students use modern interdisciplinary approaches to understand plant processes at the molecular cellular and whole-plant levels Graduates have a broad understanding of basic functional plant biology with emphases on fundamental biology biochemistry and molecular biology They are able to address complex research and policy problems in agriculture biotechnology and basic plant biology

All M S students must meet the following minimum requirements (1)make two seminar presentations and enroll each term in the interdepartmental plant physiology seminar (Bot 696 or its cross listed equivalent) (2) complete two courses chosen from the following Agron 516 Bot 512 Bot 513 and (3) complete the following courses BBMB 404 and 405 or 501 and 502 and Stat 401 A higher level course in biochemistry is recommended

All Ph D students must complete the following requirements in addition to those for the M S (1) two more seminar presentations in Bot 696 (for a total of four) (2) Agron 516 Bot 512 Bot 513 (3) one course chosen from Bot 545 Gen 520 or 620 BBMB 675 or 676 and (4) one biochemistry course beyond the level of BBMB 404/405 or 501/502 Suggested courses include BBMB 451 607 622 632 642 or 660 Stat 402 or Agron 526 or a computational biology course are strongly recommended

In consultation with his or her major professor and the POS committee a student may select additional courses from an approved list available from the chair of the supervisory committee of the interdepartmental major

Courses for Graduate Students

P Phy 512 Plant Growth and Development (Same as Bot 512) See *Botany*

P Phy 513 Plant Metabolism (Same as Bot 513) See *Botany*

P Phy 545 Plant Molecular Biology (Same as Bot 545) See *Botany*

P Phy 696 Seminar in Plant Physiology and Molecular Biology (Same as Bot 696) See *Botany*

Political Science

www iastate edu/~polsci/

James M McCormick Chair of Department

University Professors Schmidt

Professors Dearin Dobratz Kihl Lee Maney Mansbach McCormick Moses Shelley Smith Thurmaier

Distinguished Professors (Emeritus) Rasmussen

Professors (Emeritus) Parks

Associate Professors Coates Hutter Lowry

Associate Professors (Emeritus) Whitmer

Assistant Professors Ho Kaelberer Potoski Tuckness

Assistant Professors (Adjunct) Bystrom Waggoner

Undergraduate Study

For the undergraduate curriculum in Liberal Arts and Sciences with major in political science leading to the degree of Bachelor of Arts see *Liberal Arts and Sciences Curriculum*

The study of political science is designed to enable students to become familiar with theories of public values and patterns of national regional and international political systems A political science major should complete a broad liberal arts program which would maximize opportunities for study in related social science disciplines as well as in various areas of the humanities Students will understand the interrelationships of the subfields of political science develop skills in analysis and critical thinking and be able to apply research methods relevant to the discipline

The political science major is often chosen by students preparing for a career in law Students with this goal should consult with the department in selecting courses See also *Preprofessional Study*

Several internship options are available to the political science major offering students the opportunity to experience practical application of the knowledge learned in academic courses

Requirements for the Major

For the purpose of defining undergraduate requirements in the Department of Political Science the Department employs four subfields within the discipline with the following courses in each

I Theory and Methods (Pol S 235 301 305 306 313 356 406 430 431 433 470 487 490B)

II American Government and Politics (Pol S 215 310 311 312 319 320 344 358 359 360 361 370 371 385 410 413 417 420 421 464 475 476 477 480 482 486 490A)

III Comparative Politics (Pol S 241 314 340 341 342 343 346 348 349 350 440 490C)

IV International Relations (Pol S 251 315 355 356 357 358 359 381 422 451 452 453 490D)

To complete the major in Political Science a student must earn 33 semester credits of courses in Political Science subject to the following conditions

a Students must satisfactorily complete Pol S 101

b Students must complete at least two courses in each of the four subfields listed above Students may apply only one half semester mini course (Pol S 312 313 314 315) in each group

c Political Science courses in which a student has a grade of D+ or lower will not count for the major but can be counted as electives

d At least 18 credits of Political Science courses must be numbered 300 or above

e Students must pass one statistics course from among Stat 101 104 226 or 231

f Students must develop a research tool by following one of the following options (1) two years (four semesters) of a single college level foreign language as demonstrated by successful completion of a foreign language class numbered 202 (2) successful completion of Pol S 301 or (3) passing a national level examination demonstrating an intermediate level of proficiency in a language other than English Students whose first language is not English may fulfill the research tool requirement via the options described above or by providing documentation of at least 3 years full time course work in a secondary school or one year of course work in a college or university in which the language of instruction is other than English

g No more than six credits of Pol S 490 or 499 (alone or in combination) can be used to fulfill any of these requirements A maximum of three credits of Pol S 490 can be applied to meet any of the four subfield requirements

h A maximum of six credits from half semester mini-courses (Pol S 312 313 314 315) can be applied to satisfy the above requirements

i At least 15 credits of Political Science coursework must be earned at Iowa State University

English Proficiency Majors must earn at least a C+ in each of Engl 104 and 105 Those who do not must complete Engl 309 or 314 with a grade of C or higher Majors must also complete Pol S 395

The department offers a minor in political science that may be earned by completing 15 credits beyond the 100 level of coursework in political science nine of which must be at the 300 level or above A student minoring in Political Science normally will be expected to take at least 9 credits in Political Science coursework at Iowa State University Only 3 credits of Pol S 490 or Pol S 499 alone or in combination and only 2 credits of Pol S 312-315 may be included in the total of 15 credits required for the minor All minors in the College of Liberal Arts and Science required a minimum of 6 credits in courses numbered 300 and above taken at ISU with a grade of C or higher Credits earned in Pol S 499 offered on a satisfactory/fail basis only will not fulfill this requirement

Graduate Study

The department offers work for a Master of Arts degree (M A) with a major in political science and minor for students in other departments The department also offers work for a Master of Public Administration (MPA) degree or a Certificate of Public Management (CPM) for those interested in an educational certificate program that requires less work than a full masters program In addition the Political Science Department offers work for the Masters of Science in Information Assurance Brochures with detailed requirements for all graduate degrees may be obtained from the department office or at the department s web page at www iastate edu/ ~polsci/ graduate html

The M A program is designed to enable its graduates to engage in governmental research enter public service or private industry teach or pursue further graduate study Graduate students may also wish to work for certification for high school or junior college teaching A thesis is required for this degree The department also has a joint Master of Arts/Juris Doctor (M A /J D) program with the Law School of Drake University Detailed information for the M A / J D can be found at the ISU Political Science webpage as well as the Drake Law School website (under Joint Degree) www law drake edu/admissions/ specprograms html Students wishing to pursue this joint degree must submit separate applications to both Drake University and Iowa State University and be accepted by both institutions

M A graduates have a broad substantive understanding of the political process and the academic study of politics They also have in depth knowledge of one or more subfields in political science Graduates are skilled at conducting research and preparing thorough research summaries They are able to identify and address complex political questions taking into account related ethical legal economic and social issues

The usual prerequisites for major graduate work in the M A program normally are completion of at least 15 credits in political science the GRE (Graduate Record Examination) one year of a foreign language (equivalent to 8 semester hours) and a course in basic statistics (equivalent to Stat 101) If the basic statistics requirement has not been met the student may remedy the deficiency by passing equivalent courses for which no graduate credit will be received During their program of study all students are expected to complete Stat 401 Pol S 502 and a thesis Students normally do concentrated course work in at least one of the following three areas international relations comparative politics or American politics The student s program of study committee may require additional work

Students in other graduate programs may obtain a minor in political science by completing at least 9 credits of political science courses including one of the proseminars Interested students should consult the Graduate College Handbook for additional information on graduate minors

The Master of Science in Information Assurance (MSIA) is a multi disciplinary program designed to provide students with diverse backgrounds and interests the opportunity to obtain professional training in the emerging field of information assurance The core of the MSIA program is built around a series of courses taught in Electrical and Computer Engineering Mathematics and Computer Science that introduce students to software and hardware aspects of cryptography and computer security The program also recognizes however that information assurance defined in terms of security privacy access and reliability is not simply a technical problem but also involves important societal dimension including policy education ethics and management Recognizing that political science offers many potential intersections with information assurance (e g public sector management of information technology forensics and computer crime information technology policy and law information technology and international relations information warfare etc) students with interests in these areas are encouraged to select the Department of Political Science as their home department

Students opting to pursue a MSIA degree through the Department of Political Science can expect to acquire skills and background knowledge relevant to a career in public policy or public sector management of information assurance technologies The INFAS degree can also help prepare students who wish to go on to pursue a PhD in information politics and policy

Students interested in the INFAS degree program should consider Political Science as a home department if their future career and/or educational interests lie in such areas as institutional issues related to the internet and information technologies information technology international security and information warfare information technology policy and law and public administration and public sector management of information technology

Admission requirements generally follow the same guidelines as the M A or MPA in Political Science Degree requirements are specified by the INFAS program in cooperation with Political Science More in depth information on the program can be found at http //www issi iastate edu/infas html

Public Policy and Administration

The Public Policy and Administration offers work for the professional Masters of Public Administration degree (MPA) The Program is designed to educate and train students for careers in management and policy analysis at the federal state and local levels of government nonprofit sector management and those who are seeking careers in international management The Program serves a diverse student body including both pre-service students and in service employees in government and nonprofit organizations The curriculum covers a broad area of public administration and policy including organizational and administrative processes leadership in a turbulent environment organizational change dynamics human resource management budgeting cost benefit analysis financial management policy analysis ethics and international management The Program offers three tracks Public Management Policy Analysis and International Management

The MPA degree requires 37 credit hours which includes (a) 12 credit hours in Core Competency (b) 12 credit hours in one of the Concentration areas (c) 3 7 credit hours in Research Method (d) Electives up to 7 credit hours (e) 3 credit hours of Internship and (f) 3 credit hours of Creative Component (a Capstone Project)

The Program also offers a Certificate of Public Management program (CPM) which requires a completion of 15 credit hours 12 credit hours in the Core 3 credit hours in Quantitative Methods and one additional course in the area of student interest

Classes are offered both in Ames and in Des Moines Some classes are also available via ICN and Web

The Program also offers joint masters degrees with the Department of Community and Regional Planning and the Department of Human Development and Family Studies The requirement for all double degrees consists of 22 credits from each discipline for a total of 44 credit hours Under the rules of the Graduate College a graduate student may pursue a joint degree between any two disciplines of their interest Interested students are encouraged to consult the ISU s Graduate Handbook

Requirements for admission are a graduate school application an essay stating purposes for study college transcripts the GRE (waived for those with five or more years of public sector experience) three letters of recommendation and the TOEFL for international students

The department cooperates in the interdepartmental program in industrial relations interdepartmental majors in transportation and water resources and an interdepartmental minor in gerontology (see Index)

Courses open for nonmajor graduate credit 350 370 406 410 413 417 420 421 422 430 431 433 440 451 452 453 470 475 476 477 480 482 486 487

Refer to the Schedule of Classes (www iastate edu/~catalog/) or consult the department (www iastate edu/~polsci/graduate html) for up-to-date scheduling information

Courses Primarily for Undergraduate Students

Pol S 101 Orientation to Political Science (2 0) Cr 1 8 weeks FS *Prereq Political Science and Open Option majors only or permission of the instructor* Introduction to the discipline and sub-fields of Political Science including an introduction to analytical thinking and research skills relevant to political science Orientation to university college and departmental structure policies and procedures student roles and responsibilities degree planning and career awareness Offered on a satisfactory-fail a grading basis only

Pol S 215 American Government Institutions and Policies (3 0) Cr 3 FS Fundamentals of American democracy constitutionalism nature of federalism rights and duties of citizens institutions and processes of the executive legislative and judicial branches of government role of public opinion interest groups and political parties Policies and problems of national government

Pol S 235 Introduction to Ethics and Politics (3-0) Cr 3 F *Prereq Sophomore standing* Introduction to moral controversies surrounding political issues such as violence deception corruption civil disobedience democracy justice equality and freedom Students will read classic and contemporary texts and consider political applications This course serves as an introduction to advanced courses in political theory

Pol S 241 Introduction to Comparative Govern ment and Politics (3 0) Cr 3 FS Basic concepts and major theories application to selected political systems including non western political systems

Pol S 251 Introduction to International Politics (3-0) Cr 3 FS Dynamics of interstate relations pertaining to nationalism the nation state peace and war foreign policy making the national interest military capability and strategy case studies of transnational issues such as population food energy and terrorism

Pol S 298 Cooperative Education Cr R FS SS *Prereq Permission of department cooperative education coordinator sophomore classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Pol S 301 Introduction to Empirical Political Research (3-2) Cr 4 FS *Prereq 3 credits in political science one statistics course required* Techniques of empirical political research and analysis surveys methods of data collection applications of statistics and computer techniques

Pol S 305 Political Behavior (3-0) Cr 3 F *Prereq Sophomore classification* Empirical theories and descriptions of political behavior including decision-making opinion and attitudes with an emphasis on groups and political elites

Pol S 306 Political Decision-Making and Conflict Resolution (3-0) Cr 3 *Prereq 3 credits in political science* Study of domestic and international political conflict Simulation and games will be used to illustrate the process through which conflict is resolved

Pol S 310 State and Local Government (3 0) Cr 3 S *Prereq 3 credits in political science* Role of state and local governments in the American federal system Structures of participation political parties elections interest groups Major governmental institutions legislative executive and judicial Structure and functions of local governments

Pol S 311 Municipal Government and Politics (3-0) Cr 3 Alt F offered 2003 *Prereq 215* Legal position of municipal corporation forms of organization administration of municipal services problem solving in municipal government urban and metropolitan political process implications of federal urban policies

Pol S 312 Minicourse in American Government and Politics (3 0) Cr 2 8 weeks FS *Prereq Sophomore classification* Half semester courses on selected topical issues in American government and politics Designated repeat not permitted Use of credit in Pol S major and minor is limited See *Undergraduate Study* for information

Pol S 313 Minicourse inTheory and Methods (3-0) Cr 2 8 weeks FS *Prereq Sophomore classification* Half semester course on selected topical issues in theory and methods in political science Designated repeat not permitted Use of credit in Pol S major and minor is limited See *Undergraduate Study* for information

Pol S 314 Minicourse in Comparative Politics (3 0) Cr 2 8 weeks FS *Prereq Sophomore classification* Half semester course on selected topical issues in comparative politics Designated repeat not permitted Use of credit in Pol S major and minor is limited See *Undergraduate Study* for information

Pol S 315 Minicourse in International Relations (3 0) Cr 2 8 weeks FS *Prereq Sophomore classification* Half semester course on selected topical issues in international relations Designated repeat not permitted Use of credit in Pol S major and minor is limited See *Undergraduate Study* for information

Pol S 319 Law and Politics (3-0) Cr 3 FS *Prereq Sophomore standing 215 recommended* An examination of the American judicial system and the juncture between law and politics analysis and evaluation of the role of legal and political actors and prominent issues addressed by the legal system

Pol S 320 American Judicial Process (Same as CJ St 320) (3-0) Cr 3 S *Prereq 215* The genesis structure processes and personnel of American courts basic juridical concepts restraints on exercise of the judicial power major eras of American constitutional history an overview of civil liberties impact of court decisions on public policy

Pol S 334 Politics and Society (Same as Soc 334) See *Sociology*

Pol S 340 Politics of Developing Areas (3-0) Cr 3 Alt S offered 2005 Examination of economic and political development as they relate to the political process of developing states Impact of social and technological change on political systems of developing areas Some case studies

Pol S 341 Politics of Japan (3-0) Cr 3 Alt S offered 2004 Political traditions and cultures Contemporary governmental structures and processes Examination of public policy issues in Japan as a post industrial society

Pol S 342 Politics of China (3 0) Cr 3 Alt F offered 2003 The Chinese Revolution origins political theory

and practice party and government China as a modernizing nation including the problems of leadership succession and economic transformation

Pol S 343 Latin American Government and Politics (3 0) Cr 3 Political institutions processes and contemporary issues Selected countries examined intensively to illustrate generalizations Role of parties military church human rights women environmental issues interest groups ideology and globalization

Pol S 344 Public Policy (3-0) Cr 3 S How agendas come to be set in public policy theories describing the policy making process forces molding policy choices and the impact of such choices

Pol S 346 European Politics (3 0) Cr 3 S Comparative study of political institutions of Europe and the European Union emphasis on parties elections and governmental structures Substance and process of public policies in selected problem areas

Pol S 348 Israeli Government and Politics (3-0) Cr 3 Alt S offered 2005 *Prereq 241 or comparable background in Middle East/Israeli history* Major factors that have shaped and continue to influence the distinctive nature of Israeli society and politics Patterns and determinants of Mideast international relations as reflected in Arab-Israeli conflict foreign policymaking in Israel and American involvement since 1945

Pol S 349 Soviet and Post-Soviet Politics and Government (3 0) Cr 3 Alt F offered 2004 Nation states of the former Soviet Union Analysis of Soviet Communist system 1917 85 and the politics and revolutionary conflict leading to the dissolution of the Soviet Union from 1985 through 1991 Problems of post Soviet nation states of Russia and Central Eurasia since 1991

Pol S 350 Introduction to the Middle East (3-0) Cr 3 S Introduction to the Middle East as a region and to issues of political importance to the Middle East and its place in the world Topics covered include Islam regional conflicts and alliances local leaders economic issues and gender and social relations Nonmajor graduate credit

Pol S 355 Soviet and Post Soviet Foreign Policy (3 0) Cr 3 Alt S offered 2004 *Prereq 251 or comparable background in Soviet/Russian history* History and determinants of Soviet foreign policy from 1941 through 1991 emphasizing Soviet relations with Europe the United States China and the Third World Foreign relations of the post Soviet states of Russia and Central Eurasia since 1991

Pol S 356 Theories of International Politics (3 0) Cr 3 Introduction to essential theoretical concepts and approaches both classical and contemporary on world politics including realism empiricism liberalism and postpositivism for example war and conflict peace and cooperation political economy crisis decision making systemic theory dependence and interdependence

Pol S 357 International Security Policy (3-0) Cr 3 Alt F offered 2003 The major theoretical approaches in security policy—strategy and deterrence game theory bargaining theory compellance and coercive diplomacy and crisis diplomacy Illustration of these various approaches through historical and contempo rary cases

Pol S 358 United States Foreign Policy (3 0) Cr 3 F *Prereq 215 or 251 or Hist 467 or 470 or 471* U S foreign policy since World War II with emphasis on changing American values in foreign policy the role of the President Congress and the bureaucracy in policy making and a survey of current foreign policy issues and problems

Pol S 359 Current Issues in American Foreign Policy (3-0) Cr 3 S *Prereq 215 251 or 358* Examination of contemporary U S foreign policy issues (e g U S policy in the Middle East defense budgeting in the post Cold War era conventional and nuclear arms control policy) The course will explore alternate methods to analyze policy survey the evolution of each issue and discuss different policy alternatives

Pol S 360 Congress and the State Legislatures (3 0) Cr 3 Alt F offered 2003 *Prereq 215* Theory of representation in democratic government Organiza tion procedures voting patterns and leadership roles of United States Congress and state legislatures

Pol S 361 The President and the State Governors (3-0) Cr 3 Alt F offered 2004 *Prereq 215* Creation and historical development of the office of chief executive character and behavior of past chief executives selection and control powers roles functions executive staff relations with Congress press public opinion

Pol S 370 Religion and Politics (Same as Relig 370) See *Religious Studies* Nonmajor graduate credit

Pol S 371 Introduction to Public Administration (3-0) Cr 3 F *Prereq 215* The development of public administration in federal state and local government Analysis of the organization and operations of public agencies

Pol S 381 Introduction to Political Economy (3 0) Cr 3 S Introduction to the theoretical perspectives on international political economy Exploration of specific issues such as the changing international trade regime international finance and Third World development under conditions of globalization

Pol S 385 Women in Politics (Same as W S 385) (3 0) Cr 3 S Examination of the entry and participa tion of women in politics in the United States and other countries including a focus on contemporary issues and strategies for change through the political process

Pol S 395 Advanced Writing in Political Science (1 0) Cr R FS SS *Prereq Major in political science* Taken in conjunction with 300 or 400 level Political Science courses Required of majors Offered on a satisfactory fail grading basis only

Pol S 398 Cooperative Education Cr R FS SS *Prereq Permission of department cooperative education coordinator junior classification* Required of all cooperative education students Students must register for this course prior to commencing work period

Pol S 406 Public Opinion and Voting Behavior (3 0) Cr 3 S *Prereq 6 credits in political science or junior classification* The formation of political opinions and attitudes political participation and voting behavior of the general public and their influences on American politics polling as a means of assessing public opinions and behaviors Nonmajor graduate credit

Pol S 410 Iowa Government and Politics (3 0) Cr 3 S *Prereq 215* Analysis of Iowa government and politics public opinion and political participation governmental institutions and major policy issues Nonmajor graduate credit

Pol S 413 Intergovernmental Relations (Dual listed with 513) (3-0) Cr 3 S *Prereq 6 credits in American government* Theories and practices of the American federal system Politics and policy making among federal state and local governments Nonmajor graduate credit

Pol S 417 Campaign Rhetoric (Same as Sp Cm 417) See *Speech Communication* Nonmajor graduate credit

Pol S 420 Constitutional Law (3 0) Cr 3 F *Prereq 215 junior classification* Development of the United States Constitution through judicial action influence of public law and judicial interpretations upon American government and society Nonmajor graduate credit

Pol S 421 Constitutional Freedoms (3 0) Cr 3 S *Prereq 320 or 420* Leading Supreme Court cases interpreting the Bill of Rights and the Fourteenth Amendment Emphasis on religion speech privacy due process and equal protection Nonmajor graduate credit

Pol S 422 International Law (3 0) Cr 3 Alt S offered 2005 *Prereq 215 or 251 junior classification* Development of the principles of international law of peace and war analysis of theories concerning its nature and fundamental conceptions its relation to national law problems of international legislation and codification Nonmajor graduate credit

Pol S 430 Western Political Thought Plato to Machiavelli (Same as Cl St 430) (3 0) Cr 3 *Prereq 6 credits in political science philosophy or European history* Major concepts in original texts of classical medieval and renaissance authors justice community man s basic nature natural law force society outside the political order Nonmajor graduate credit

Pol S 431 Modern Political Thought (Dual-listed with 531) (3 0) Cr 3 *Prereq 6 credits in political science philosophy or European history* Texts of political thinkers beginning with Thomas Hobbes Human nature and its influence on contract theory private rights differing conceptions of liberty sovereignty constitutionalism bureaucracy law and democratic theory Nonmajor graduate credit

Pol S 433 American Political Thought (3-0) Cr 3 S *Prereq 6 credits in political science or in American history* Review of major political concepts and theorists in American political history Analysis of current concepts in U S political thought and their possible impacts on our political institutions Nonmajor graduate credit

Pol S 440 Comparative Politics of the Middle East (3 0) Cr 3 *Prereq 241 and coursework on the Middle East* Applies comparative methodology to the analysis of problems and issues affecting the Middle East as a region Focus on democratization and economic liberalization Nonmajor graduate credit

Pol S 451 International Politics of Asia (3 0) Cr 3 F *Prereq 241 or 251* International politics of Asia emphasis on shifting power balance role of major powers security dilemma foreign policies of small nations prospect for regional integration Nonmajor graduate credit

Pol S 452 Comparative Foreign Policy (Dual-listed with 552) (3-0) Cr 3 S *Prereq 251* Various theoretical approaches to explain foreign policy making and behavior through the use of case studies of selected nations Nonmajor graduate credit

Pol S 453 International Organizations (3 0) Cr 3 S *Prereq 251* Private and public organizations such as the United Nations other specialized agencies and multinational organizations and their influence on our daily lives Nonmajor graduate credit

Pol S 464 Political Parties and Interest Groups (3-0) Cr 3 F *Prereq 215 junior classification* Interest groups and American political parties their principles organizations and activities

Pol S 470 Public Choice (Same as Econ 470) See *Economics* Nonmajor graduate credit

Pol S 475 Management in the Public Sector (Dual listed with 575) (3 0) Cr 3 F *Prereq 371* Literature and research on organizational behavior and management theory with emphasis on applied aspects of managing contemporary public sector organizations Topics include distinctions between public and private organizations leadership productivity employee motivation organizational structure and organizational change Nonmajor graduate credit

Pol S 476 Administrative Law (Dual listed with 576) (3 0) Cr 3 Alt S offered 2004 *Prereq 215 junior classification* Constitutional problems of delegation of governmental powers elements of fair administrative procedures judicial control over administrative determinations Nonmajor graduate credit

Pol S 477 Government, Business and Society (Dual listed with 577) (3-0) Cr 3 Alt F offered 2003 *Prereq Junior classification* Diverse perspectives on the changing roles and relationships of business government and society so as to open the way for more effective policy decisions on corporate government affairs Topics may include the changing economy transformation of workplace and commu

nity conditions consumerism social responsibilities of businesses economic policies and regulations and politics in the business government relationship Nonmajor graduate credit

Pol S 480 Ethics and Public Policy (Dual listed with 580.) (3 0) Cr 3 *Prereq 6 credits in political science* Major ethical concepts in U S political philosophy The controversy over public versus private morality in political policy making Analysis of public decision making case studies with emphasis on ethical considerations Major proposals and legislation related to improving the quality of ethical criteria and decisions in public policy making Nonmajor graduate credit

Pol S 482 Environmental Politics and Policies (Dual listed with 582 same as Env S 482.) (3 0) Cr 3 F *Prereq 3 credits in political science or 3 credits in Environmental Studies junior classification* Major ideologies relation to conservation and ecology Processes participants and institutions involved in state national and global environmental policymaking Case studies of environmental controversies and proposals for policy reform Nonmajor graduate credit

Pol S 486 Science Technology and Public Policy (Dual listed with 586.) (3 0) Cr 3 Alt S offered 2005 *Prereq 6 credits in Political Science junior or senior classification* Examines the development of science and technology policy in the United States including the historical evolution of the government s role in science and technology the dynamics of government university-industry relations on technological advancement and the impact of science and technology on global politics Nonmajor graduate credit

Pol S 487 Electronic Democracy Schmidt (2-1) Cr 3 *Prereq Sophomore standing or instructor approval* The impact of computers the Internet and the World Wide Web on politics and policy The positive and negative effects on information technology (IT) on selected topics such as freedom power and control privacy civic participation the sense of community virtual cities interest group behavior the new media campaigns elections and voting will be examined Nonmajor graduate credit

Pol S 490 Independent Study *Cr var FS Prereq 6 credits in political science* No more than 9 credits of Pol S 490 may be counted toward graduation Special studies in the political institutions processes and policies of American foreign and international governments Also studies in traditional and behavioral political theory Use of credit in Pol S major and minor is limited See *Undergraduate Study* for information

A American Government and Politics
B Theory and Method
C Comparative Politics
D International Relations
E Extended credit The student may earn an additional 1 or 2 credits for extra study done for any 300 or 400 level course with instructor s approval
G Catt Center Project
H Honors

Pol S 495 Capstone Project in Political Science (3 0) Cr 3 S *Prereq 21 credits in political science and permission of instructor* Capstone project for political science majors integrating research analysis and participation

Pol S 498 Cooperative Education Cr R FS SS *Prereq Permission of department cooperative education coordinator senior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Pol S 499 Internship in Political Science Cr var FS SS *Prereq 6 credits in political science junior or senior classification and permission of internship coordinator* Work experience with a specific nongovernmental or governmental agency at the local state national or international level combined with academic work under faculty supervision Offered on a satisfactory fail grading basis only Use of credit in Pol S major and minor is limited See *Undergraduate Study* for information

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Pol S 502 Political Analysis and Research (3 0) Cr 3 S *Prereq 6 credits in political science* Scope and methods of political science Introduction to theoretical approaches and analytical reasoning in political science Relationship of theory and data Research design

Pol S 504 Proseminar in International Politics (3 0) Cr 3 F *Prereq 6 credits in political science or graduate standing* An overview of the major theoretical and empirical works in the study of international politics and foreign policy Among the major theoretical approaches surveyed and applied to international politics are realism neo-realism liberalism functionalism rational choice theory game theory and decision-making theory Seminal writings by leading scholars will be reviewed

Pol S 505 Proseminar in Comparative Politics (3 0) Cr 3 F Major theoretic approaches to the study of comparative politics – varying concepts and definitions of society and policy administrative traditions institutional arrangements political behavior etc Contrasting research method designs

Pol S 506 Proseminar in American Politics (3 0) Cr 3 S *Prereq 6 credits in political science or graduate standing* A presentation of the major theories and research on American government and politics Substantive topics include modern democratic theory institutional performance and mass political behavior A variety of research methodologies are examined including normative theory *behavioralism and rational choice analysis*

Pol S 510 State Government and Politics (3 0) Cr 3 *Prereq 310* Comparative analysis of state political systems Role of interest groups political parties legislatures courts and governors in state politics Possible determinants of public policy outputs at the state level

Pol S 513 Intergovernmental Relations (Dual listed with 413.) (3 0) Cr 3 S *Prereq 6 credits of American government* Theories and practices of the American federal system Politics and policy making among federal state and local governments

Pol S 531 Modern Political Thought (Dual listed with 431.) (3 0) Cr 3 *Prereq 6 credits in political science philosophy or European history* Texts of political thinkers beginning with Thomas Hobbes Human nature and its influence on contract theory private rights differing conceptions of liberty sovereignty constitutionalism bureaucracy law and democratic theory

Pol S 535 Contemporary Political Philosophy (Same as Phil 535.) See *Philosophy*

Pol S 544 Comparative Public Policy (3 0) Cr 3 *Prereq 6 credits in political science* Examines how why and to what effect governments deal with substantive policy problems differently Environmental factors ideologies cultures domestic policy making processes and interest groups

Pol S 547 Political Leadership and Elites (3 0) Cr 3 *Prereq 6 credits in political science* Various forms of leadership and leader follower relations Obligations exchanges incentives coercion corruption bossism in both the U S and foreign experience

Pol S 552 Comparative Foreign Policy (Dual listed with 452.) (3-0) Cr 3 S *Prereq 251* Various theoretical approaches to explain foreign policy making and behavior through the use of case studies of selected nations

Pol S 559 International Relations Theory (3 0) Cr 3 F *Prereq 6 credits in international studies* Selected theoretical writings both classical and contemporary on world politics Realism war and conflict peace and cooperation political economy crisis decision making and transnational relations

Pol S 560 American Political Institutions (3 0) Cr 3 *Prereq 6 credits in American government* Examination of policy making and governance in a separation of powers system Interaction between the chief executive the legislature administrative agencies and the public How political and legal forces affect policy makers and are reflected in public policies and programs

Pol S 570 Politics and Management of Nonprofit Organizations (3 0) Cr 3 Alt S offered 2004 Overview of issues concerning nonprofit and nongovernmental organizations Roles nonprofit organizations play in society and United States legal requirements and restrictions for tax-exempt organizations

Pol S 571 Organizational Theory in the Public Sector (3-0) Cr 3 F *Prereq 6 credits in political science* Major theories of administrative organization including motivations of administrators and organizations comparisons of organizational arrangements factors affecting organizational arrangements and formal and informal decision making structures

Pol S 572 Public Budgeting and Financial Management (3 0) Cr 3 F *Prereq 6 credits in political science* The process of public budgeting Alternative budget systems including taxation the appropriation process program evaluation and debt and risk management at federal state and local levels

Pol S 573 Public Personnel Administration (3 0) Cr 3 S *Prereq 6 credits in political science* Recruitment retention and development of employees merit systems collective bargaining and grievance procedures

Pol S 574 Policy and Program Evaluation (3 0) Cr 3 S *Prereq 9 credits in political science* Integration application and utilization of public administration and public policy concepts in the interpretation of results and effectiveness of public programs and the prediction of consequences for policymakers and administrators

Pol S 575 Management in the Public Sector (Dual listed with 475.) (3 0) Cr 3 F *Prereq 6 credits in political science* Literature and research on organizational behavior and management Theory with emphasis on applied aspects of managing contemporary public sector organizations Topics include distinctions between public and private organizations leadership productivity employee motivation organizational structure and organizational change

Pol S 576 Administrative Law (Dual listed with 476.) (3-0) Cr 3 Alt S offered 2004 *Prereq Graduate classification* Constitutional problems of delegation of governmental powers elements of fair administrative procedures judicial control over administrative determinations

Pol S 577 Government, Business and Society (Dual listed with 477) (3-0) Cr 3 Alt F offered 2003 *Prereq Graduate classification* Diverse perspectives on the changing roles and relationships of business government and society so as to open the way for more effective policy decisions on corporate government affairs Topics may include the changing economy transformation of workplace and community conditions consumerism social responsibilities of businesses economic policies and regulations and politics in the business-government relationship

Pol S 580 Ethics and Public Policy (Dual listed with 480.) (3 0) Cr 3 *Prereq 6 credits in political science* Major ethical concepts in U S political philosophy The controversy over public versus private morality in political policy making Analysis of public decision making case studies emphasis on ethical considerations Major proposals and legislation related to improving the quality of ethical criteria and decisions in public policy making

Pol S 581 International Political Economy (3 0) Cr 3 S *Prereq 6 credits in political science* An overview of the international political economy since

the end of World War II Special emphasis on national (primarily U S) development assistance and agricultural/food politics and policies and those of the international food organizations the World Bank and the regional development banks

Pol S 582 Environmental Politics and Policies (Dual listed with 482) (3-0) Cr 3 F *Prereq 3 credits in political science or 3 credits in Environmental Studies graduate classification* Major ideologies relating to conservation and ecology Processes participants and institutions involved in state national and global environmental policymaking Case studies of environmental controversies and proposals for policy reform

Pol S 586 Science Technology and Public Policy (Dual listed with 486) (3-0) Cr 3 Alt S offered 2005 *Prereq 6 credits in Political Science* Investigates the dynamics of interaction between science and politics at the national and international level and how this interaction shapes policy for science human welfare and global concerns The topics include the evolution ary relationship between science and government the old and new social contract for science national innovation policy and global economic and environ mental concerns

Pol S 590 Special Topics Cr 2 to 5 each time taken FS *Prereq 15 credits in political science written permission of instructor*
A American Political Institutions
B Public Law
C Political Theory and Methodology
D Comparative Government
E International Relations
F Political Parties and Policy Formation
G Public Administration and Public Policy
I Internship
T Teaching Preparation

Pol S 598 Public Administration Internship Cr 3 6 FS *Prereq 15 credits in political science permission of the instructor* Supervised internship with administrative agencies legislative organizations judicial branch offices and nonprofit groups

Pol S 599 Creative Component

Courses for Graduate Students

Pol S 610 Graduate Seminars (3 0) Cr 3 for each seminar FS *Prereq 15 credits in political science*
A American Political Institutions
B Public Law
C Political Theory and Methodology
D Comparative Government
E International Relations
F Policy Process
G Public Administration and Public Policy

Pol S 699 Research

Preprofessional Study

Requirements for admission to most professional academic programs can be met by study at Iowa State University These requirements may be met in the course of obtaining a bachelor s degree from Iowa State or at a level below that of a degree depending on the intended field of study The specific courses taken in a preprofessional program will depend primarily upon the admission requirements of the professional schools to which a student wants to apply In some programs requiring three years of preprofessional work a student may by careful planning complete requirements for the bachelor s degree upon transferring to Iowa State up to 32 semester credits of professional coursework Generally these credits will be counted as electives but a maximum of 24 may be used as major credits in interdisciplinary studies and a smaller number as major credits in appropriate departments

Students who have not declared a major upon entry should enter as preprofessional students i e premedical prelaw PHP (preprofessional health programs) or GENPV (General Undergraduate Studies Pre Vet) until they choose a major or transfer to a professional school All students whether they have selected a major or not are encouraged to identify their interest in a professional career by designating it on their application or by completing a preprofessional interest form during registration

Information about preprofessional program admis sions requirements and career opportunities in human health or law may be obtained in the Liberal Arts and Sciences Advising Center Information about veterinary medicine admissions requirements and career opportunities may be obtained from the coordinator of the preveterinary program in the Office of the Dean of the College of Veterinary Medicine

Clinical Laboratory Science/Medical Technology

Clinical laboratory scientists still commonly referred to as medical technologists are important members of health care teams They perform the chemical microscopic radio-assay and microbiological tests that are necessary in disease diagnosis and they type and cross match blood samples to facilitate blood transfusions They usually work under the supervision of a physician in a hospital or clinic laboratory but may also be employed by a pharmaceutical company or by manufacturers of analytical instruments The professional training requires 12 months in a hospital based CLS/MT program following at least 3 years of college study that emphasizes chemistry and the biological sciences Students may earn a bachelor s degree by completing the admissions requirements of the CLS/MT program and most of the degree requirements in 3 years on campus then spending their fourth year in one of the hospital programs that are affiliated with Iowa State University Before beginning the off-campus studies students must earn at least 94 5 credits the 32 most recent credits must have been earned in residence at ISU A maximum of 32 semester credits earned in professional CLS/MT school can be used to partially fulfill the requirements for the bachelor s degree Students who complete all degree requirements in residence at the university may apply to any school of medical technology for which the admission requirements have been met

The following CLS/MT programs are affiliated with Iowa State University

Mercy Hospital Medical Center Des Moines Iowa Program Director Stacy Sime Medical Director Vijaya L Dhannavada

St Luke s Methodist Hospital Cedar Rapids Iowa Education Coordinator Nadine Sojka Medical Director Dorryl Buck

University of Iowa Hospitals Iowa City Iowa Program Director Mark Bowman Medical Director Robert D Tucker

Cytotechnology

A cytotechnologist works in a medical laboratory preparing staining mounting and evaluating specimens of human body tissues in order to find those cells that are abnormal The abnormal specimens are then submitted to the pathologist supervising the laboratory for confirmation and interpretation The training requires 12 months in a school of cytotechnology after at least 3 years of college study that includes a minimum of 20 semester credits in biological sciences 8 semester credits in chemistry and 3 semester credits in math Certifica tion as a cytotechnologist requires a baccalaureate degree Students may enter the professional school after earning a bachelor s degree in a related field Alternatively they may use up to 32 semester credits from an affiliated cytotechnology school in partial fulfillment of requirements for a B S degree

An Interdisciplinary Studies major must earn 94 5 credits before off campus study the most recent 32 credits must have been earned in residence at ISU

Iowa State University is affiliated with the cytotechnol ogy programs of the State Laboratory of Hygiene at the University of Wisconsin Madison and Mercy Hospital Medical Center in Des Moines

Dental Hygiene

A dental hygienist screens dental patients for oral defects performs clinical procedures such as cleaning teeth and may participate in oral health education programs Most work with dentists in private practice but some have positions in public health centers and schools Certification as a dental hygienist requires 2 years in a professional program of study Admissions requirements for these programs vary A student may study for 2 years at Iowa State University and then transfer to an institution that grants the bachelor s degree in dental hygiene Alternatively a student may earn a bachelor s degree in another field at Iowa State before entering a professional program

Dentistry

Dentists diagnose treat and try to prevent diseases and injuries of the teeth jaws and mouth Usually a general practitioner will have spent 3 or 4 years taking preprofessional courses at the undergraduate level and 4 years in dental school earning the degree of doctor of dental surgery (D D S) or doctor of dental medicine (D M D) Learning a specialty requires at least 2 more years The courses necessary for admission to most dental schools include English biology general and organic chemistry and physics Students may earn a degree in any major that Iowa State University offers as they meet the admission requirements they should choose their major to reflect their own interests and abilities Highly qualified students may be accepted into dental school after 3 years of preprofessional study without earning a baccalaureate degree

Health Information Management

Health information managers serve as supervisors of medical records departments in hospitals clinics nursing homes and other healthcare institutions To be certified as registered record administrators (R R A) they must have completed a program leading to a bachelor s degree in medical record administra- tion Most professional programs are 2 years in length and follow 2 years of college study in chemistry biology the humanities social sciences languages and philosophy Students may take the preprofessional courses at Iowa State University and then transfer to a university offering the professional program or they may earn a bachelor s degree at Iowa State University before entering a health information management program

Hospital and Health Administration

Administrators of health care organizations manage and guide the varied activities in hospitals clinics nursing homes and mental health facilities The professional requirement may be for a master s degree or a bachelor s degree depending upon the size of the institution and whether an upper or middle entry-level position is desired Students at Iowa State may take general education courses for two or more years and then transfer to a university offering a bachelor s degree in health administration or they may spend four years earning a bachelor s degree in any department before entering a master s degree program at the University of Iowa or other university Courses required for admission to master s degree programs in hospital and health administration vary but may include introductory accounting manage ment statistics and economics

Human Medicine

Physicians study diagnose and treat illness and injury They may work in offices clinics hospitals or laboratories in private practice or for government or industry Their professional training usually consists of 4 years of study in a college of medicine to earn the doctor of medicine (M D) degree and then 3 or more years in hospital residency learning a specialty such as family medicine pediatrics surgery obstetrics or psychiatry A degree of doctor of osteopathy (D O) is awarded to those students who complete 4 years in a college of osteopathic medicine before their residency All medical schools recommend a broad preprofessional education that includes courses in biology chemistry physics mathematics English the social sciences arts and humanities The degree of a premedical student can be from any college and in any curriculum or major offered by the university The major should reflect the student s interests and provide appropriate preparation for an alternative career

Law

A lawyer assists the legal peaceful resolution of conflicts in many different ways Most lawyers are engaged in private practice but many are employed by government agencies and private business At least 3 years are needed to complete a law school program leading to a doctor of jurisprudence (J D) or a bachelor of laws (LL B) degree and a bachelor s degree is required for admission to nearly all law schools A student planning to enter law school may major in any field The courses taken should develop skill in critical thinking comprehension and expression of ideas and understanding of human institutions and values Perhaps most valuable are courses in English language and literature government economics history mathematics Latin logic and scientific method and philosophy

Library and Information Science

Librarians are essential in educational institutions medical facilities government agencies industries and public information centers The professional preparation for library administration is provided by master s degree programs Admission requirements for the University of Iowa s program for example include a bachelor s degree with at least 85 semester credits in the arts and humanities and the natural and social sciences Iowa State students may choose majors that reflect their own interests and that may provide a foundation for working in medical law or other specialized libraries

Nuclear Medicine Technology

The use of radioactive chemicals in the diagnosis and treatment of disease is the distinguishing feature of nuclear medicine Under the supervision of a physician in a hospital or clinic the technologist prepares and administers these radiochemical tracers uses sophisticated detectors and computers to trace the movement and localization of the tracers in the human body and analyzes biological specimens to determine levels of hormones drugs and other chemicals in the body One year in a training program such as that at the University of Iowa College of Medicine is required to become a certified nuclear medicine technologist (C N M T) Admission to this program requires at least 94 semester credits of preprofessional coursework in chemistry physics zoology English mathematics computer science statistics the social sciences and humanities Students at Iowa State University can transfer to a university offering a nuclear medicine technology program after 2 or 3 years of preprofessional courses and then receive the bachelor s degree at that institution Alternatively the student may earn a bachelor s degree before entering the 1 year professional program or may spend 3 years at Iowa State University meeting the admissions require ments of the program and completing requirements for a B S degree using a maximum of 32 semester credits that may be transferred to Iowa State University from the professional school

Nursing

A professional nurse may do clinical nursing teaching or research in hospitals private practice public health centers schools or industry Although becoming a registered nurse (R N) does not require a bachelor s degree the student who completes the bachelor of science degree in nursing (B S N) has college-level preparation for clinical nursing and an essential base for graduate study Iowa State University does not offer a nursing degree Students may take prenursing courses for two years at Iowa State University and if accepted transfer to the BSN program at another college or university

Occupational Therapy

Occupational therapists provide purposeful activities to help those who have been disabled by physical illness or injury birth defects emotional disorder aging drug abuse or other problems to learn to cope with everyday living Therapists treat patients in hospitals school systems and rehabilitation centers Students may complete a bachelor s degree in a related area at Iowa State University and then enter a certification master s or doctoral degree program at another university or they may complete 1 or 2 years of preoccupational therapy courses at Iowa State and then transfer to another university to complete the requirements for a bachelor s degree in occupational therapy The prerequisites for admission to an occupational therapy program usually include

English art biology chemistry physics psychology sociology anthropology and statistics but vary from one school to another

Optometry

Optometrists examine diagnose treat and manage diseases of the visual system the eye and associated structures Treatment may include corrective glasses or contacts vision therapy and therapeutic drugs Optometrists usually set up their own offices or work in group practice Professional study requires 4 years in a school or college of optometry and leads to the doctor of optometry (O D) degree All optometry schools require at least 90 semester credits of preprofessional courses including biology chemistry physics mathematics and English Certain optometry schools require a bachelor s degree Students wishing to earn the bachelor s degree from Iowa State University may choose any major and take the courses required for graduation with that major as they take the courses required for admission to a professional optometry program

Pharmacy

Pharmacists prepare and dispense therapeutic drugs educate health care professionals patients and the general public about the appropriate use of drugs conduct pharmaceutical research and work in industrial settings which involve the manufacture marketing and advertising of pharmaceutical Students may complete prepharmacy courses within two years at Iowa State University Upon admission the student will then transfer to a Pharm D program of study which will entail three or four years of study

Physical Therapy

Physical therapists work with people who have been disabled by injury illness or birth defects They assist in evaluating the physical problems and administer therapeutic agents such as massage and exercise heat baths ultrasonics and electricity they work in hospitals clinics nursing homes schools rehabilita tion centers and private practice Students may complete three years of undergraduate courses including prerequisites before transferring to a three year professional curriculum such as the master s degree program at St Ambrose University or the doctoral degree program at Creighton University Usually students earn a bachelor s degree in a related field at ISU before entering professional school to earn a master s degree or doctoral Admission to the master s degree program at the University of Iowa requires a bachelor s degree The bachelor s degree from ISU may be earned in any department provided that the physical therapy prerequisites are completed Earning a bachelor s degree prior to entering professional school allows a student to apply to a range of graduate level programs and builds a strong liberal arts foundation Courses required for admission to a professional program include biology chemistry physics psychology mathematics and statistics

Physician Assistant

A physician assistant provides medical services under the supervision of a licensed physician PAs conduct physical examinations order and interpret laboratory tests make diagnostic and treatment decisions and are allowed to prescribe medication in most states Certification as a physician assistant requires 2 years in a professional program at the master s or bachelor s degree level Students applying to a bachelor s degree program must have completed at least 60 semester credits of college work including general and organic chemistry zoology behavioral science and humanities Applicants who have had health care experience with direct patient contact are preferred Admission to a master s degree program requires similar coursework and clinical experience in addition to a bachelor s degree

Podiatry

Podiatrists diagnose and treat diseases and disorders of the human foot and ankle They treat patients in private and group practice hospitals and increasingly in industrial and sports related positions Professional training requires 4 years in a college of podiatric medicine and leads to the degree of doctor of podiatric medicine (D PM) This is usually followed by 1 to 3 years in a hospital residency All podiatric colleges require at least 3 years of preprofessional study including courses in biology general and organic chemistry physics and English Most entrants have a bachelor s degree which may be in any major A few students may complete the admission requirements and most of the bachelor s degree requirements in 3 years If so a maximum of 32 semester credits may be transferred to Iowa State University from the first year in an accredited podiatric college in order to complete the requirements for the bachelor s degree

Theology or Religious Studies

The professional education of a student of religion can follow one of two paths The path to a profession as a pastor priest rabbi or other leadership position in a religious tradition usually requires 3 years in a program leading to the master of divinity (M Div) offered at a school of divinity or of theology The path to a profession as a teacher of religious studies at the college level requires 4 7 years in a program leading to the Ph D at a graduate school of Religious Studies Both seminaries and graduate schools require a bachelor s degree for admission The American Association of Theological Schools recommends the following areas of study as the best preparation for theological studies English language and literature history including non Western culture philosophy natural sciences social sciences especially psychology sociology and anthropology the fine arts Biblical and modern languages and religion both Western and Eastern Although students in a variety of major fields may qualify for admission to a theological school interested persons are advised to review their proposed programs with a representative of the Religious Studies Program in the Department of Philosophy and Religious Studies

Veterinary Medicine

About 75% of all veterinarians are engaged in private practice In a mixed practice they diagnose and treat health problems among a variety of animals Others specialize in one species (e g feline pet bird) and still others specialize in a specific discipline within veterinary medicine (e g cardiology ophthalmology) Veterinarians may also choose public and corporate practice (e g public health education research food safety industry laboratory animal medicine aquatic animal medicine poultry medicine and military veterinary medicine)

The professional program requires four years at a college of veterinary medicine and leads to the doctor of veterinary medicine degree (D V M) Admission to a veterinary college involves at least two years of preprofessional college education Candidates must take courses in biology chemistry genetics physics English humanities social sciences speech anatomy and physiology and biochemistry (For Iowa State University see *Veterinary Medicine Admission Requirements* for most recent information consult the College of Veterinary Medicine Web site www vetmed iastate edu)

Students may pursue their preveterinary preparation in any college at Iowa State University A major (preveterinary medicine is not a major) should be selected that is allied to each student s vocational interests in veterinary medicine or that otherwise offers vocational satisfaction in the event that plans for entry into the College of Veterinary Medicine change Students are encouraged to pursue a bachelor s degree the most effective progress toward a bachelor s degree is made when a major is selected upon entry and no change occurs before graduation However students who have not even considered a career other than veterinary medicine may need some time to explore possibilities before selection of a major

To assist students who have indicated interest in the preveterinary program for the College of Veterinary Medicine and are undecided about a major an advising category is available known as GENPV (General Undergraduate Studies Pre Vet) Orientation and advising services for these students are designed to help students fulfill preveterinary course requirements to introduce available majors and careers allied to veterinary medicine and to introduce career options in veterinary medicine GENPV students must select a major by the end of their second semester Some Iowa State University majors allow by careful planning the opportunity for a student to earn the bachelor s degree by combining credits from three years of preprofessional study and one year of professional study in the College of Veterinary Medicine

Production/Operations Management

(Administered by the Department of Logistics Operations and Management Information Systems)

Richard F Poist Jr Interim Chair of Department

Distinguished Professors Allen Baumel

Professors Crum Poist

Professors (Emeritus) Thompson Voorhees

Associate Professors Hendrickson Larson Lummus Mennecke Nilakanta Premkumar Ruben Townsend Walter

Assistant Professors Hackbarth Johnson Montabon Strader Suzuki Zhu

Instructors (Adjunct) Blanshan Chang Choobineh Clayton Tandradinata

Undergraduate Study

For undergraduate curriculum in business major in production and operations management see *College of Business Curricula*

Production/operations management is the planning control and implementation of the processes used to transform inputs into finished goods and services A majority of the firm s investment personnel and purchases of materials and equipment are often controlled by the operations function The efficient management of these resources is critical to the success of the firm Although operations management principles apply to all types of organizations the production/operations management major focuses on the application of these principles in manufacturing systems Students learn how to efficiently organize and manage the labor equipment material and information systems resources required to deliver products that satisfy customer needs The major provides business students with the understanding of manufacturing planning and control systems continuous process improvement techniques lean manufacturing methods strategic quality management systems and other manufacturing practices needed to become gainfully employed in manufacturing industries

Students are required to take three courses - POM 420 422 and 424 plus three additional courses from an approved list Stat 326 is recommended though not a prerequisite for any required courses

The department also offers a minor for non Production/Operations Management majors in the College of Business The minor requires 15 credits from an approved list of courses of which 9 credits must stand alone Students with declared majors have priority over students with declared minors in courses with space constraints

Graduate Study

The production/operations management major participates in two graduate programs the M S in Business and the full time and part time M B A programs The M S program is a 30-credit curriculum culminating in a thesis

The M B A program is a 48-credit nonthesis noncreative component curricula Twenty four of the 48 credit hours are core courses and the remaining 24 are graduate electives

Students can obtain a manufacturing and quality specialization in the MBA program by taking 12 credit hours of graduate courses from a selected set of courses

Courses open for nonmajor graduate credit POM 420 422 424 428

Courses Primarily for Undergraduate Students

POM 320 Production/Operations Management (3 0) Cr 3 *Prereq Stat 226* Introduction and analysis of the basic concepts in production/operations management Topics include applied forecasting aggregate planning scheduling shop floor control total quality management inventory management facility layout and project management

POM 420 Decision Models for Business (3 0) Cr 3 *Prereq Stat 226* Topics include Business applications of decision theory inventory theory business forecasting optimization models the transportation algorithm with trans shipment introduction to decision support systems and network models Nonmajor graduate credit

POM 422 Manufacturing Planning and Control (3-0) Cr 3 *Prereq 320* In-depth analysis of integrated operations management systems with emphasis on operations planning and control material requirements planning master scheduling forecasting capacity planning and related topics Nonmajor graduate credit

POM 424 Competitive Manufacturing Management (3 0) Cr 3 *Prereq 320* Advanced topics in operations management focused on concepts techniques and systems used to improve a company s competitive advantage in manufacturing with an emphasis on lean manufacturing continuous improvement time based competition bar coding electronic data interchange (EDI) and theory of constraints Nonmajor graduate credit

POM 428 Special Topics in Operations Management (3 0) Cr 3 each time elected *Prereq 320* In depth analysis of current issues problems and systems in operations management with emphasis on new theoretical and methodological developments Topics may include in different semesters supply chain management productivity and quality improvement management of technology and innovation information technology in operations management quick response manufacturing and service operations management Nonmajor graduate credit

POM 490 Independent Study Cr 1 to 3 each time taken *Prereq 320 senior classification permission of instructor*

Courses Primarily for Graduate Students Open to Qualified Undergraduate Students

POM 502 Operations Management and Strategy (2 0) Cr 2 *Prereq Graduate classification Stat 328* The design analysis planning and control of business processes to achieve desired performance objectives Topics include the fit between operations strategy competitive priorities and process structure the impact of process structure on process performance process performance measures and their relationships process performance evaluation and managerial levers for improving and controlling process performance

POM 520 Decision Models for Supply Chain Management (Same as TrLog 520) (3 0) Cr 3 *Prereq 502* The application of decision models for supply chain management Topics include business applications of decision theory inventory theory business forecasting optimization models transportation and network models routing problems and project management

POM 521 Strategic Quality Management (3 0) Cr 3 *Prereq Stat 328 graduate classification* Management and technical issues related to quality problem solving including the strategic importance and economic impacts of quality managerial issues in planning and designing quality assurance systems control of quality systems employee involvement statistical concepts relevant to designing for quality inspection and measurement process control and acceptance sampling Uses projects to experience diagnosing and solving real quality problems

POM 522 Manufacturing Information Systems (3-0) Cr 3 *Prereq 502* An integrated analysis of advanced manufacturing planning and control procedures for business A variety of topics are covered including forecasting demand management aggregate planning master production scheduling material requirements planning enterprise resource planning capacity planning shop floor control just in-time and competitive analyses of modern manufacturing systems The design selection and implementation of informations systems to support these concepts is emphasized

POM 525 Manufacturing Strategy (3-0) Cr 3 *Prereq 502* Formulation implementation and evaluation of manufacturing strategies for achieving competitive advantage Topics include strategic issues related to global competitiveness quality productivity delivery performance manufacturing flexibility inventory information technology and performance measurement

POM 590 Special Topics Cr 1 to 3 each time taken *Prereq Permission of instructor* For students wishing to do individual research in a particular area of POM

Professional Agriculture

(Interdepartmental Program administered by the Department of Agricultural Education and Studies)

Supervisory Committee Eric Hoiberg Kenneth Holscher Steve Jungst Paul Lasley Sergio Lence Dan Loy Kenneth Moore Gary Munkvold James Pease

Graduate Study

The graduate major in professional agriculture is an off-campus program leading to the degree master of agriculture The program is considered to be a professional master s degree and not preparation for further graduate study Graduates have a broad base of knowledge in one or more agriculture disciplines They have the ability to communicate effectively and make decisions based on knowledge To earn the 32 credits necessary for graduation students must complete 28 semester credits of formal coursework and 4 credits of creative component Courses are delivered via video-tapes interactive video world wide web on and off campus classes and workshops Specific courses offered in the program and the location of the off-campus classes may be obtained from the departmental course listings off-campus course catalog or by contacting the Professional Agriculture Coordinator 201 Curtiss Hall

Psychology

psych server iastate edu/

Craig A Anderson Chair of Department

Distinguished Professors Wells

Professors Anderson Andre Bonett Bushman Cutrona Epperson Gerrard Gibbons Larson Peters Phye Russell

Distinguished Professors (Emeritus) Ahmann

University Professors (Emeritus) Brown

Professors (Emeritus) Bath Borgen Charles Edwards Hannum Hughes Karas Layton Lewis Schuster Strahan Warman Wolins Zytowski

Associate Professors Cooper Cross Cunnick Dark Hanisch Scott Venkatagiri

Assistant Professors Cleary Madon Malmberg Morris Vogel Wei

Assistant Professors (Adjunct) Mason

Assistant Professors (Collaborators) Day

Undergraduate Study

For college level requirements in undergraduate curricula leading to the degrees of bachelor of arts and bachelor of science see *Liberal Arts and Sciences Curriculum*

An undergraduate major in psychology may be taken as liberal arts education as preparation for graduate study in psychology or as background for professional education in law and in the health professions A student with a bachelor s degree in psychology may qualify for a variety of positions including those in social sciences mental health corrections rehabilitation developmental disability centers business management and public opinion surveying Depending on professional goals a minor in another discipline may be desirable Students should consult with their academic advisors early in their undergradu ate curriculum

The requirements of the program enable graduates to understand and apply the scientific principles facts and basic methods of psychology in their personal and professional activities Graduates learn to think scientifically about human behaviors and mental processes They can communicate effectively in speech and in writing respect individual and cultural differences in behaviors and appreciate ethical issues in both the science and practice of psychology Professional work with a job title of psychologist in academic business clinical government and school settings requires graduate degrees

The major must include the following psychology courses 101 102 111 201 301 and 440 each with a minimum grade of C The major also must include five courses distributed across at least four of the following five areas Area A 230 Area B 280 Area C - 310 315 Area D - 312 313 316 Area E 360 460 Two additional 3-credit courses in psychology must be taken Area courses may be used to meet this requirement but variable credit courses (470 490 491 and 492) may not In accordance with college requirements a C or better average is required in the courses used to satisfy the major

Departmental requirements for the B A and B S include the following supporting courses six credits in philosophy including 201 two of the following Biol 109 or 201 Zool 155 Chem 163 Gen 260 one of the following Stat 101 104 or 227 and a course in mathematics acceptable in LAS Gen Ed group 111a

Students electing a B S degree also must complete Psych 302 with a minimum grade of C- and a minimum of 10 additional supporting credits as follows three credits from LAS Gen Ed group 111a or approved departmental list six credits from LAS Gen Ed group 111b and one credit in a laboratory course from LAS Gen Ed group 111b

Students electing a B A degree also must complete an ISU approved minor

See also the B S /M S program under Graduate Study

The department offers a minor in psychology The minor requires completing 18 credits in psychology including 101 and 301 each with a minimum grade of C At least 9 of the 18 credits must be in 300 level courses (or above) but no more than three credits total may be from Psych 490 491 and 492 A C average or better is required in the courses used to satisfy the minor Contact the psychology advising office for more information

English proficiency requirement The department requires a grade of C- or better in Engl 104 and in Engl 105 (or 105H) and a C- or better in Psych 302 or Psych 490 (2 credits minimum) or Engl 302 309 or 314

Graduate Study

The department offers the degrees master of science and doctor of philosophy in psychology and a minor to students with a major in other departments

Within the major of psychology the department offers a doctoral specialization in counseling psychology (APA accredited) and doctoral areas of concentration in cognitive psychology and social psychology The department also offers a non thesis master s degree program in general psychology

Students seeking a graduate major in psychology must have graduated from an accredited college in a curriculum substantially equivalent to the undergradu ate curriculum in Liberal Arts and Sciences at Iowa State University Prerequisite to admission is at least 15 credits of basic psychology which should include a laboratory course a measurement course and a statistics course

Graduates function as academic psychologists in higher education or as professional psychologists in applied settings They have an extensive knowledge of psychological principles and the conceptual and quantitative skills to conduct psychological research communicating the results to the scientific commu- nity students in the classroom and the general public Graduates in applied programs have specialized knowledge in counseling and program development They are skilled in delivering such programs and services to diverse clientele in a variety of settings

The department also participates in the interdepart- mental programs in industrial relations and neuro- science and in the interdepartmental minor in gerontology (see *Index*)

A formal class and a supervised practicum in the teaching of psychology is recommended for all doctoral students whose future plans may include teaching at the college level A 12 month internship in a training site or agency approved by the faculty is required of all doctoral students in counseling psychology

The department also offers a B S /M S program in psychology that allows the student to obtain both the B S and M S degrees in five years Students interested in this program should contact the chair of the department s Graduate Program Committee Application for admission to the Graduate College and department should be made near the end of the junior year of undergraduate study

Courses open for nonmajor graduate credit Psych 401 413 422 436 440 450 460 484 485 488 CmDis 471

Courses Primarily for Undergraduate Students

Psych 101 Introduction to Psychology (3 0) Cr 3 FS SS Fundamental psychological concepts derived from the application of the scientific method to the study of behavior and mental processes Applications of psychology 101H (2 2) F Honors section (For students in the University Honors Program only)

Psych 102 Laboratory in Introductory Psychology (0-2) Cr 1 FS *Prereq Credit or enrollment in 101* Laboratory to accompany 101

Psych 111 Orientation to Psychology (1-0) Cr R FS Program requirements and degree/career options Required of psychology majors Offered on a satisfactory fail grading basis only

Psych 131 Academic Learning Skills (0 2) Cr 1 FS Efficient methods of study and reading Offered on a satisfactory-fail grading basis only

Psych 201 Exploring Psychology at ISU (0 2) Cr 1 FS Survey of psychological research and practice Psychology majors only Offered on a satisfactory fail grading basis only

Psych 230 Developmental Psychology (3-0) Cr 3 FS SS Life span development of physical traits cognition intelligence social and emotional behavior personality and adjustment

Psych 280 Social Psychology (3 0) Cr 3 FS SS Individual human behavior in social contexts Emphasis on social judgments and decisions attitudes perceptions of others social influence attraction aggression and group pressure

Psych 301 Research Design and Methodology (3 0) Cr 3 FS SS *Prereq Stat 101 1 course in psychology* Survey of the principal research techniques used in psychology with an emphasis on the statistical analysis of psychological data

Psych 302 Research Methods in Psychology (2 2) Cr 3 FS *Prereq 301* Discussion of and experience in designing research studies collecting and analyzing data and preparing research reports in psychology

Psych 310 Brain and Behavior (Same as Zool 310) (3-0) Cr 3 FS *Prereq 101 Biol 109 or 201 or Zool 155* Survey of basic concepts in the neurosciences with emphasis on brain mechanisms mediating sensory processes arousal motivation learning and abnormal behavior

Psych 312 Sensation and Perception (3 0) Cr 3 FS *Prereq 101* Survey of the physiology and psychology of human sensory systems including vision audition smell taste the skin senses and the vestibular senses

Psych 313 Learning and Memory (3 0) Cr 3 FS *Prereq 101* Fundamental concepts and theories of learning and memory derived from human and animal research

Psych 314 Motivation (3-0) Cr 3 FS *Prereq 101* Concepts and topics of motivation including curiosity pain emotion sex aggression love play addiction sleep fatigue and work

Psych 315 Drugs and Behavior (3 0) Cr 3 FS *Prereq 101 Biol 109 or 201 or Zool 155* A biological perspective on fundamentals of psychoactive drugs and their use in experimental therapeutic and social settings

Psych 316 Cognitive Processes (3 0) Cr 3 FS *Prereq 101* Human information processing during thinking problem solving reading and language Fundamental processes in perceiving coding storing and retrieving information from short term and long- term memory including underlying brain mechanisms

Psych 333 Educational Psychology (Same as C I 333) See *Curriculum and Instruction*

Psych 346 Psychology of Women (Same as W S 346) (3 0) Cr 3 S *Prereq 2 courses in psychology including 101* Survey of psychological literature relating to biological developmental interpersonal and societal determinants of the behavior of women

Psych 360 Psychology of Normal Personality (3-0) Cr 3 FS SS *Prereq 101* Theories and research in the study of development and functioning of normal personality

Psych 381 Social Psychology of Small Group Behavior (Same as Soc 381) (3 0) Cr 3 S *Prereq 280 or Soc 305* A survey of small group research and theory from a social psychological perspective Major theories of interpersonal behavior such as exchange theory equity theory and status consistency theory and major areas of research such as leadership power conformity bargaining status norms and roles

Psych 401 History of Psychology (3 0) Cr 3 FS *Prereq 4 courses in psychology* Philosophy and science backgrounds of psychology Development of theories and causes of events in academic and applied psychology Nonmajor graduate credit

Psych 413 Psychology of Language (Same as Ling 413) (3 0) Cr 3 *Prereq 101* Psychological and linguistic processes involved in language related activities like speaking listening reading and writing Nonmajor graduate credit

Psych 422 Counseling Theories and Techniques (2 2) Cr 3 F *Prereq 3 courses in psychology* Survey of major theoretical approaches in counseling and related assessment and treatment techniques Supervised practice in basic counseling skills Nonmajor graduate credit

Psych 434 Applied Behavior Analysis (Dual listed with 534) (3 0) Cr 3 *Prereq 9 credits in human*

development and family studies or psychology Design and evaluation of behavioral interventions in applied settings such as classrooms institutions and families Design of single subject experiments

Psych 436 Individual Differences and Exceptional Patterns of Development (3 0) Cr 3 *Prereq 230* Behaviors abilities and needs of retarded gifted handicapped and other atypical persons differences associated with race sex and socio-economic status Nonmajor graduate credit

Psych 437 Characteristics of Giftedness (Dual listed with 537 same as HD FS 437) (3-0) Cr 3 *Prereq 9 credits in human development and family studies or psychology including Psych 230 or HD FS 102 junior classification* Understanding of giftedness and talent from cognitive developmental and social perspec tives using a life span approach Current conceptualizations and research regarding gifted children and adults Implications for education and guidance

Psych 440 Psychological Measurement I (2 2) Cr 3 FS SS *Prereq 301 and 9 credits in psychology Stat 101* Principles of psychological measurement including concepts of reliability and validity interpretation of scores factors influencing performance construction and use of measures of ability achievement and personality Nonmajor graduate credit

Psych 450 Industrial Psychology (3 0) Cr 3 FS *Prereq 2 courses in psychology including 101 Stat 101* Content and methods of industrial psychology including the different approaches used to select employees how to conduct performance appraisals and how to train employees in organizations Work attitudes and behaviors of employees work schedules safety and human factors as well as relevant legal issues are discussed Statistics including regression and correlation are used in the course Nonmajor graduate credit

Psych 460 Abnormal Psychology (3 0) Cr 3 FS SS *Prereq 3 courses in psychology including 101* Description of major forms of maladaptation including anxiety mood disorders personality disorders substance dependence and schizophrenia Factors in the development of behavior deviations Research pertinent to the description development and maintenance of abnormal behavior Nonmajor graduate credit

Psych 470 Seminar in Psychology (1 0 to 3 0) Cr 1 to 3 each time taken *Prereq 12 credits in psychology* Current topics in psychological research and practice
A Counseling
B Experimental
C Individual Differences
D Social

Psych 484 Psychology of Close Relationships (3 0) Cr 3 *Prereq 9 credits in psychology including 280* Theories and research concerning the functions development and deterioration of close relationships Influence of psychological processes on friendship romantic marital and family relationships Topics include mate selection interdependence trust and commitment power and dominance in relationships sexuality divorce gender roles and family interaction Nonmajor graduate credit

Psych 485 Health Psychology (3 0) Cr 3 F *Prereq Junior classification 6 credits in psychology* Application of psychological theory and research methods to issues in physical health Psychological factors in illness prevention health maintenance treatment of illness recovery from injury and illness and adjustment to chronic illness Nonmajor graduate credit

Psych 488 Cultural Psychology (3-0) Cr 3 *Prereq 280 and 301 junior classification* Examination of psychological differences among people living in different parts of the world with a focus on cross cultural research related to social developmental and personality psychology Nonmajor graduate credit

Psych 490 Independent Study Cr var maximum 3 per semester FS SS *Prereq Junior classification 6 credits in psychology and permission of instructor* No more than 9 credits of 490 may be counted toward a degree in psychology Supervised reading in an area of psychology Writing requirement

Psych 491 Research Practicum Cr var FS SS *Prereq Junior classification permission of instructor and credit or enrollment in 301* No more than 9 credits of 491 may be counted toward a degree in psychology Supervised research in an area of psychology Primarily for students intending to pursue graduate education

Psych 492 Fieldwork Practicum Cr var FS SS *Prereq Junior classification 12 credits in psychology and permission of instructor* No more than 9 credits of 492 may be counted toward a degree in psychology Supervised fieldwork in a human service agency or other appropriate setting Offered on a satisfactory-fail grading basis only

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Psych 507 Applications of Multivariate Methods in Psychology (3 0) Cr 3 *Prereq Stat 401 Stat 402* Training in the application of multivariate methods in the analysis of psychological data using standard statistical packages Techniques that are covered include exploratory and confirmatory factor analysis MANOVA multiple regression models logistic regression survival analysis path analysis and structural equation analysis with latent variables

Psych 508 Research Methods in Applied Psychology (3-0) Cr 3 *Prereq 440 Stat 401* Methods and issues in applied psychological research Role of theory in research fidelity of measurement selection of subjects sampling ethical issues experimenter bias data collection methods power analysis meta analysis and professional standards for writing research articles Emphasis on research methodological issues not statistical issues

Psych 511 Advanced Physiological Psychology (3 0) Cr 3 *Prereq 310* Neurophysiological correlates of behavior

Psych 512 Advanced Perception (3 0) Cr 3 *Prereq 312* Survey of current theory and research in perception with an emphasis on vision

Psych 514 Advanced Human Learning and Memory (3 0) Cr 3 *Prereq 313 or 316 or 9 hours in psychology* Historical and contemporary survey of human learning and memory

Psych 516 Advanced Cognition (3-0) Cr 3 *Prereq 316* Theoretical models and empirical research in human cognition including pattern recognition attention text processing memory problem solving decision making and language

Psych 517 Psychopharmacology (3 0) Cr 3 *Prereq 310 315 or equivalent and permission of instructor* Fundamentals of drug behavior interactions with emphasis on psychoactive drugs and their use in experimental therapeutic and social settings

Psych 519 Cognitive Neuropsychology (3-0) Cr 3 *Prereq Permission of instructor* Psychological models and related neurological substrates underlying cognition in normal and brain damaged individuals

Psych 533 Psychology of Learning Cognition, and Motivation in Educational Settings (Same as C I 533) See *Curriculum and Instruction*

Psych 534 Applied Behavior Analysis (Dual listed with 434) (3 0) Cr 3 *Prereq 9 credits in human development and family studies or psychology* Design and evaluation of behavioral interventions in applied settings such as classrooms institutions and families Design of single subject experiments

Psych 537 Characteristics of Giftedness (Dual listed with 437 same as HD FS 537) (3 0) Cr 3 *Prereq 9 credits in human development and family studies or psychology including Psych 230 or HD FS 102 junior classification* Understanding of giftedness and talent from cognitive developmental and social perspec tives using a life span approach Current conceptualizations and research regarding gifted children and adults Implications for education and guidance

Psych 538 Developmental Disabilities in Children (Same as HD FS 538) See *Human Development and Family Studies*

Psych 540 Psychological Measurement II (3 0) Cr 3 *Prereq 9 credits in psychology 3 credits in statistics and permission of instructor or graduate classification in psychology* Nature of psychological measurement Measurement and scaling theory Theoretical and statistical definitions of reliability and validity Test and scale construction strategies

Psych 542 Psychoeducational Assessment (3 0) Cr 3 F *Prereq 440* Theory and research concerning assessment of intelligence and achievement with emphasis on developmental patterns and diagnosis of learning problems Critical examination of current assessment practices in clinical and educational settings

Psych 544 Practicum in Assessment *Prereq 542 and permission of instructor* Supervised practice in designing and implementing observational systems and in administering scoring interpreting and reporting individual tests
A Behavioral Assessment (2-1) Cr 2
B Individual Tests Children (2 1) Cr 2
C Testing Adult Ages (1 2) Cr 2

Psych 550 Advanced Industrial and Organizational Psychology (3 0) Cr 3 *Prereq 440 Stat 402* Critical examination of theories methods and applications in industrial and organizational psychology History and legal issues predictor and criteria relationships employee attitudes and behaviors employee training and motivation and human factors

Psych 560 Advanced Personality Psychology (3 0) Cr 3 *Prereq 4 courses in psychology including 360* Analysis of theories of personality concepts methods and current research issues

Psych 561 Psychopathology and Behavior Deviations (3 0) Cr 3 *Prereq 460* Examination of theoretical perspectives and current research pertinent to the major forms of adult dysfunction including adjustment anxiety mood somatoform dissociative sexual and gender identity personality schizophrenic eating and substance abuse disorders

Psych 562 Personality Assessment (3 0) Cr 3 *Prereq 360 440 Stat 401* Principles concepts and methods of personality assessment Though not a practicum course exposure is given to a variety of objective projective and situational tests

Psych 563 Developmental Psychopathology (3 0) Cr 3 *Prereq 230 and 460 or graduate classification* Theory and research related to major disorders of childhood and adolescence with an emphasis on assessment etiology and developmental processes and multimodal interventions

Psych 580 Advanced Social Psychology Psycho logical Perspectives (3 0) Cr 3 *Prereq 4 courses in psychology including 280* Current theories methods and research in social psychology with an emphasis on cognitive and interpersonal processes such as attribution social cognition attitude change attraction aggression and social comparison

Psych 581 Applications of Social Psychology Theories (3 0) Cr 3 *Prereq 12 credits in psychology including 280* Application of social psychological theory to various applied topics including physical and mental health stress and coping

Psych 586 Research Methods in Social Psychology (3 0) Cr 3 *Prereq Stat 402 and permission of instructor* Ethical issues generating testable hypotheses operationalizing independent and dependent variables sampling and design issues laboratory procedures and interpretation of results in experimental research Issues in analysis of variance Bayesian reasoning and effect size estimation will be emphasized as will writing and publication strategies

Psych 588 The Meta Analytic Review (3 0) Cr 3 *Prereq Stat 401* Presentation of and hands-on experience with all stages of meta analytic reviews including problem formation data collection data evaluation data analysis and interpretation and public presentation

Psych 590 Special Topics Cr var *Prereq 12 credits in psychology and permission of instructor* Guided reading on special topics or individual research projects
A Counseling
Q Cognitive
R Social
Z General

Psych 592 Seminar in Psychology (1 0 to 3 0) Cr 1 to 3 each time taken *Prereq 12 hours in psychology*
A Counseling
B Industrial Organizational
M Professional Issues and Ethics
P Research Methods and Psychometrics
Q Cognitive
R Social
Z General

Psych 597 Internship in Psychology Cr R *Prereq M S degree candidacy permission of instructor* Full-time non-clinical supervised experience in a setting relevant to psychology Intended for master s degree level internships

Psych 599 Creative Component Cr Var Offered on a satisfactory fail grading basis only

Courses for Graduate Students

Psych 601 History of Philosophy of Psychology (3-0) Cr 3 *Prereq 4 courses in psychology* Origins of psychology in philosophical medical and related thought Development as an independent discipline in the nineteenth and twentieth centuries as a science and as a practice including traditional and contempo rary theory and philosophy

Psych 621 Psychological Counseling Theory and Process (3-0) Cr 3 F *Prereq Graduate classification* Overview of major counseling theories with emphases upon key concepts of theories the role of the counselor and applications of theory in fostering client change

Psych 621L Techniques in Counseling (0-6) Cr 3 F *Prereq 621 or concurrent enrollment in 621 and permission of instructor* Development of basic counseling skills and techniques through observation role playing case studies and supervised counseling sessions

Psych 623 Vocational Behavior (3-0) Cr 3 *Prereq 3 courses in psychology* Theoretical views research and issues in career development through the life span Methods of career counseling including appraisal interviewing assessment test interpreta tion and use of information sources

Psych 626 Group Counseling (2 2) Cr 3 *Prereq 621L 691A* Theory research ethical issues and therapeutic considerations relevant to group counseling Participation in lab exercises for development of group counseling skills and observation of ongoing groups

Psych 628 Advanced Counseling Theory (2 0) Cr 2 *Prereq Practicum in counseling psychology* In depth coverage of major theoretical positions including comparative analysis Coverage and evaluation of research on counseling interventions

Psych 633 Teaching of Psychology (3 0) Cr 3 *Prereq Enrollment in degree program in psychology completion of at least 1 year of graduate study permission of instructor* Orientation to teaching of psychology at college level academic issues and problems instructional and evaluative techniques

Psych 635 Interventions with Children and Adolescents (3 0) Cr 3 *Prereq Graduate classification and permission of the instructor* Research and theory underlying application of behavioral and cognitive psychology to the treatment of childhood and adolescent psychopathology with an emphasis on internalizing disorders developmental processes and multimodal interventions

Psych 691 Practicum in Psychology Cr var *Prereq Permission of instructor* Supervised practice and experience in the following fields of specialization in applied psychology
A Counseling
E Group Counseling *Prereq 626 691A*
F Advanced Counseling *Prereq 691A*
T Teaching *Prereq 633* (satisfactory fail basis grading only)
Z General

Psych 692 Research Seminar (1 0 to 3-0) Cr 1 to 3 each time taken *Prereq Permission of instructor*
A Counseling
Q Cognitive
R Social
Z General

Psych 697 Internship in Counseling Psychology Cr R *Prereq Ph D candidacy in the Counseling Psychology program approved dissertation proposal and permission of instructor* Full time supervised predoctoral internship experience in a setting relevant to counseling psychology

Psych 699 Research Offered on a satisfactory fail grading basis only

Communication Disorders (CmDis)

(Administered by the Department of Psychology)

The following courses are part of the Speech Communication program For more information refer to that section CmDis 170 275 286 371 471

Courses Primarily for Undergraduate Students

CmDis 170 Speech Improvement for Nonnative Speakers (2 0) Cr 2 For nonnative speakers of English only Development of effective English vowel and consonant productions accommodation processes that occur in context intelligibility in conversational English and appropriate stress patterns Offered on a satisfactory fail grading basis only

CmDis 275 Introduction to Communication Disorders (Same as Ling 275) (3-0) Cr 3 Survey of nature causes and types of major communication disorders including phonological adult and child language voice cleft palate fluency and hearing disorders

CmDis 286 Basic Sign Language (Same as Ling 286) (3 0) Cr 3 Development of basic skills in the use and understanding of signed English a modification of American Sign Language Overview of the types causes and consequences of hearing impairment deaf culture and the education of hearing impaired children

CmDis 371 Phonetics and Phonology (Same as Ling 371 (3-0) Cr 3 *Prereq 275 or Engl 219* Analysis of speech through study of individual sounds their variations and relationships in context English phonology practice in auditory discrimination and transcription of sounds of American English description of speech sounds in terms of their production transmission and perception

CmDis 471 Language Development (Same as Ling 471) (3-0) Cr 3 *Prereq 275 or Psych 230 or Engl 219* Definition of components of language Overview of theories and developmental processes related to each component of linguistic skill (semantics lexicon syntax morphology phonology pragmatics) Overview of normative information available for infants children adolescents and adults Attention to metalinguistic skills and the complementary nonlinguistic and paralinguistic skills Nonmajor graduate credit

Sociology

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R Paul Lasley, Chair of Department

Distinguished Professors C Flora

University Professors Lorenz

Professors Blake Bruton Butler Bystydzienski Dobratz J Flora Holberg Hraba Jones-Johnson Keith Korsching Lasley Padgitt Ryan Wells Woodman

Professors (Collaborators) Conger Hoyt Simons Whitbeck

Distinguished Professors (Emeritus) Beal

University Professors (Emeritus) Goudy

Professors (Emeritus) Bultena Chang Cohen Klonglan Miller Mulford Oulman Schafer Tait

Associate Professors Aigner Anderson Besser Harrod Litt Mazur Roberts Sapp Sawyer

Associate Professors (Collaborators) Bell

Assistant Professors Allan Bird Cast Delisi Frisco Hinrichs Hochstetler Morton Munoz Schweingruber

Assistant Professors (Adjunct) Hanson Jarnagin Waggoner

Undergraduate Study

The department offers course work leading to either a bachelor of arts or bachelor of science in sociology Additionally a bachelor of science in Public Service and Administration in Agriculture is offered The department offers course work for a minor in Criminal Justice Studies Programs of study in sociology offered in both the College of Agriculture and the College of Liberal Arts and Sciences are outlined in this section For the undergraduate curriculum in Liberal Arts and Sciences with a major in sociology leading to the degrees of bachelor of arts and bachelor of science see *Liberal Arts and Sciences Curricula* For the undergraduate curriculum in agriculture with major in public service and administration in agriculture leading to the degree bachelor of science see *Agriculture Curriculum in Public Service and Administration in Agriculture* For the undergraduate curriculum in Liberal Arts and Sciences with a minor in criminal justice studies see *Liberal Arts and Sciences Curriculum*

Graduates understand how social institutions communities and organizations work and change they can examine the causes and consequences of conformity deviance and inequality They can apply sociological understanding of human behavior to practical work situations and everyday life Graduates can read critically think independently and communi cate effectively about social issues and social policy

College of Liberal Arts and Sciences—Sociology

A major in sociology can serve as a liberal arts education as preparation for various positions in social service and related occupations in business and industry as background for professional education in such areas as law and theology or as a basis for graduate professional training as a sociologist in academic government business and industrial settings

Departmental requirements for all majors include the following supporting course Philosophy including 230 and one upper level Philosophy course English 302 or 309 or 314 One of the following courses Statis tics101 or 104 At least three additional credits with a Mathematics designator

A program of study that meets the needs and interests of the student and department requirements will be developed in consultation with the major adviser *Programs of study will include* 115 130 *or* 134 202 three credits from 310 380 or 420 302 305 three credits from 327 330 331 or 332 401 9 credits of upper level electives Majors must receive grades of C or better in Engl 104 and 105 and a grade of C or better in either Engl 302 or 309 or 314 Programs leading to a bachelor of arts degree will emphasize additional coursework in groups I II and IV of the general education requirements Programs leading to a bachelor of science degree will emphasize additional coursework in groups III and IV of the

general education requirements Some of the possible fields of concentration are criminal justice systems community (urban and rural) sociology family sociology sociology of work social science teaching research methods and statistics social change and development complex organizations human population and ecology social inequality social psychology and sociological theory

In consultation with their advisers students may gain work experience and develop their skills in their field of concentration through the field observation and practice options of 454 and 460

The department offers a minor in sociology which may be earned by completing 15 credits in sociology including Sociology 130 or 134 3 credits from 310 380 or 420 3 credits from 264 305 or 381 an additional 6 credits in sociology courses At least 9 of the 15 credits must be at the 300 level or higher 6 of these credits must be taken at ISU with a minimal grade of C

College of Agriculture—Public Service and Administration in Agriculture

The curriculum in public service and administration in agriculture is designed for students who desire an interdisciplinary education to pursue a career with agriculturally related governmental and private agencies or with businesses and industries that are concerned with public services in agriculture Students will explore the planning and implementing of rural and agriculturally related programs in organizations communities (town city or county) multicounty areas states regions and at the federal level

The curriculum has a broad base of general education subjects including credits in communications mathematics physical and biological sciences social sciences and humanities The technical subjects represent a combination of sociology economics government and technical agriculture with emphases on social and economic change history of public services complex organizations interagency relationships community leadership community action adoption and diffusion group dynamics and political and legal behavior as they relate to agriculture and rural areas

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with majors in sociology and rural sociology and minor work for students majoring in other departments For M S and Ph D departmental requirements see Program of Graduate Study for Degrees in Sociology and Rural Sociology available from the department office The department offers concentrations in a number of areas e g community studies and development family inequality life course and aging food systems agriculture and environment methodology social change and development social deviance and mental health social organization and social psychology The Department of Sociology does not offer a nonthesis master s program

Graduates have a broad understanding of sociology address complex societal problems and communi cate effectively with scientific colleagues and the general public in both formal and informal settings They understand sociological theory conduct research and are prepared to educate college students and contribute to public policy

Although the department stipulates no language requirement for either the degree master of science or the degree doctor of philosophy specifying competence in one or more languages may be desirable in some instances

The department also participates in the interdepart-mental program in industrial relations interdepartmen tal majors in sustainable agriculture transportation and water resources and interdepartmental minors in gerontology (see *Index*)

Courses open for nonmajor graduate credit 377 401 411 415 420 425 450 473 476

Courses Primarily for Undergraduate Students

Soc 110 Orientation to Public Service and Administration in Agriculture (1 0) Cr R F Survey of public service and administration in agriculture Exploration of career tracks and career planning Recommended during first semester of freshman year or as soon as possible after transfer into the department

Soc 115 Orientation to Sociology (1 0) Cr R FS Orientation to sociology A familiarization with University and LAS College requirements and procedures Occupational tracks and career options open to sociology Introduction to career planning Recommended during first semester of freshman year or as soon as possible after transfer into the department Offered on a satisfactory-fail grading basis only

Soc 130 Rural Institutions and Organizations (3 0) Cr 3 FS An introductory analysis of sociological concepts and theories as they relate to rural institutions and organizations Emphasis on the static structure and function of these institutions and organizations and on their dynamic adaptation to changing societal environmental and economic conditions General sociological principles and perspectives Credit for only 130 or 134 may be applied toward graduation

Soc 134 Introduction to Sociology (3-0) Cr 3 FS SS Social interaction and group behavior with emphasis on contemporary U S society including issues relating to socialization inequality and changing rural and urban communities Analysis of relationships among the institutions of family religion political participation work and leisure Credit for only 130 or 134 may be applied toward graduation H Honors

Soc 202 Introduction to Research Methods (3 0) Cr 3 FS *Prereq 130 or 134 credit in Stat 101 or concurrent enrollment in Stat 101* A survey of the principal research methods used in sociological analysis

Soc 219 Sociology of Intimate Relationships (3 0) Cr 3 FS SS *Prereq 130 or 134* Analysis of intimate relationships among couples using a sociological perspective Attention is given to singlehood dating and courtship sexuality mate selection cohabitation and marriage Relationship quality communication conflict and dissolution of these types of relationship will also be explored

Soc 235 Social Problems (3-0) Cr 3 FS *Prereq 130 or 134* Sociological concepts and methods employed in the analysis of various social problems including crime substance abuse problems with institutions rural and urban problems and international concerns Consideration of various solutions

Soc 241 Youth and Crime (Same as CJ St 241) (3 0) Cr 3 F *Prereq 130 or 134* An examination of delinquency that focuses on the relationship between youth as victims and as offenders social and etiological features of delinquency the role of the criminal justice system delinquents rights and traditional and alternative ways of dealing with juvenile crime

Soc 264 Small Group Dynamics (3-0) Cr 3 FS *Prereq 130 or 134* An introduction to intra and intergroup dynamics in small groups Group decision making coalitions conformity intergroup relations status and role effects leadership group development and group conflict Includes student participation in small group processes

Soc 302 Advanced Research Methods (2-2) Cr 3 FS Alt SS offered 2004 *Prereq 202 Stat 101* Experience in designing research projects collecting and analyzing data and reporting results

Soc 305 Social Psychology A Sociological Perspective (3-0) Cr 3 FS SS *Prereq 130 or 134* Examination of human behavior in a social environ ment with emphasis on development of the self interpersonal relations attitudes and small groups

Soc 310 Community (3 0) Cr 3 FS *Prereq 130 or 134* Analysis of evolving theory and research of community as an ideal type an ecological system a political economy and an interactional field examination of the impact of economic cultural social and political infrastructures on community power structures and change processes in a global era

Soc 325 Agriculture in Transition (3 0) Cr 3 S The impacts of agricultural changes on farm families rural communities and consumers Past present and future trends in family farms and their social implications

Soc 327 Sex and Gender in Society (Same as W S 327) (3 0) Cr 3 FS SS *Prereq 130 or 134* How the biological fact of sex is transformed into a system of gender stratification The demographics and social positions of women and men in the family education media politics and the economy Theories of the social psychological and sociological bases for behavior and attitudes of women and men The relationship between gender class and race

Soc 328 Sociology of Masculinities and Manhood (Same as W S 328) (3-0) Cr 3 S *Prereq Soc 130 134 or W S 201* Examination of socially constructed and idealized images of manhood the nature of social hierarchies and relations constructed on the basis of imagery ideologies and norms of masculinity Theories on gender (sociological psychological and biological) Particular attention given to theory and research on gender variations among men by race class ethnicity sexual orientation physical ability and age

Soc 330 Ethnic and Race Relations (Same as Af Am 330) (3 0) Cr 3 FS SS *Prereq 130 or 134* Analysis of ethnic and race relations particularly in America emphasis on the sociology and psychology of race and ethnic relations

Soc 331 Social Class and Inequality (3 0) Cr 3 FS SS *Prereq 130 or 134* Social stratification and processes resulting in poverty implications of status class and poverty for people of different races ethnicity and gender

Soc 332 The Latino/Latina Experience in U S Society (3 0) Cr 3 F *Prereq 130 or 134* Examination of the social historical economic and political experience of varied Latino ethnic groups in the U S primarily focusing on Mexican Puerto Ricans and Cubans

Soc 334 Politics and Society (Same as Pol S 334) (3 0) Cr 3 F *Prereq A course in political science or sociology* The relationship between politics and society with emphasis on American society Discussion of theories of inequality power social movements elites ruling classes democracy and capitalism

Soc 340 Deviant and Criminal Behavior (Same as CJ St 340) (3-0) Cr 3 S SS *Prereq 130 or 134* Theory and research on the etiology of types of social deviance issues relating to crime antisocial behavior and social policies designed to control deviant behavior

Soc 341 Criminology (Same as CJ St 341) (3 0) Cr 3 F *Prereq 130 or 134* The nature of crime and criminology the concept of crime statistics and theories of criminality major forms of crime official responses to crime and control of crime

Soc 345 Population Problems and Society (Same as Env S 345) (3 0) Cr 3 F *Prereq 130 or 134* Human overpopulation impact on food resources and services population growth and development trends of births deaths and geographic movement projecting future population population control and family planning population policies and laws comparison of the United States with other societies throughout the world

Soc 371 High Risk Children and Adolescents (3 0) Cr 3 S *Prereq 130 or 134* This class traces life course developmental risk and resiliency through early adulthood Its focus is on contextual factors that contribute to or impede prosocial outcomes in young

people with special emphasis on the origins and processes associated with cumulative risk It reviews the literature on children and adolescents in high risk social contexts such as runaway and homeless adolescents inner city adolescents and gangs

Soc 377 Social Dimensions of Religion (Same as Relig 377) See *Religious Studies* Nonmajor graduate credit

Soc 380 Sociology of Work (3 0) Cr 3 FS *Prereq 130 or 134* Inequalities (gender race class) related to jobs occupations firms and industries Satisfactions rewards alienation discrimination and other topics of importance to workers are examined

Soc 381 Social Psychology of Small Group Behavior (Same as Psych 381) (3 0) Cr 3 S *Prereq Soc 305 or Psych 280* A survey of small group theory and research from an interdisciplinary social psychological perspective

Soc 382 Environmental Sociology (Same as Env S 382) (3-0) Cr 3 FS *Prereq Soc 130 134 or Env S 201* Environment society relations social construction of nature and the environment social and environmental impacts of resource extraction production and consumption environmental inequality environmental mobilization and movements U S and international examples

Soc 401 Contemporary Sociological Theories (3 0) Cr 3 FS SS *Prereq 9 credits in sociology* Both historical and modern social theories as applied to understanding and researching the social world Nonmajor graduate credit

Soc 411 Social Change in Developing Countries (3-0) Cr 3 S *Prereq 130 or 134 plus 3 credits in social sciences* Social change and development in developing countries international interdependence causes and consequences of persistent problems in agriculture city growth employment gender equality basic needs local and worldwide efforts to foster social change and international development Nonmajor graduate credit

Soc 412 Senior Seminar on Career Development (1-0) Cr 1 F *Prereq Most of major core courses senior classification* Transition from student to professional Career development procedures including self assessment short and long term goals strategies for the job search development of contacts and sources resumes and interviews Enrollment preferred in first semester as senior Offered on a satisfactory fail grading basis only

Soc 415 Sociology of Technology (3 0) Cr 3 F *Prereq 130 or 134 plus 3 credits in social sciences* Review of physical biological and social approaches to technology evaluation Examination of public responses to complex and controversial technology Strategies for gaining adoption/rejection of technology Applications to topics in agriculture development and marketing Nonmajor graduate credit

Soc 420 Complex Organizations (3 0) Cr 3 FSS *Prereq 130 or 134 plus 3 credits in social sciences* Study of bureaucracies and other large organizations as social systems through the perspective of basis social processes and structural variables Incorporates topics of organizational effectiveness power and change Nonmajor graduate credit

Soc 425 Social Movements and Revolution (3 0) Cr 3 S *Prereq 6 credits in sociology* Theoretical approaches and contemporary evidence of the origins development and impact of social movements including social psychological organizational and structural dimensions Nonmajor graduate credit

Soc 431 Chicanos/Chicanas in Contemporary Society (3-0) Cr 3 S *Prereq 130 or 134* An interdisciplinary examination of Chicanos/as the largest U S Latino ethnic group Special attention will be given to social conflict and social transformation as it relates to contemporary Chicano/a issues particularly in the Midwest

Soc 435 Urban Society (3 0) Cr 3 Alt S offered 2004 *Prereq 130 or 134 plus 3 credits in social sciences* Development of cities and urban systems human and spatial ecology urban transformation decline and revitalization poverty immigration homelessness residential segregation housing policy urban social movements local governance alternative solutions and planning for cities international comparisons

Soc 450 Demographic Analysis Projections and Modeling (3 0) Cr 3 Alt SS offered 2005 *Prereq 6 credits in sociology* Methods and techniques for analyzing projecting and modeling demographic behavior and change Focus on fertility migration and mortality extensions made to aging education labor force housing service utilization resource consumption and consumer markets Integrating population variables into planning processes Applications using surveys census data and other indicators *Nonmajor* graduate credit

Soc 454 Field Observation and Practice Cr var maximum of 12 FS SS *Prereq Junior or senior classification permission of faculty internship coordinator major or minor in sociology or PSA or 201 302 305* Supervised practice in industrial plants business organizations and governmental agencies Not more than a total of 12 credits of field experience (Soc 454 and 460) may be counted toward graduation No credits in Soc 454 may be used to satisfy minimum sociology requirements for sociology majors Offered on a satisfactory fail grading basis only
A General Sociology
B Rural Sociology

Soc 460 Criminal and Juvenile Justice Practicum (Same as CJ St 460) Cr 3 12 FS SS *Prereq Junior or senior classification permission of criminal justice studies coordinator major or minor in sociology or criminal justice studies minor* Study of the criminal and juvenile justice systems and social control processes Supervised placement in a police department prosecutor s office court probation and parole department penitentiary juvenile correctional institution community based rehabilitation program or related agency Not more than a total of 12 credits of field experience (Soc 454 and 460) may be counted toward graduation No credits in Soc 460 may be used to satisfy minimum sociology requirements for sociology majors Offered on a satisfactory fail grading basis only

Soc 461 Life Course Sociology (3-0) Cr 3 F *Prereq 6 credits in sociology* Theoretical and empirical perspectives on individuals facing developmental tasks age related norms values and subcultures Decisions and issues faced by individuals as they progress through stages of the life cycle

Soc 464 Community Action and Leadership (3 0) Cr 3 S SS *Prereq 6 credits in sociology* Methods of planning organizing and conducting planned social change and other action programs in communities Strategies of change change agent roles client need identification community organization strategies citizen participation leadership identification and development program planning and evaluation

Soc 473 Youth and Society (3 0) Cr 3 Alt S offered 2004 SS *Prereq 6 credits in sociology* Analysis of problems of adolescents and youth created by the impact of changing institutional structure on the transition from childhood to adulthood Nonmajor graduate credit

Soc 476 The Aged in American Society (Same as Geron 476) (3 0) Cr 3 S *Prereq 6 credits in sociology* A survey of sociological problems of the aging and the social implications of a sizable aged population Nonmajor graduate credit

Soc 484 Topical Studies in Criminal and Juvenile Justice (3 0) Cr 3 Alt S offered 2004 *Prereq 6 credits in sociology and permission from instructor* Thematic or topical issues and studies dealing with the sociology of police judiciary institutional and community based corrections gender/ethnicity and crime/delinquency criminal and delinquent gangs and crime and delinquency prevention

Soc 485 Sociology of the Family (3-0) Cr 3 S *Prereq 6 credits in sociology* The contemporary family in developing industrial and post industrial societies Effects of modernization and family policies on family structures and functions

Soc 490 Independent Study Cr 1 to 3 each time taken *Prereq 6 credits in sociology and permission of instructor* Students in the College of Agriculture must be of junior or senior classification and may use no more than 6 credits of Soc 490 toward the total of 128 credits required for graduation Students in the College of Liberal Arts and Sciences may count no more than 9 credits of 490 toward graduation
A General Sociology
B Rural Sociology
H Honors
E Senior Seminar

Soc 496 Agriculture and Rural Development in Ireland (3 0) Cr 3 S Comparative analysis of the agricultural and rural development needs of Ireland and the U S Course involves a 2 week tour of the Irish countryside where students can observe and experience small town and farm life

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Soc 505 History of Social Thought (3-0) Cr 3 F *Prereq 401* Reviews the historical origins of social ideas about society how social thought has evolved throughout history and how these affect modern sociological thinking

Soc 509 Agroecosystem Analysis (Co listed with Agron 509 Anthr 509 SusAg 509) (3 0) Cr 3 F *Prereq 6 credits in social sciences 6 credits in natural biological or engineering sciences and senior or above classification* Field study of commercial farming systems within the context of global energy flows and biogeochemical cycles including ecological agronomic and social perspectives

Soc 511 Intermediate Research Methods (2 2) Cr 3 S *Prereq 302 and Stat 401* Research methods in sociology including problem selection research design hypothesis formulation sampling alternative data collection techniques Designing a research strategy appropriate for a variety of social science questions and assessing the appropriateness validity and generalizability of published sociological research

Soc 512 Sociological Measurement (3-0) Cr 3 Alt F offered 2004 *Prereq 511* Reliability and validity for observed and latent variables exploratory and confirmatory factor analysis in the construction and evaluation of measurement models Applications using LISREL AMOS and other programs

Soc 513 Qualitative Research Methods (2 2) Cr 3 Alt F offered 2003 *Prereq 511* Applied qualitative research methods in sociology Design and implementation of a course based research project including data collection analysis and presentation of results Qualitative data gathering techniques using observational historical in-depth interviewing or content analysis approaches Laboratory emphasis on completion of data gathering analysis and report writing

Soc 515 Sociology of Technology (3-0) Cr 3 Off campus and nonmajors only Offered as demand warrants *Prereq 6 hours of social science* Linkages among science technology and society Physical life and social science approaches to technology evaluation Public responses to complex and controversial technologies Strategies for gaining adoption/rejection of technology Required in the Master of Agriculture program

Soc 520 Social Psychology A Sociological Perspective (3 0) Cr 3 Alt F offered 2004 *Prereq 305 or Psych 280* Examination of cognitive symbolic interaction exchange role reference group and dramaturgical approaches Assessment of contemporary issues in social psychology

Soc 521 Small Groups (3 0) Cr 3 Alt F offered 2003 *Prereq 305 or Psych 280* Examination of alternative theoretical models and methods of studying small groups

Soc 522 Attitude and Attitude Change (3 0) Cr 3 Alt S offered 2005 *Prereq 305 or Psych 280* Analysis of theories of attitude and attitude change current controversies between the theories examined as well as supporting research

Soc 528 Sociology of Gender (Same as W S 528) (3-0) Cr 3 Alt F offered 2003 *Prereq 6 credits in sociology* Examination of the social construction of gender and the social organization of gender inequality Analysis of gender identity in socialization interpersonal behavior the media and the economy Investigation of the intersection of gender race and class

Soc 529 Racial and Ethnic Inequality (3 0) Cr 3 Alt S offered 2005 *Prereq 6 credits in sociology* Analysis of racial and ethnic inequality in the United States and the world focus on the implications of the changing world social and economic order for differences in racial and ethnic groups relative to wealth status and power a critical examination of majority-group domination of minority groups in various societies

Soc 530 Social Organization (3-0) Cr 3 Alt S offered 2004 *Prereq 6 credits in sociology* Methodological and analytical issues associated with the study of group structure contemporary theories of social organization

Soc 532 Organizations and Their Environments (3-0) Cr 3 Alt F offered 2004 *Prereq 6 credits in sociology* Comparative analysis of complex organizations complex organizations as semi-open systems Interorganizational relations and organizational effectiveness

Soc 533 Models of Community (3 0) Cr 3 Alt F offered 2003 *Prereq 6 credits in sociology* Emphasis on different models or frames of reference used in community analysis Theoretical and methodological tools current views of community problems and explanation of social and cultural change are presented for each model

Soc 534 Social Stratification (3-0) Cr 3 Alt S offered 2004 *Prereq 6 credits in sociology* Critical examination of the causes and consequences of social stratification and inequality classical theories contemporary frameworks and recent empirical studies international stratification patterns

Soc 535 Urban Sociology (3 0) Cr 3 Alt S offered 2005 *Prereq 6 credits in social sciences* Theoretical conceptual and methodological approaches to understanding transformation of urban society in comparative perspective interrelations among demographic social economic and political dimensions of persistent urban problems and of urban development examination of case studies

Soc 541 Technological Innovation Social Change and Development (Same as T SC 541 U St 541) (3-0) Cr 3 Alt F offered 2004 *Prereq 6 credits in social sciences* Sources theories and models of technological innovation social and institutional contexts of technology transfer appropriate/intermediate technology issues and methods of impact assessment planning technology related social change democratic control of technological innovations and application local and international case studies

Soc 542 Rural Development (3 0) Cr 3 Alt S offered 2005 *Prereq 6 credits in sociology* Sociological perspectives on contemporary theory and practice in rural development Emphasis on the U S with international comparisons Rural development approaches examined in a global context The role of local state and national agencies institutions of higher education and the private sector in rural development will be assessed

Soc 544 Sociology of Food and Agricultural Systems (3 0) Cr 3 Alt F offered 2003 *Prereq 6 credits in sociology* Social organization of food and fiber production processing and distribution systems Sociological comparison of conventional and alternative production systems gender roles in agriculture and food systems local national and global food systems perspectives on food and agricultural research and policy

Soc 546 Organizational Strategies for Diversified Farming Systems (Co listed with SusAg 546 Hort 546 Agron 546) (3-0) Cr 3 Alt S offered 2004 *Prereq SusAg 509* Organization and operation of complex diversified farming systems Topics include systems analysis ecological diversity agronomic diversity economic diversity social diversity analytical frames for evaluating farming system sustainability and problem solving Participation in several field trips to Iowa farms is required

Soc 547 Sociology of Adoption and Diffusion (3 0) Cr 3 Alt S offered 2004 *Prereq 6 credits in sociology* Sociological and social psychological theories related to adoption and diffusion of new ideas analysis of adoption and diffusion models methods of field research factors related to rates and intensity of adoption and diffusion new directions in diffusion research

Soc 548 Sociology of the Environment (3-0) Cr 3 Alt F offered 2004 *Prereq 6 credits in sociology* Social causes and social consequences of environmental problems Interrelationship between social inequality and environmental inequality Social construction and social experience of the environment Contemporary developments in the social theory of the environment International and domestic implications

Soc 561 The Life Course (Same as Geron 561) (3 0) Cr 3 Alt F offered 2003 *Prereq 6 credits in sociology* Examination of the basic principles of life course theory as well as relationship and family issues within several life course stages Topics to be covered include adolescence and the transition to adulthood union formation and dissolution work/family conflict parenthood caring for aging parents and aging in general

Soc 564 Community Action Practice and Theory (3 0) Cr 3 Alt F offered 2004 *Prereq 6 credits in sociology* Methods of planning organizing and conducting planned social change and other action programs in communities strategies of change change agent roles client need identification community organization strategies citizen participation leadership identification and development program planning and evaluation

Soc 566 Political Sociology (3 0) Cr 3 Alt S offered 2005 *Prereq 6 credits in sociology and/or political science* The relationship between state and society with emphasis on American society Analysis of theoretical frameworks political participation power social movements elites democracy and capitalist society

Soc 582 Theories of Social Deviance (3-0) Cr 3 Alt F offered 2003 *Prereq 6 credits in sociology* Theory and research regarding causes of and reactions to deviant behavior Mental illness homicide family violence and property crime are among the types of deviant behavior considered

Soc 583 Sociology of Mental Health (3 0) Cr 3 Alt S offered 2004 *Prereq 6 credits in sociology* A review of contemporary sociological research and theory in mental health social implications of the incidence and prevalence of mental disorders in various populations the social antecedents and consequences of mental health

Soc 584 Current Issues in Crime and Justice (3 0) Cr 3 Alt S offered 2005 *Prereq 6 credits in sociology* Discussion of current research and theory in crime and delinquency topics include the purpose and role of law in social life emerging theoretical directions in criminology recent work on specific forms of criminality controversies in the criminal justice system

Soc 585 Current Research in Family Sociology (3 0) Cr 3 Alt F offered 2004 *Prereq 6 credits in sociology* Course presents a general overview of the field of family sociology Topics to be covered include demographic trends family theory and empirical research as well as current debates in the discipline

Soc 590 Special Topics Cr 1 to 3 each time taken *Prereq 6 credits in sociology senior or graduate classification*
A General Sociology
B Rural Sociology

Soc 591 Orientation to Sociology (1-0) Cr R F *Prereq Formal admission into the sociology graduate program* Introduction to the department current graduate student policies at department and university levels departmental administrative procedures Required of graduate students Offered on a satisfactory fail grading basis only

Soc 592 Teaching Sociology (3-0) Cr 3 Alt F offered 2003 *Prereq Graduate classification in sociology* Pedagogical and substantive issues in the teaching of sociology at the college level focusing on course organization instructional objectives techniques of presentation and instruments for evaluation of learning and instruction

Soc 599 Research for Master s Thesis
A General Sociology
B Rural Sociology

Courses for Graduate Students

Soc 607 Contemporary Sociological Theory (3 0) Cr 3 S *Prereq 6 graduate credits in sociology* Provides a review of modern sociological thought issues and controversies as they affect current research and discourse in the discipline

Soc 610 Society and Technology in Sustainable Food System (Co listed as SusAg 610 A E 610 cross listed as Agron 610) (3 0) Cr 3 Alt S offered 2005 *Prereq SusAg 509* Social and technological dimensions of sustainability in food systems Emphasis on ethics and strategies for evaluating existing and emerging options

Soc 613 Advanced Theory Construction and Causal Modeling (3 0) Cr 3 Alt S offered 2004 *Prereq 512 and Stat 404* Formal strategies of research design and analysis using structural equations with latent variables Strategies for the analysis of multi informant and panel data with emphasis on distributional problems and diagnostics

Soc 640 Comparative Social Change (3 0) Cr 3 Alt F offered 2003 *Prereq 6 graduate credits in sociology* Contemporary theories of social change modernization dependency and development are critically examined methodological issues identified supporting research explored applicability of theoretical models concepts and strategies to current national and international needs are evaluated

Soc 675 Current Topics in Family and the Life Course (3 0) Cr 3 Alt S offered 2004 Current developments in a selected field in the sociology of family and the life course

Soc 698 Seminars in Sociology (3 0) Cr 3 each
A Family and Life Course
B Methodology
C Community Studies and Development
D Social Change and Development
E Social Deviance and Mental Health
G Social Organization
H Social Psychology
I Social Inequality
J General
K Food Systems Agriculture and Environment

Soc 699 Dissertation Research
A General Sociology
B Rural Sociology

Speech Communication

(Administered by the College of Liberal Arts and Sciences)

Undergraduate Study

The cross-disciplinary program in speech communication offers introductory courses designed for all students as part of their general education as a complement to professional training and as an introduction to further study within the discipline

Students who major or minor in speech communication can prepare themselves for a wide variety of future employment opportunities depending upon individual interests background and abilities Present curricula can prepare students for the study of law or theology for positions in business and industry or education and for graduate level work in speech communication or related disciplines

A student electing to major in speech communication must meet the particular requirements of one of the following options interpersonal and rhetorical communication or speech education (bachelor of arts)

The general requirement for majors in speech communication is that no credits in 290 499 and 590 may be applied toward the minimum required credits within any prescribed option (IRC 33 credits SpEd 41 credits) Specific requirements for the major in speech communication with its various options are listed under their respective descriptions

The English proficiency requirement may be met by (1) completion of Engl 104 105 (or 105H) or its equivalent with a grade in each of 2 0 or better (2) one additional writing course beyond Engl 105 with a *grade of 2 0 or better from the following approved list* Engl 302-305 309 314 415 JI MC 201

The requirements for minors in speech communication may be fulfilled by credit in Sp Cm 212 plus at least 15 additional hours of which 9 credits are in courses numbered 300 or above All 15 credits must be taken within interpersonal and rhetorical communication No credits in 290 490 499 and 590 may apply toward the minor

The program participates in the following interdisciplinary undergraduate minor programs the interdisciplinary program in linguistics and the interdisciplinary program in technology and social change and the undergraduate program in gerontology

Speech Communication Education

Students seeking endorsement to teach speech as an additional area prepare to teach speech communication dramatic arts and media at the secondary school level In addition they prepare to direct co-curricular and extra curricular activities

Each student seeking an additional endorsement in speech communication must fulfill the requirements outlined in the Teacher Education section of this bulletin

Interpersonal and Rhetorical Communication (Sp Cm)

The interpersonal and rhetorical communication area provides a thorough understanding of communication theories principles and applications Students will be required to complete courses which provide a solid grounding in the theories of communication the nature of rhetorical principles in communication and the role of communication in creating maintaining and changing human relationships The following courses are required for an emphasis in interpersonal and rhetorical communication ComSt 101 Sp Cm 212 305 327 412 and 497 (Capstone Seminar) plus an additional 15 credits from courses in interpersonal and rhetorical communication (Sp Cm)

Emphasis in the area prepares students for graduate study the study of law or theology to teach speech communication in high school or enter a variety of communication related careers and occupations in business and professional organizations Communication internships in business and professional settings are available for qualified students The area s courses also provide a minor concentration for students in business English journalism foreign languages and literatures and the social sciences

Theatre

The theatre program is administered by the Department of Music (see *Index*)

Graduate Study

The program offers courses for a graduate minor in speech communication as well as supporting work for other disciplines The Program of Speech Communication also participates in the interdepartmental program leading to a master s degree in Interdisciplinary Graduate Studies

Courses open for nonmajor graduate credit Sp Cm 305 321 323 327 410 412 and 417

Communication Studies (ComSt)

The communication studies major is administered by the Greenlee School of Journalism and Communication (see *Index*)

Interpersonal and Rhetorical Communication (Sp Cm) Courses Primarily for Undergraduate Students

Sp Cm 110 Listening (3 0) Cr 3 FS SS Theory principles and competency development in comprehensive therapeutic critical consumer and appreciative listening The impact of listening in relationships and partnerships

Sp Cm 205 Popular Culture Analysis (Same as Engl 205) See *English*

Sp Cm 212 Fundamentals of Public Speaking (3 0) Cr 3 FS SS Theory and practice of basic speech communication principles applied to public speaking Practice in the preparation and delivery of extemporaneous speeches

Sp Cm 223 Intercollegiate Debate and Forensics Cr 1 each time taken maximum of 6 credits FS *Prereq Permission of instructor* Participation in intramural and intercollegiate debate and other forensic events

Sp Cm 290 Special Projects Cr 1 to 2 each time taken maximum of 4 credits FS SS *Prereq 3 credits in speech communication permission of department chair*

Sp Cm 305 Semantics (3 0) Cr 3 FS SS *Prereq Engl 105* The study of symbolic processes and how meaning is encoded in words phrases sentences and utterances discussion of modern theories of meaning and an exploration of relationships among language thought and action Nonmajor graduate credit

Sp Cm 312 Business and Professional Speaking (3 0) Cr 3 FS SS *Prereq 212* Theory principles and competency development in the creation of coherent articulate business and professional oral presentations

Sp Cm 313 Communication for the Classroom Teacher (3 0) Cr 3 S SS *Prereq 212* Communication in the teaching profession training in classroom oriented communication activities use of video recorder for analysis of presentation

Sp Cm 321 Communication with the Elderly (Same as Geron 321) (3 0) Cr 3 S Communication theory and practice presented with applications and strategies for interactions with elderly persons Interpersonal competencies in social conversations and interviewing developed Nonmajor graduate credit

Sp Cm 322 Argumentation, Debate and Critical Thinking (3 0) Cr 3 FSS *Prereq 212* Practice in preparing and presenting *argumentative and debate* speeches emphasis on critical thinking and ethical and logical duties of the advocate analysis evidence reasoning attack defense research case construction and judging

Sp Cm 323 Gender and Communication (Same as W S 323) (3-0) Cr 3 F *Prereq 212* The rhetorical strategies women and men use to succeed in oral communication the theory principles and practice of effective gender communication in a variety of settings Nonmajor graduate credit

Sp Cm 324 Legal Communication (3-0) Cr 3 S *Prereq 212* Speech communication in the legal system inside and outside the trial process interviewing and counseling negotiating and bargaining voir dire opening statements examination of witnesses closing arguments judge s instructions jury behavior and appellate advocacy

Sp Cm 325 Nonverbal Communication (Same as ComSt 325) See *Communication Studies*

Sp Cm 327 Persuasion (3-0) Cr 3 FS SS *Prereq 212* Examination of persuasive theories strategies and research in persuasion Emphasis on application and analysis logical emotional and ethical proofs Nonmajor graduate credit

Sp Cm 350 Rhetoric and the History of Ideas (Same as Engl 350) See *English*

Sp Cm 404 Seminar (Dual listed with 504) Cr 3 each time taken maximum of 9 *Prereq 18 credits in speech communication*
A Interpersonal and Rhetorical Communication
B Speech Education

Sp Cm 410 Persuasion in the Athenian Democracy (Same as Cl St 410) See *Classical Studies*

Sp Cm 412 Rhetorical Criticism (3-0) Cr 3 S *Prereq 212 and 6 credits in speech communication* Development of rhetorical theory and practice from Corax to modern times Application of principles of criticism to current public speaking practices Nonmajor graduate credit

Sp Cm 416 American Public Address (3-0) Cr 3 S Relationship between public persuasions and leaders process of preparing major public addresses selected speakers and speeches as linked with political or historical events

Sp Cm 417 Campaign Rhetoric (Same as Pol S 417) (3-0) Cr 3 Alt F offered 2004 *Prereq 212* Backgrounds of candidates for state and national elections selected speeches and issues persuasive strategies and techniques of individual speakers Nonmajor graduate credit

Sp Cm 490 Independent Study Cr 1 to 3 each time taken maximum of 9 FS SS *Prereq 18 credits in speech communication junior classification permission of department chair* Only one independent study enrollment is permitted within the department per semester

Sp Cm 495A Directing Speech Activities (1-0) Cr 1 S *Prereq C I 301 9 credits in speech communication minimum grade point of 2 5 in speech communication courses* Problems methods and materials related to directing speech activities in secondary schools

Sp Cm 495B Teaching Speech (Same as C I 495B) (3 0) Cr 3 F *Prereq Sp Cm 313 9 credits in speech communication minimum grade point average of 2 5 in speech communication courses* Problems methods and materials related to teaching speech theatre and media in secondary schools

Sp Cm 497 Capstone Seminar (3-0) Cr 3 S *Prereq 15 credits in speech communication junior or senior classification* Students synthesize relevant theory and research culminating in a capstone project/paper

Sp Cm 499 Communication Internship Cr var 1 to 3 each time taken maximum of 6 FS SS *Prereq 18 credits in speech communication courses other courses deemed appropriate by faculty adviser 2nd semester junior or senior standing cumulative GPA of at least 2 5 overall and 3 0 in speech communication and permission of the internship committee* Applications should be submitted in the term prior to the term in which the internship is desired Supervised application of interpersonal and rhetorical communication in professional settings

Courses Primarily for Graduate Students, open to qualified undergraduates

Sp Cm 504 Seminar (Dual listed with 404) Cr 3 each time taken maximum of 9 F S SS *Prereq 9 credits in speech communication* Topics may include the following
A Interpersonal and Rhetorical Communication
B Speech Education

Sp Cm 513 Proseminar Teaching Fundamentals of Public Speaking (0 2) Cr 1 F Required of all new Speech Communication 212 teaching assistants Introduction to the teaching of public speaking Support and supervision of teaching assistants of Sp Cm 212 Discussion of lesson planning teaching methods development of speaking assignments and evaluation of student speaking

Sp Cm 590 Special Topics Cr 1 to 4 each time taken maximum of 12 credits *Prereq Permission of department chair*

Statistics

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Kenneth J Koehler Interim Chair of Department

Distinguished Professors Athreya Meeker

University Professors Koehler Lorenz Stephenson

Professors Amemiya Bailey Bonett Brendel Carriquiry Dixon Isaacson Kennedy Lahiri Morris Shelley Vardeman Wolter

Professors (Collaborators) Therneau

Distinguished Professors (Emeritus) Herbert A David Fuller

University Professors (Emeritus) D Cox Herbert T David Groeneveld Hinz

Professors (Emeritus) C P Cox Harville Hickman Hotchkiss Pollak Strahan Wolins

Associate Professors Cook Kaiser Marasinghe Nettleton Nusser Opsomer Roberts Rollins Sherman Yang

Associate Professors (Emeritus) Sukhatme

Assistant Professors Adams Dorman Duckworth Evans Froelich Hofmann Huang Maiti Wu

Assistant Professors (Collaborators) Sargent Sloan

Undergraduate Study

For the undergraduate curriculum in liberal arts and sciences major in statistics leading to the degree bachelor of science see *Liberal Arts and Sciences Curriculum*

The curriculum in liberal arts and sciences with a major in statistics is designed to prepare students for (1) entry level statistics positions requiring the B S degree in statistics in business industry or commerce nonprofit institutions and in state or federal government (2) graduate study in statistics Entry level positions include the following types of work statistical design analysis and interpretation of experiments and surveys data processing and analysis using modern computation facilities and statistical computing systems application of statistical principles and methods in commercial areas such as finance insurance industrial research marketing manufacturing and quality control Nonprofit organizations such as large health study institutions have entry level positions for B S graduates in statistics Also there are opportunities for work in statistics that require a major in a subject matter field and a minor in statistics

Students completing the undergraduate degree in statistics should have a broad understanding of the discipline of statistics They should have a clear comprehension of the theoretical basis of statistical reasoning and should be proficient in the use of modern statistical methods and computing Such graduates should have an ability to apply and convey statistical concepts and knowledge in oral and written form They should be aware of ethical issues associated with polling and surveys and in the summarization of the outcomes of statistical studies

Undergraduate majors in this department usually include in their programs (a) Statistics 101 or an alternative introductory course (104 or 226) (b) Mathematics 165 166 265 (or 165H 166H 265H) 307 (or 317) and Computer Science 207 and (c) Statistics 341 342 401 402 421 479 480

These courses plus at least two additional courses in statistics at the 400 level or above constitute the major With the permission of the department I E/Stat 361 may be substituted for one of these 400 level courses It is advisable to have a minor in a field of application

The department offers a minor in statistics which may be earned by completing an introductory course in statistics plus additional courses from 341 342 361 and 400 level or above to yield a total of at least 15 credits in statistics courses

English and Speech proficiency requirement The department requires a grade of C– or better in each of Engl 104 and 105 (or 105H) and completion of one of Engl 302 or 314 with a grade of C or better The department requires a passing grade in ComSt 102 or Sp Cm 212

Students intending to do graduate work in statistics normally will take additional courses in mathematics

Graduate Study

The department offers the degrees master of science and doctor of philosophy with a major in statistics and minor work for students majoring in other departments Within the statistics major the student choose to emphasize topics such as experimental design probability statistical methods statistical theory statistical computing survey sampling quality control spatial statistics time series reliability or applied statistics (e g biometrics econometrics environmental statistics psychometrics sociometrics etc) A major in operations research leading to a master of science degree is offered in cooperation with the Department of Industrial and Manufacturing Systems Engineering The doctor of philosophy degree is offered as a co major with other departments Such departments have included Animal Science Botany Economics Educational Leadership and Policy Studies Genetics Industrial and Manufacturing Systems Engineering Mathematics Meteorology and Psychology

M S graduates have a basic understanding of statistical theory and methods Elective courses in statistics provide the opportunity for the student to emphasize particular areas within the field of statistics based on interest and future career goals Communication skills are developed through course projects assistantship duties and creative components Ph D graduates study advanced theory and methods and are able to do independent research in statistics and collaborative research outside of statistics

Prerequisite to major graduate work is the completion of an undergraduate curriculum essentially equivalent to the curriculum in liberal arts and sciences at this institution including at least a year of calculus

The degree master of science may be earned on either a thesis or nonthesis basis The nonthesis option requires the completion of at least 34 credits of acceptable graduate work including the completion of a creative component and satisfactory performance on a written examination The thesis option requires the completion of 34 credits of acceptable graduate work including the completion of a thesis and satisfactory performance on a written examination

The department encourages students to prepare themselves in foreign languages and in computer languages but specific requirements for the degrees master of science and doctor of philosophy are at the discretion of the student s advisory committee

The department participates in the interdisciplinary program in business administrative sciences and in the interdepartmental major in genetics

Courses open for nonmajor graduate credit 328 330 361 401 402 403 404 406 407 415 421 432 447 451 479 480 493 495 496

Courses Primarily for Undergraduate Students

Stat 100 Orientation in Statistics (1 0) Cr R F Opportunities challenges and the scope of the curriculum in statistics For students planning or considering a career in this area

Stat 101 Principles of Statistics (3 2) Cr 4 F S SS *Prereq 1 1/2 years of high school algebra* Statistical concepts in modern society descriptive statistics and graphical displays of data the normal distribution data collection elementary probability elements of statistical inference estimation and hypothesis testing linear regression and correlation contingency tables Credit for only one of the following courses may be applied toward graduation 101 104 105 226

Stat 104 Introduction to Statistics (2 2) Cr 3 F S SS *Prereq 1 1/2 years of high school algebra* Statistical concepts and their use in science collecting organizing and drawing conclusions from data elementary probability binomial and normal distributions regression estimation and hypothesis testing For students in the agricultural and biological sciences Credit for only one of the following courses may be applied toward graduation 101 104 105 226

Stat 105 Introduction to Statistics for Engineers (3 0) Cr 3 F S *Prereq Math 165 (or 165H)* Statistical concepts with emphasis on engineering applications Data collection descriptive statistics probability distributions and their properties elements of statistical inference regression statistical quality control charts use of statistical software team project involving data collection description and analysis Credit for only one of the following courses may be applied toward graduation 101 104 105 226 Credit for both 105 and 305 may not be applied for graduation

Stat 226 Introduction to Business Statistics I (3-0) Cr 3 F S SS *Prereq Math 150 or 165* Obtaining presenting and organizing statistical data measures of location and dispersion the Normal distribution sampling and sampling distributions estimation and confidence intervals interference for simple linear regression analysis use of computers to visualize and analyze data Credit for only one of the following courses may be applied toward graduation 101 104 105 226

Stat 231 Probability and Statistical Inference for Engineers (4-0) Cr 4 F S *Prereq Credit or enrollment in Math 265* Emphasis on engineering applications Basic probability random variables and probability distributions joint and sampling distributions propagation of error Descriptive statistics confidence intervals hypothesis testing simple linear regression multiple linear regression one way analysis of variance use of statistical software

Stat 305 Engineering Statistics (3 0) Cr 3 F S SS *Prereq Math 165 (or 165H)* Statistics for engineering problem solving Principles of engineering data collection descriptive statistics elementary probability distributions principles of experimentation confidence intervals and significance tests one two and multi sample studies regression analysis use of statistical software team project involving engineering experimentation and data analysis Credit for both 105 and 305 may not be applied for graduation

Stat 322 Probabilistic Methods for Electrical Engineers (Same as E E 322) (3 0) Cr 3 F S *Prereq E E 224* Introduction to probability with applications to electrical engineering Sets and events probability reliability of systems Discrete and continuous random variables associated probability modes extensions to multivariate random vectors Expectation moments correlation functions of random variables Random processes

Stat 326 Introduction to Business Statistics II (2 2) Cr 3 FS *Prereq 226* Multiple regression analysis regression diagnostics model building applications in analysis of variance and time series statistical process control methods use of computers to visualize and analyze data

Stat 328 Applied Business Statistics (2 2) Cr 3 FS *Prereq 326 primarily for MBA students* Application of statistical methods to problems in business and economics review of multiple regression residual analysis model building analysis of variance introduction to experimental design concepts time series analysis and forecasting Nonmajor graduate credit

Stat 330 Probability and Statistics for Computer Science (3 0) Cr 3 FS *Prereq Math 166* Topics from probability and statistics applicable to computer science Basic probability Random variables and their distributions Elementary probabilistic simulation Queuing models Basic statistical inference Introduction to regression Nonmajor graduate credit

Stat 341 Introduction to the Theory of Probability and Statistics I (Same as Math 341) (3-0) Cr 3 FS *Prereq Math 265 (or 265H)* Probability distribution functions and their properties classical discrete and continuous distribution functions moment generating functions multivariate probability distributions and their properties Credit for both 341 and 447 may not be applied toward graduation

Stat 342 Introduction to the Theory of Probability and Statistics II (Same as Math 342) (3 0) Cr 3 S *Prereq 341 Math 307 or 317* Sampling distributions confidence intervals theory of estimation and tests of hypotheses linear model theory enumerative data

Stat 361 Statistical Quality Assurance (Same as I E 361) See *Industrial Engineering* Nonmajor graduate credit

Stat 398 Cooperative Education Cr R FS SS *Prereq Permission of department chair* Off campus work periods for undergraduate students in a field of statistics

Stat 401 Statistical Methods for Research Workers (3 2) Cr 4 FS SS *Prereq 101 or 104 or 105 or 226* Graduate students without an equivalent course should contact the department Methods of analyzing and interpreting experimental and survey data Statistical concepts and models estimation hypothesis tests with continuous and discrete data simple and multiple linear regression and correlation introduction to analysis of variance Nonmajor graduate credit

Stat 401I Statistical Methods for Field Biologists (Same as Ia LL 401I) See *Iowa Lakeside Laboratory*

Stat 402 Statistical Design and the Analysis of Experiments (3 0) Cr 3 FS *Prereq 401* The role of statistics in research and the principles of experimental design Experimental units randomization replication blocking subdividing and repeatedly measuring experimental units factorial treatment designs and confounding extensions of the analysis of variance to cover general crossed and nested classifications and models that include both classificatory and continuous factors Nonmajor graduate credit

Stat 403 Distribution Free and Nonparametric Statistical Methods (3-0) Cr 3 Alt F offered 2003 *Prereq 231 or 328 or 401* Statistical inference for non normally distributed data analysis of rank data efficiency of distribution free procedures and robustness of comparable normal theory procedures nonparametric modeling Nonmajor graduate credit

Stat 404 Regression for Social and Behavioral Research (2 2) Cr 3 F *Prereq 401* Lorenz Roberts *Applications of generalized linear regression models* to social science data Assumptions of regression diagnostics and transformations analysis of variance and covariance path analysis Nonmajor graduate credit

Stat 406 Statistical Methods for Spatial Data (Dual listed with 506) (3-0) Cr 3 Alt S offered 2004 *Prereq Six hours of statistics at the 400-level* The analysis of spatial data geostatistical methods and spatial prediction discrete index random fields and Markov random field models models for spatial point processes Emphasis on application and practical use of spatial statistical analysis Nonmajor graduate credit

Stat 407 Methods of Multivariate Analysis (2 2) Cr 3 F *Prereq 401 knowledge of matrix algebra* Carriquiry Cook Techniques for analyzing multivariate data including comparing group mean vectors using Hotelling s T2 multivariate analysis of variance reducing variable dimension with principal components grouping/classifying observations with cluster analysis and discriminant analysis Imputation of missing multivariate observations Nonmajor graduate credit

Stat 415 Advanced Statistical Methods for Research Workers (2 2) Cr 3 Alt S offered 2005 *Prereq 401* Advanced statistical methods using modern computer methods for modeling and analyzing data Examples from a wide variety of scientific and engineering disciplines Nonmajor graduate credit

Stat 421 Survey Sampling Techniques (2 2) Cr 3 S *Prereq 231 or 328 or 401* Methods of designing and analyzing survey investigations simple random stratified and multistage sampling designs methods of estimation including ratio and regression construction and use of sample frames Nonmajor graduate credit

Stat 432 Applied Probability Models (3-0) Cr 3 F *Prereq 231 or 341 or 447* Probabilistic models in biological engineering and the physical sciences Markov chains Poisson birth and-death renewal branching and queing processes applications to bioinformatics and other quantitative problems Nonmajor graduate credit

Stat 447 Statistical Theory for Research Workers (4-0) Cr 4 FS SS *Prereq Math 151 and permission of instructor or Math 265* Primarily for graduate students not majoring in statistics Emphasis on aspects of the theory underlying statistical methods Probability population distributions and their properties sampling distributions point and interval estimation tests of hypotheses simple regression Credit for both 341 and 447 may not be applied toward graduation Nonmajor graduate credit

Stat 451 Applied Time Series (3-0) Cr 3 S *Prereq 231 or 328 or 401* Meeker Methods for analyzing data collected over time review of multiple regression analysis Elementary forecasting methods moving averages and exponential smoothing Autoregressive moving average (Box Jenkins) models identification estimation diagnostic checking and forecasting Transfer function models and intervention analysis Nonmajor graduate credit

Stat 479 Computer Processing of Statistical Data (3-0) Cr 3 F *Prereq 401* Marasinghe Structure content and programming aspects of a modern statistical package Advanced techniques in the use of a statistical software system for data analysis Introduction to graphical methods in statistics and a macro programming language Currently SAS is the software system used Nonmajor graduate credit

Stat 480 Statistical Computing Applications (3-0) Cr 3 S *Prereq 231 or 328 or 401* Modern statistical computing Data management spread sheets verifying data accuracy transferring data between systems Data and graphical analysis with microcom puter statistical software packages Macro program ming Algorithmic programming concepts and applications Simulation Interface with the World Wide Web Software reliability Nonmajor graduate credit

Stat 490 Independent Study Cr var *Prereq 10 credits in statistics* No more than 9 credits in Stat 490 may be counted toward graduation H Honors

Stat 493 Workshop in Statistics (1-0 or 2 0) Cr 1 or 2 Off-campus offered as demand warrants *Prereq 101 or 104 or 226* Planning executing and interpret ing experiments by understanding experimental design and utilizing the statistical concepts of linear models Designed for master of agriculture program only Nonmajor graduate credit

Stat 495 Applied Statistics for Industry I (3-0) Cr 3 Alt F offered 2004 *Prereq 101 or 104 or 105 or 226 Math 166 (or 166H)* Graduate students without an equivalent course should consult the department Statistical thinking applied to industrial processes Assessing monitoring and improving processes using statistical methods Analytic/enumerative studies graphical displays of data process monitoring control charts capability analysis Nonmajor graduate credit

Stat 496 Applied Statistics for Industry II (3 0) Cr 3 Alt S offered 2005 *Prereq 495* Statistical design and analysis of industrial experiments Concepts of control randomization and replication Simple and multiple regression factorial and fractional factorial experiments reliability analysis of lifetime data Nonmajor graduate credit

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Stat 500 Statistical Methods (3 2) Cr 4 F *Prereq 101* Introduction to methods for analyzing data from experiments and surveys Graphical data summaries Comparison of groups using t tests analysis of variance and nonparametric analogs Uses of randomization blocking factorial designs and nested units in experiments Correlation and regression models model selection and assessment effects of collinearity Introduction to SAS statistical software

Stat 501 Multivariate Statistical Methods (3-0) Cr 3 S *Prereq 500 or 402 447 or 542 knowledge of matrix algebra* Statistical methods for analyzing and displaying multivariate data dynamic graphics principal components factor analysis canonical correlations cluster analysis classification methods Hotelling s T2 multivariate analysis of variance Statistical software SAS S Plus and GGobi

Stat 503 Exploratory Methods and Data Mining (2 2) Cr 3 Alt S offered 2005 *Prereq 401 341 or 447* Approaches to finding the unexpected in data pattern recognition classification association rules graphical methods classical and computer intensive statistical techniques and problem solving Emphasis is on data-centered non inferential statistics for large or high-dimensional data topical problems and building report writing skills

Stat 505 Environmental Statistics (2 2) Cr 3 Alt S offered 2004 *Prereq 341 or 447 401* Basic ideas of statistical modeling for environmental applications causation versus association ecotoxicology limits of detection spatial statistics geostatistics kriging spatial sampling hierarchical modeling Bayesian methodology

Stat 506 Statistical Methods for Spatial Data (Dual listed with 406) (3-0) Cr 3 Alt S offered 2004 *Prereq 447 or 542* The analysis of spatial data geostatistical methods and spatial prediction discrete index random fields and Markkov random field models models for spatial point processes

Stat 511 Statistical Methods (3-0) Cr 3 S *Prereq 500 or 402 or 404 447 or 542 and current enrollment in 543 knowledge of matrix algebra* Introduction to the general theory of linear models least squares and maximum likelihood estimation hypothesis testing analysis of unbalanced designs models with both fixed and random factors Introduction to non linear and generalized linear models bootstrap estimation local smoothing methods Requires use of S Plus statistical software

Stat 512 Design of Experiments (3 0) Cr 3 F *Prereq 511* Basic ideas of experimental design and analysis completely randomized randomized complete block and Latin Square designs randomiza tion analysis factorial experiments confounding fractional replication split plot and incomplete block designs crossover designs

Stat 513 Response Surface Methodology (3 0) Cr 3 Alt S offered 2004 *Prereq 402 or 512 knowledge of elementary matrix theory and matrix formulation of regression* Morris Analysis techniques for locating optimum and near-optimum operating conditions standard experimental designs for first and second-order response surface models design performance criteria use of data transformations mixture experiments optimization for multiple response problems Requires use of statistical software with matrix functions

Stat 515 Theory and Applications of Nonlinear Models (3 0) Cr 3 F *Prereq 447 or 543 511* Kaiser Construction of nonlinear statistical models random and systematic model components review of likelihood based inferences Iterative algorithms for maximum likelihood estimation Nonlinear regression models using additive error with nonconstant variance transform both sides models generalized linear models and their extensions Introduction to compartment models growth curves and pharmacokinetic models Basic random parameter models beta binomial and gamma Poisson mixtures Requires use of instructor supplied and student written S plus functions

Stat 521 Theory and Applications of Sample Surveys (3 0) Cr 3 S *Prereq 401 447 or 542* Maiti Opsomer Practical aspects and basic theory of design and estimation in sample surveys for finite populations Simple random systematic stratified cluster multistage and unequal probability sampling Horvitz Thompson estimation of totals and functions of totals means proportions regression coefficients Linearization technique for variance estimation Model assisted ratio and regression estimation Two phase sampling and sampling on two occasions Non response effects Imputation

Stat 531 Quality Control and Engineering Statistics (Same as I E 531) (3 0) Cr 3 Alt S offered 2005 *Prereq 401 342 or 447* Vardeman Statistical methods and theory applicable to problems of industrial process monitoring and improvement Statistical issues in industrial measurement Shewhart CUSUM and other control charts feedback control process characterization studies estimation of product and process characteristics acceptance sampling continuous sampling and sequential sampling economic and decision theoretic arguments in industrial statistics

Stat 533 Reliability (Same as I E 533) (3 0) Cr 3 Alt S offered 2004 *Prereq 342 or 432 or 447* Meeker Probabilistic modeling and inference in reliability analysis of systems Bayesian aspects product limit estimator probability plotting maximum likelihood estimation for censored data accelerated failure time and proportional hazards regression models with applications to accelerated life testing repairable system data planning studies to obtain reliability data

Stat 534 Ecological Statistics (3 0) Cr 3 Alt F offered 2003 *Prereq 447 or 542* Dixon Statistical methods for analysis of data from ecological field studies Estimation of abundance from mark recapture data Deterministic and stochastic matrix models of population trends Estimation of species richness and diversity Ordination and analysis of complex multivariate data Statistical methods discussed will include randomization and permutation tests spatial point processes bootstrap estimation of standard error partial likelihood and Empirical Bayes methods

Stat 536 Genetic Statistics (Same as Gen 536) (3 0) Cr 3 Alt F offered 2004 *Prereq 401 447 Gen 320 or Biol 301* Probability applied to genetic systems random mating selection mutation and migration theory of inbreeding effects of finite population size basic concepts in quantitative genetics prediction of progress from artificial selection

Stat 537 Statistics for Molecular Genetics (Same as Gen 537) (3-0) Cr 3 Alt S offered 2005 *Prereq 536* Sampling designs and experimental designs to obtain information from markers detecting major genes linkage analysis and segregation analysis finding alignments and similarities between DNA sequences constructing phylogenetic trees

Stat 542 Theory of Probability and Statistics I (4 0) Cr 4 F *Prereq 341 Math 414 or 465* Sample spaces probability conditional probability Random variables univariate distributions expectation moment generating functions Common theoretical distributions Joint distributions conditional distributions and independence covariance Probability laws and transformations Introduction to the Multivariate Normal distribution Sampling distributions order statistics Convergence concepts the central limit theorem and delta method Basics of stochastic simulation

Stat 543 Theory of Probability and Statistics II (3 0) Cr 3 S *Prereq 542* Point estimation including method of moments maximum likelihood estimation exponential family Bayes estimators Loss function and Bayesian optimality unbiasedness sufficiency completeness Basu s theorem Interval estimation including confidence intervals prediction intervals Bayesian interval estimation Hypothesis testing including Neyman Pearson Lemma uniformly most powerful tests likelihood ratio tests Bayesian tests Nonparametric methods bootstrap

Stat 544 Bayesian Statistics (3-0) Cr 3 S *Prereq 543* Specification of probability models subjective conjugate and noninformative prior distributions hierarchical models analytical and computational techniques for obtaining posterior distributions model checking model selection diagnostics comparison of Bayesian and traditional methods

Stat 546 Theory of Nonparametric and Asymptotic Methods (3-0) Cr 3 Alt S offered 2005 *Prereq 542* Introduction to nonparametric problems tests based upon sample distribution functions rank tests for location scale and independence local properties of rank tests convergence of a sequence of random variables limit theorems asymptotic distributions of sample quantiles U statistics rank statistics chi square and other goodness of fit test statistics asymptotic efficiency of tests

Stat 551 Time Series Analysis (3 0) Cr 3 F *Prereq 447 or 542* Huang Stationary and non stationary time series covariance and spectral properties of stationary time series autoregressive moving average processes best linear prediction state space models and Kalman recursions estimation techniques model building and diagnostics

Stat 554 Introduction to Stochastic Processes (Same as Math 554) See *Mathematics*

Stat 555 Theory of Stochastic Processes (Same as Math 555) See *Mathematics*

Stat 557 Statistical Methods for Counts and Proportions (3 0) Cr 3 Alt F offered 2004 *Prereq 500 or 401 543 or 447* Koehler Statistical methods for analyzing simple random samples when outcomes are counts or proportions measures of association and relative risk chi squared tests loglinear models logistic regression and other generalized linear models extensions to longitudinal studies and complex designs models with fixed and random effects Use of statistical software SAS or S Plus

Stat 565 Methods in Biostatistics (Same as Tox 565) (3-0) Cr 3 Alt F offered 2003 *Prereq 500 543 or 447* Statistical methods useful for biostatistical problems Topics include analysis of observational studies and randomized clinical trials techniques in the analysis of survival and longitudinal data approaches to handling missing data and meta analysis Examples will come from recent studies in cancer AIDS heart disease and psychiatry and from studies to evaluate health care in the U S (health services research)

Stat 579 Orientation to Software Systems for Statistical Computing (1 0) Cr 1 F *Prereq Graduate classification in statistics* Kennedy Marasinghe Orientation to scientific and statistical software available on campus Offered on a satisfactory fail grading basis only

Stat 580 Computational Methods in Statistics (3 0) Cr 3 S *Prereq 500 542* Marasinghe Linear and nonlinear least squares and regression computations computations associated with maximum likelihood estimation problems applications of Monte Carlo methods in statistics research computer intensive applications including the bootstrap evaluation of multiple integrals EM algorithm etc Assignments will include applications of these methods using the S Plus programming language

Stat 581 Advanced Statistical Computing (3 0) Cr 3 Alt F offered 2004 *Prereq 511 580 and programming in a scientific language* Marasinghe Kennedy Numerical computations and algorithms with applications in statistics These include discussions on random number generation solution of nonlinear equations optimization methods numerical linear algebra numerical integration and approximation methods

Stat 590 Special Topics Cr var
A Theory
B Methods
C Design of Experiments
D Design of Surveys

Stat 598 Cooperative Education Cr R FS SS *Prereq Permission of the department chair* Off-campus work periods for graduate students in a field of statistics

Stat 599 Creative Component

Courses for Graduate Students

Stat 601 Advanced Statistical Methods (4 0) Cr 4 F *Prereq 511* This course is designed to provide students with computational and simulation skills needed to address curent and recent developments in statistical modelling and applications Topics may include resampling procedures Markov Chain Monte Carlo procedures for solving estimating equations nonparametric procedures analysis of large complex data sets Assignments are designed to develop problem solving and communication skills and will include application of R and other software

Stat 606 Advanced Spatial Statistics (3-0) Cr 3 Alt S offered 2005 *Prereq 506 642* General formulation of spatial models construction of nonstationary covariance functions conditional and simultaneous model specification hierarchical spatial models and Bayesian analysis random measures and point processes spatio temporal models

Stat 611 Theory and Applications of Linear Models (3-0) Cr 3 F *Prereq 500 or 402 or 404 542 or 447 a course in matrix algebra* Wu Matrix preliminaries estimability theory of least squares and of best linear unbiased estimation analysis of variance and covariance distribution of quadratic forms extension of theory to mixed and random models inference for variance components

Stat 612 Advanced Design of Experiments (3 0) Cr 3 Alt S offered 2005 *Prereq 512* Advanced topics of current interest in design of experiments which may include design optimality criteria theoretical and computational aspects of identifying optimal and efficient designs design construction tools fractional factorial designs theory of approximate designs and the equivalence theorem crossover designs with applications

Stat 621 Advanced Theory of Survey Sampling (3 0) Cr 3 Alt F offered 2004 *Prereq 521* Advanced topics of current interest in the design of surveys and analysis of survey data including asymptotic theory for design and model based estimators use of auxiliary information in estimation variance estimation techniques small area estimation non response modeling and imputation

Stat 642 Advanced Probability Theory (Same as Math 642) (4-0) Cr 4 F *Prereq 542* Athreya Lahiri Yang Probability spaces Kolmogorov s existence theorem for stochastic processes expectation

Jensen s inequality and applications Borel Cantelli lemmas Weak and strong laws of large numbers convergence of moments weak convergence of probability distributions characteristic functions continuity theorem Lindeberg Feller central limit theorem and its ramifications conditional expectation and probability discrete time martingales discrete parameter Markov chains Brownian motion

Stat 643 Advanced Theory of Statistical Inference (4-0) Cr 4 S *Prereq 543 642* Lahiri Vardeman Sufficiency completeness Elements of decision theory Bayesian paradigm of inference and theory of Markov Chain Monte Carlo Invariance Neyman Pearson theory of testing hypotheses Uniformly most powerful tests introduction to unbiased tests likelihood ratio tests Wald s tests Rao s tests Asymptotic theory of maximum likelihood estimation and likelihood ratio tests Asymptotic efficiency Resampling methods

Stat 647 Multivariate Analysis (3-0) Cr 3 F *Prereq 543 knowledge of matrix algebra* Amemiya Multivariate normal distribution Wishart distribution multiple partial and canonical correlations inference for mean vector multivariate regression principal components discriminant analysis factor analysis covariance structure analysis latent variable modeling

Stat 648 Seminar onTheory of Statistics and Probability Cr var Alt S offered 2004 *Prereq 643*

Stat 651 Time Series (3-0) Cr 3 Alt S offered 2004 *Prereq 551 642* Covariance and spectral representation of time series Stationary and nonstationary autoregressive models Fourier and periodogram analyses Stochastic difference equations Estimation and distribution theory

Stat 690 Advanced SpecialTopics Cr Var *Prereq Permission of instructor*
A Theory
B Methods
C Design of Experiments
D Design of Surveys
E Statistical Computing
F Graphics

Stat 699 Research

Sustainable Agriculture

(Interdepartmental Graduate Major)

Coordinating Committee R Salvador Chair T Richard Associate Chair M Bell L T Brumm C Brummer M Butler K Delate J Flora N Grudens Schuck M Honeyman S M Huang F Kirschenmann M Liebman C Mize J Obrycki X B Yang

The Graduate Faculty
Members in Sustainable Agriculture Acker Allen Anderson Asbjornsen Bell Blackmer Brummer Butler Cambardella Cruse Delate DeWitt Duffy C Flora J Flora Ford Gibson Gleason Grudens Schuck Hart Hartzler Hatfield Hinrichs Honeyman Huang Hurburgh Ilahiane Jannick Jones Karlen Kanwar Keeney Kirschenmann Liebman Logsdon Loynachan Mallorino Martin Mize Morton Muenchrath Mullen Munkvold Nutter Obrycki Richard Salvador Sandor Schultz Steward Thompson Trexler Xin Wells Wiedenhoeft Woodman Yang

The graduate program in sustainable agriculture is an interdepartmental major offered through faculty in ten participating departments Agricultural and Biosystems Engineering Agricultural Education and Studies Agronomy Animal Science Anthropology Entomology Forestry Horticulture Plant Pathology and Sociology M S and Ph D degrees are offered within the major

Master s students should have a bachelor s degree in one of the life social or engineering sciences or a bachelor s degree plus equivalent experience in these areas Doctoral students must have a master s degree and either an undergraduate or master s degree in one of the majors in the College of Agriculture or its equivalent

Graduates of the program will be equipped with skills to design and manage agricultural systems that increase food security enhance human communities and protect environmental quality To acquire these skills students learn agroecological principles study social relations underlying sustainable farming and food systems and gain experience with practical techniques of sustainable agriculture The program seeks to balance specialized disciplinary knowledge with broader system level analyses It integrates technical and social sciences through a sequence of team-taught interdisciplinary core courses emphasizing higher order critical thinking skills and active collaborative approaches to engaged learning Students choose an area of specialization and additional course work in this area is developed via consultation with the student s Program of Study committee

Graduates of the program will be qualified to work in a variety of settings including university research education extension agribusiness governmental and non-governmental organizations and farming

Information on applications procedures research interests of the faculty and specific requirements of the major can be obtained from the office of Dr Lorna Michael Butler Henry A Wallace Chair for Sustainable Agriculture 110 Curtiss Hall gpsa@iastate edu or from the following Internet address http // www sust ag iastate edu/gpsa

Courses for Graduate Students

SusAg 509 Agroecosystem Analysis (Same as Agron 509 Anthr 509 Soc 509) (3 0) Cr 3 F *Prereq 6 credits in social sciences 6 credits in natural biological or engineering sciences and senior or above classification* Salvador Butler Field study of commercial farming systems within the context of global energy flows and biogeochemical cycles including ecological agronomic and social perspectives

SusAg 515 Integrated Crop and Livestock Production Systems (Same as A E 515 Agron 515 An S 515) (3-0) Cr 3 Alt F offered 2003 *Prereq 509* Richard Russell Wiedenhoeft Managing productivity and minimizing ecological impacts of agricultural systems by understanding nutrient cycles crop residue and manure management and multispecies interactions Consideration of crop and livestock production within landscapes and watersheds The course include a significant off campus componenet with teams analyzing Iowa farms

SusAg 530 Ecologically Based Pest Management Strategies (Same as Agron 530 Ent 530 Pl P 530) (3-0) Cr 3 Alt F offered 2004 *Prereq 509* Liebman Obrycki Gleason Durable least toxic strategies for managing weeds pathogens and insect pests with *emphasis on underlying ecological processes*

SusAg 546 Organizational Strategies for Diversified Farming Systems (Same as Agron 546 Hort 546 Soc 546) (3 0) Cr 3 Alt S offered 2004 *Prereq 509* Bell Liebman Organization and operation of complex diversified farming systems Topics include systems analysis ecological diversity agronomic diversity economic diversity social diversity analytical frames for evaluating farming system sustainability and problem solving Participation in several field trips to Iowa farms is required

SusAg 590 SpecialTopics Cr 1 3 FS SS *Prereq Graduate classification permission of instructor* For students wishing to do individual research in a particular area of sustainable agriculture

SusAg 599 Creative Component Cr Var FS SS Pre enrollment contract required Advanced topic for creative component report in lieu of thesis

SusAg 600 Sustainable Agriculture Colloquium (1-0) Cr 1 FS Weekly seminar for graduate students in the Sustainable Agriculture program

SusAg 610 Society andTechnology in Sustainable Food Systems (Same as A E 610 Anthr 610 Soc 610) (3-0) Cr 3 Alt S offered 2005 *Prereq 509* Hinrichs Richard Social and technological dimensions of sustainability in food systems Emphasis on ethics and strategies for evaluating existing and emerging options

SusAg 699 Research Cr Var FS SS M S and Ph D thesis and dissertation research

Systems Engineering

(Interdepartmental Graduate Major)

Supervisory Committee D Gemmill (Chair) D Flugrad E Jones A Mann G Sheble

Work is offered for the master of engineering with a major in systems engineering The graduate major in Systems Engineering is both an on and off campus *program It is an interdisciplinary program that allows* students to take courses across a variety of departments Graduates of the program will possess the analytical abilities needed to design evaluate and build complex systems involving many components and demanding specifications They will have the ability to work across disciplinary boundaries as the practice of modern engineering often requires Graduates will have developed management capabilities and extended their disciplinary knowledge

The program is broadly based and uses courses in the various departments of the College of Engineering and courses in other departments of the university The 30 credits necessary for graduation includes 27 semester credits of formal coursework and 3 credits for a creative component Completion of the program requires two courses in systems engineering two courses in the major discipline of the student three engineering courses with a systems engineering emphasis two courses outside of the college and a creative component Courses are delivered to off campus students both with the instructor present and through various distance education systems including the Iowa Communications Network (ICN) satellite transmission and videotape

The program of study committee in consultation with the student determines the courses to be taken and the acceptability of transfer credits The major professor should be selected from the discipline where a concentration of coursework will be taken

Admission to the program requires a baccalaureate degree in engineering and admission to the graduate college Students with degrees in other areas will be considered on an individual basis The degree awarded is a Master of Engineering in Systems Engineering

For additional information students should contact the Chair of the Supervisory Committee 2019 Black Engineering Building ISU Ames Iowa 50011

Teacher Education

Walter H Gmelch Director Teacher Education and Dean College of Education

All students who are recommended by Iowa State University for teacher licensure must meet the requirements of the teacher education program and be recommended by the College of Education An undergraduate seeking a bachelor s degree must be enrolled in the department in which he or she plans to major and must meet the graduation requirements of that department and the college in which it is located Students already holding a bachelor s degree should consult with the coordinator of the area in which they plan to specialize so that an individualized program of study can be developed

Admission to Undergraduate Teacher Education Program

A student seeking admission to a teacher education program must be accepted by a selection committee for the specific program which the student seeks to enter Factors considered in evaluating applications include scholarship interest in teaching character and physical and mental health Recommendations by selection committees must be confirmed by the University Teacher Education Committee before admission to the program in teacher education is granted

Students may apply as early as four semesters before the one in which they plan to enroll for student teaching however they must be fully admitted into the Teacher Education Program by mid semester prior to their planned students teaching semester Requirements for full admission to the Teacher Education Program are

1 A minimum 2 5 cumulative grade point average that must be maintained through graduation to be recommended for licensure (Some licensure areas may require a higher cumulative grade point average)
2 One of the following
—Minimum ACT composite of 19
—Minimum SAT I composite score of 910
—High school rank above the 49th percentile
3 A composite Praxis I (PPST) score of 522 with a minimum of 170 for each subtest (reading writing and mathematics) (Some licensure areas may require higher Praxis I scores)
Details regarding the dates and fees for any of these tests are available in the Testing Office in 2030 Student Services Building or from the Teacher Education Program Coordinator in Education Student Services
4 Documented completion of 10 hours of pre-student teaching field experience

Student Teaching

Student teaching is the culminating experience to the teacher preparation program at Iowa State University To ensure that students are prepared for this experience the following requirements must be met prior to student teaching
1 Full admission to the teacher education program by mid point of the semester prior to the semester when student teaching is planned
2 A passing grade must have been earned in all required professional teacher education courses (see The Professional Teacher Education Requirement) and selected courses in one s licensure area
3 Completion of the student teaching application by the first week of fall semester for spring student teaching and the first week of spring semester for fall student teaching Details regarding application are available in the Field Experiences Office E105 Lagomarcino Hall
4 A minimum ISU cumulative grade point average of 2 50 or higher at time of application for student teaching (Some licensure areas may require a higher cumulative grade point average)

Teacher Licensure

The Iowa Initial License may be recommended for those who hold the bachelor s degree from Iowa State and who have completed the following
1 All requirements of an approved teacher education program including the human relations requirement of C I 406

2 A minimum of 33 5 semester hours in courses designed to serve the general needs of college students This total will include Engl 104 and 105 one course appropriate for developing interpersonal or group presentation skills (see college or department for appropriate courses) Psych 230 or HD FS 102 Lib 160 two natural sciences courses and one mathemat ics course

3 Additional requirements as designated by the State of Iowa that include but are not limited to a special education component and 50 hours of pre student teaching field experience 40 of which are to be taken after admission to the Teacher Education Program

4 A minimum ISU cumulative grade point average of 2 50 or higher was maintained through graduation (or completion of the Teacher Education Program) (Some licensure areas may require a higher cumulative grade point average)

5 Documentation from the student teaching supervisor that the student has successfully completed the final assessment of his/her program portfolio

6 The State of Iowa has mandated that practitioner preparation programs assess students teaching and content competencies relative to designated performance standards Each licensure area at ISU has developed its own way of meeting these standards In order to obtain a teaching license each student who started as a freshman in Fall 2001 or thereafter must demonstrate that he or she meets these licensure standards

The state standards are

1 Student Learning The practitioner understands how students learn and develop and provides learning opportunities that support intellectual career social and personal development

2 Diverse Learners The practitioner understands how students develop in their approaches to learning and creates instructional opportunities that are equitable and are adaptable to diverse learners

3 Instructional Planning The practitioner plans instruction based upon knowledge of subject matter students the community curriculum goals and state curriculum models

4 Instructional Strategies The practitioner understands and uses a variety of instructional strategies to encourage students development of critical thinking problem solving and performance skills

5 Learning Environment/Classroom Management The practitioner uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interation active engagement in learning and self motivation

6 Communication The practitioner uses knowledge of effective verbal non verbal and media communica tion techniques and other forms of symbolic representation to foster active inquiry collaboration and support interaction in the classroom

7 Assessment The practitioner understands and uses formal and informal assessment strategies to evaluate the continuous intellectual social and physical development of the learner

8 Foundations Reflection and Professional Development The practitioner continually evaluates the effects of the practitioner s choices and actions on students parents and other professionals in the learning community and actively seeks out opportunities to grow professionally

9 Collaboration Ethics, and Relationships The practitioner fosters relationships with parents school colleagues and organizations in the larger community to support students learning and development

10 ComputerTechnology Related to Instruction The practitioner uses computer technology to enhance student learning

11 Subject Matter Specialization The practitioner understands the central concepts tools of inquiry and structure of the discipline(s) her or she teaches and can create learning experiences that make these aspects of subject matter meaningful for students

Note Specific courses taken to be used for licensure may not be taken pass/not pass

Complete details of the State of Iowa requirements for licensure are outlined in the University Teacher Education Handbook that may be purchased at the University Bookstore

Approval for the early childhood education license requires successful completion of the licensure curriculum through either the Department of Curriculum and Instruction or the Department of Human Development and Family Studies

Graduate programs are available for those who seek approval as elementary and secondary school principals superintendents counselors or instruc tional media specialists Students also may pursue a program for approval to teach in the area of special education art agriculture family and consumer sciences mathematics reading and other programs as approved by the Iowa Department of Education

Information concerning licenses not described above as well as more detailed requirements for any license may be obtained from the Education Student Services Office in the College of Education

The General Education Requirement

All prospective teachers are required to complete a program in general education which is integrated with their professional preparation and extends through the undergraduate curriculum

The student is expected to complete studies in four groups in general education Usually courses relating to a given area may be found in several different departments Credits listed are minimum require-ments

Cr	
9	I Natural sciences and at least one mathematics course
9	II Social sciences
6	III Humanities
9	IV Communication skills
5	Library Skills (Lib 160)
33 5	Total

This total will include Engl 104 and 105 one course appropriate for developing interpersonal or group presentation skills (see college department for appropriate course) Psych 230 or HD FS 102 and one course in American history or government (see approved list) Additional credits in general education may be required by departments preparing teachers

The Professional Teacher Education Requirement

As part of a total educational program the prospective teacher must complete certain studies related directly to the profession of teaching All students in teacher education must take the following courses prior to student teaching unless one s licensure area has an approved content area course that addresses the same performance standards

Cr	
3	C I 201—Instructional Technology
3	C I 204—Social Foundations of American Education
3	C I 333—Educational Psychology OR C I 332 – Educational Psychology of Young Learners
3	C I 406—Multicultural Awareness and Non sexism in the Classroom
12 16	Student teaching (minimum 12 weeks)

Secondary education students must also complete the following courses

R C I 415—Senior Seminar
3 C I 426—Principles of Secondary Education

All students must satisfactorily complete at least one credit of pre student teaching laboratory experience This requirement may be met through a pre student teaching course (e g C I 280) or in certain subject areas a course designated to provide an equivalent experience

Professional Courses in Areas of Specialization

AgEdS—AgEds 211 310 401 402 416 417

Biology—C I 280M 347 418 419 468J 468K C I/LAS 417D

Chemistry—LAS 417B 419

Earth Sciences—C I 280M 347 418 419 468J 468K C I/LAS 417J

English—C I 395 Engl 392 394 417 494 LAS 417E

Family and Consumer Sciences Education and Studies Teacher Education option—FCEDS 206 306 318 403 413 417A 417B

Foreign Languages—F Lng 417 487

General Science—C I 280M 347 418 419 468J 468K C I/LAS 417B

Health Education—H S 375 417

Mathematics—LAS 417C 480C Math 497 542

Music—LAS 417K and/or 417L Music 266 366 466

Vocal 358A 360 367 465 Instrumental 350 351 352 353 354 355 356 358B 368 or 369 464

Physical Education—Ex Sp 275 375 395 417 418 470 475

Physical Sciences—C I 280M 347 418 419 468J 468K C I/LAS 417B

Physics—C I 280M 347 418 419 468J 468K C I/LAS 417B

The Requirements for Areas of Specialization in Teacher Education

A teacher must also be competent in the area of a teaching specialization For instance certain competencies are required of those who would teach at the prekindergarten kindergarten or the elementary level Those preparing to teach at the secondary level must develop a depth of understanding in one or more subject matter areas

For full time teaching in secondary schools an approved subject matter concentration of at least 30 semester hours is required Additional subject matter areas usually consisting of 24 semester hours each are possible but not required Students interested in adding a second subject area should consult with the coordinator of the area

The additional courses required by specific teaching areas are

Agricultural Sciences and Agribusiness

See *Curriculum Agricultural Education*

Art

See *Curriculum Art Education Department of Art and Design B FA*

Biology

Coordinator Warren Dolphin

Students seeking approval to teach biology must earn 13 credits in chemistry 8 in physics and at least 6 in mathematics and take the following biological courses Biol 201 201L 202 202L 301 301L 302 303 302L and 312

Bot 306
Micro 202
Zool 355

Seven additional credits at the 300 level or above in a basic biological science A course emphasizing concepts in biotechnology is recommended but not required

Students who have begun their biological science program under earlier catalogs need to see the science teaching adviser if they have questions

Chemistry

Coordinator Thomas Greenbowe

Students seeking approval to teach chemistry must earn credits in the following courses

General chemistry 177 177L 178

Analytical chemistry 210 or 211 211L 316 and 316L

Organic chemistry 331 331L 332 332L

Inorganic chemistry 301

Physical chemistry 321 321L 322

Math 165 166

Phys 221 and 222 or 111 and 112

A minimum of one course in biology is required The recommended course is Biol 201 201L or equivalent

Students with an endorsement in a natural science who seek approval to teach chemistry as an additional area must earn credits in the courses below (15 minimum credits)

Chem 177 177L 178 178L 211 211L 331 331L 332 332L

or

Chem 163 163L 164 164L 211 211L 231 231L

Students with no natural science endorsement who seek approval to teach chemistry as an additional area must complete one of the two sets of courses listed above plus sufficient additional courses to total 24 chemistry credits chosen from

Chem 316 316L 301 321 322 321L

or

BBMB 301 320 311 451

In addition students are required to take the physical science teaching methods course LAS 419

Coaching Interscholastic Athletics

Coordinator Rich Engelhorn

Students seeking approval for the Iowa State University endorsement to coach interscholastic athletics must

a Satisfy the professional teacher education requirements of the College of Education

b Satisfy the requirements of a teaching specialization area

c Earn credits in the following Zool 155 EX SP 220 258 355 315 358 365

Curriculum and Instruction

Early Childhood Education See *Curriculum Curriculum and Instruction or Human Development and Family Studies*

Elementary Education See *Curriculum Curriculum and Instruction*

Earth Sciences

Coordinator Kenneth Windom

Students seeking approval to teach earth sciences must earn credits in the following courses

Geol 100 100L 102 102L 302 305 311 356 365 368 480
Mteor 206
Astro 120 150
Chem 177 177L 178 178L
Phys 111 112 or 221 222
Math 151 or 160 or 165
Com S 107
and one course in biology

Students with an endorsement in a natural science who seek approval to teach earth sciences as an additional area must earn credits in the following courses
Geol 100 100L 102
Mteor 206
Astro 120 150
Courses 300 or above—3 credits

Students with no other natural science endorsement but who seek endorsement in this area must take the listed courses plus additional credits in this area to give a total of 24 See area coordinator for approval prior to taking courses

English

Coordinator Robert Tremmel

Students seeking endorsement to teach English (7 12) must earn 58 credits in the following courses

12	English Studies 199 (required but no credit) 219 260 310 339
3	Advanced writing (selected from 302 303 304 305 306 307 309 313 314 315 316)
3	Classical Studies Cl St 353
6	British literature (selected from 370 373 374 375 376 378)
6	American literature (selected from 360 362 364)
3	Any literature course
3	Womens and/or multicultural literature (selected from 340 344 345 346 347 348 349 460) (or 301 366 389 461 464 489 when appropriate)
22	English Education 220 394 420 392 (C I 280 for 2 cr must be taken concurrently with 392) 494 (C I 280 for 2 cr must be taken concurrently with 494) C I 395

Students seeking to add English as an additional endorsement area must earn 43 credits in the following courses

3	Advanced writing (selected from 302 303 304 305 306 307 309 313 314 315 316)
9	English Studies 220 260 and 310
3	British literature (selected from 370 373 374 375 376 378)
6	American literature (selected from 360 362 364)
3	Any literature course
3	World womens or multicultural literature (selected from 340 344 345 346 347 348 349 353 354)
16	English education 394 392 (C I 280 for 2 cr must be taken concurrently with 392) 494 (C I 280 for 2 crs must be taken concurrently with 494) C I 395

English as a Second Language

Coordinator Roberta Vann

To add a K 12 teaching endorsement in English as a Second Language students must fulfill the certification requirements in a major subject area and complete twenty four semester hours in ESL

Those twenty four hours must include Engl 518 and 588 In addition students must take at least one course in each of the following areas In some cases relevant special topics courses or experimental courses may be substituted Some courses have prerequisites
Teaching ESL Engl/Ling 524 525 528
Applied Linguistics Engl/LIng 220 419/516 519 526
Language in Culture ComSt 310 Anthr/Ling 309 500 Engl 344 349 549 Span 320
Bilingual Education Engl/Ling 514
Nature of Language Engl/Ling 219 420 511 512 527
Process in Language Acquisition Engl/Ling 425 517

Family and Consumer Sciences and Studies

Coordinator Beverly Kruempel

See *Curriculum Family and Consumer Sciences Education Teacher Licensure option*

Foreign Languages and Literatures

Coordinator Linda Quinn Allen

Students seeking approval to teach a foreign language as their first endorsement must have a major in the target language For a second endorsement in a foreign language students must earn 25 credits in that language Nine (9) credits must be at the 300 level or above with six (6) of these credits in composition and conversion Courses at the 100 level are not counted in the 25 required credits

All students seeking to teach a modern foreign language must demonstrate their proficiency in the language by taking the ACTFL OPI (Oral Proficiency Interview) and scoring at least at the advanced-low level Students are responsible for the cost of the administration of the OPI and must request that the results of the OPI be added to their transcript Students are required to take a mock OPI at no cost during their sophomore year

For an endorsement in Latin 10 of the 25 credits must be at the 300 or 400 level and must include Hist 430 (Cl St 403) Students seeking approval to teach Greek or Portuguese as an additional language must earn 25 credits in the language 9 of these credits must be at the 300 level or above Endorsement in Greek also requires History 402

General Science

Coordinators Thomas Greenbowe David Meltzer

Students seeking approval to teach general science must earn credits in the following courses
Biol 201 201L 202 202L
Chem 163 163L 164 164L 231 231L
Geol 100 100L
Phys 111 112 or 221 222
Math 151 or 160 or 165

At least 6 credits from courses numbered 300 or above in astronomy and astrophysics biochemistry

and biophysics biology botany chemistry genetics geology meteorology microbiology physics and zoology

Health Education
Coordinator Frank Schabel

Students seeking approval to teach health education must earn credit in the following courses EX SP 258 H S 110 215 305 310 350 375 390 FS HN 167 HD FS 276 373 or 377 Zool 155 156

Students seeking approval for health education as an additional subject area must earn credits in the following courses FS HN 167 HD FS 276 H S 110 215 305 310 350 375 390 Zool 155 156

Human Development and Family Studies
Early Childhood Education See *Curriculum Human Development and Family Studies* or *Curriculum and Instruction*

Mathematics
Coordinator Janet Sharp

Students majoring in mathematics and seeking approval to teach mathematics as a primary endorsement must take the following

One of the following sequences Math 165 166 201 or 175 176

Math 265 266 or 267 301 302 or 307 or 317 304 or 341 365 414 435 436 489 497

Com S 107 or 207 or 227

Students wishing to add mathematics as an additional endorsement area or as a non mathematics major seeking a license to teach mathematics must take the following

Math 165 166 201

Math 266 or 267 301 304 or 341 302 or 307 or 317 414 435 436 489 497

Com S 107 or 207 or 227

Music
Coordinator Sylvia Munsen

Students seeking approval to teach music must earn credits in the following courses

Music 119 120 219 221 222 231 232 248 266 319 331 332 337 338 361 362 366 419 466 3 credits of advanced music history and 3 credits of advanced music theory

Music 327 358A 360 367 and 465 and 3 credits of music theater or opera studio are required for students planning to teach vocal music

Music 350 351 352 353 354 355 356 358B 464 and either 368 or 369 are required for students planning to teach instrumental music

Physical Education
See *Curriculum Exercise and Sport Science Physical Education Licensure*

Physical Sciences
Coordinators Thomas Greenbowe David Meltzer

Students seeking approval to teach physical sciences must earn credits in the following courses

Astro 120 150 or 342 346
Chem 163 163L 231 231L
Geol 100 100L
Mteor 206
Phys 111 112 or 221 222
Biology one course
Math 151 or 160 or 165

Three credits from courses numbered 300 and above in astronomy and astrophysics chemistry meteorol ogy physics and geology

Students with an endorsement in a natural science who seek approval to teach physical sciences as an additional area must earn credits in the courses listed below Students with no other science endorsement but who seek an endorsement in this area must take the listed courses plus additional credits in the area to yield a total of at least 24 See area coordinator for approval prior to taking additional courses
Astro 120 or 150 or 342 or 346
Chem 163 163L
Geol 100 100L
Mteor 206
Phys 111 112 or 221 222

Physics
Coordinator David Meltzer

Students seeking approval to teach physics must earn credits in the following courses

Phys 221 222 311T 399 (2 cr) 321 or 324 and at least 12 credits from Phys 302 304 306 310 321L 322 322L 361 364 365 396 Astro 342 344L 346 Chem 321 322 E E 201 203 441 E M 274 345 378 M E 330 332

Students with an endorsement in a natural science who seek approval to teach physics as an additional area must complete one of the following sets of courses

Phys 221 222 311T 321 321L 399 (2 cr) or Phys 111 112 302 311T 399 (2 cr)

Students with no other natural science endorsement who seek approval to teach physics as an additional area must complete one of the two sets of courses listed above plus sufficient additional credits from the following list of courses to total 24 credits

Phys 221 222 271 272 302 304 306 310 321 321L 322 322L 324 Astro 342 344L 346 Chem 321 322 E E 201 203 441 E M 274 345 378 M E 330 332

Reading (K-6, 7-12)
Coordinator Donna Merkley

Students seeking endorsement to teach reading (7 12) as an additional area must earn credits in the following courses Engl 219 394 Engl 302 or 304 or 305 or 306 or 404 or 405

C I 378 395 488/588 Students seeking reading approval for grades K-6 see elementary education adviser

Speech Communication
Coordinator Connie Ringlee
Students seeking endorsement to teach speech as an additional area must earn credits in the following courses

ComSt 102 Sp Cm 212 313 322 412 495A 495B Thtre 255 358 JI MC 101

Advisers for Areas of Specialization in Teacher Education
Persons interested in teaching in one of the following areas should consult with the appropriate individual Details of each area will be found in the appropriate departmental section

Elementary Education—Al Campbell Erin Sheldahl Kari Soderholm

Early Childhood Education—Al Campbell (College of Education) Patricia Walsh (College of Family and Consumer Sciences)

Special Education—Pat Carlson

Secondary Education
Agricultural Sciences/Agribusiness Education—Gregory S Miller

Art—Barbara Caldwell

Biology—Warren Dolphin Mike Clough

Chemistry—Thomas Greenbowe

Coaching Interscholastic Athletics—Rich Engelhorn

Earth Sciences—David Meltzer Mike Clough

English—Robert Tremmel

English as a Second Language—Roberta Vann

Family and Consumer Sciences Education and Studies—Beverly Kruempel

Foreign Languages—Linda Quinn Allen

General Science—Michael Clough Thomas Greenbowe

Health Education—Frank Schabel

Mathematics—Janet Sharp Richard Tondra

Music—Sylvia Munsen

Physical Education— Katherine Thomas

Physical Sciences—Mike Clough Thomas Greenbowe David Meltzer

Physics—David Meltzer

Reading—Donna Merkley

Speech Communication—Connie Ringlee

Technology and Social Change

Advisory Committee Eric Abbott coordinator Lulu Rodriguez undergraduate coordinator Robert Mazur graduate coordinator

Undergraduate Study
Technology and social change is a cross-disciplinary program examining the relationships between technologies and the social and cultural environments in which they operate The program has a national and international perspective with courses addressing the interrelationships policies and impacts created by the international exchange of technologies Through T SC students will better understand the institutional and sociocultural consequences of technological change from differing perspectives and will become sensitive to the issues attending the use of technology to improve people s lives Work in the program can also serve as preparation for advanced study in this field

The program requirement for a minor in technology and social change is a minimum of 15 credit hours One of the courses must be T SC 341 An additional 3 credits must be taken from T SC cross listed courses The remaining 9 may be selected from T SC cross listed courses or from the list of T SC approved courses At least 9 of the 15 credits must be in courses numbered 300 or above Because technology and social change is an interdisciplinary study minor programs must include coursework in at least two departments Students seeking a minor should develop a specific program of courses either with the T SC faculty representative in their department or with the T SC undergraduate coordinator The student s minor program must be approved by the T SC program coordinator

T SC courses are listed below The list of T SC approved courses is available from the program coordinators Through the program coordinator students may petition for approval of courses not on the approved list that address matters relevant to technology and social change

Graduate Study
The graduate minor in technology and social change is a cross disciplinary program that enables students to study the interactions between technologies and their users on both societal and individual levels The minor strengthens the ability of students to apply differing perspectives in understanding the effects of the global exchange of technologies and to heighten their sensitivity to the institutional and sociocultural issues attending the use of technology to improve people s lives

Students choosing to minor in technology and social change will pursue a degree program in the major department In consultation with their major professor students are to identify a T SC Faculty member to serve on the committee guiding their program of study This T SC Faculty member must be on the Graduate faculty and must be from a discipline outside the major field of study With the agreement of the POS committee the student declaring a minor in T SC will select a group of courses from the list of T SC approved courses available through the program coordinators For the master s degree this group should be at least 9 credit hours for a doctoral degree the group should be at least 15 credit hours

In either case T SC/Soc 541 is required Students may not include in their minor any courses from their own major All programs of study that include a T SC minor must be approved by the T SC Program coordinator

Courses open for nonmajor graduate credit 342 343

Courses Primarily for Undergraduate Students

T SC 341 Technology International Social, and Human Issues (3-0) Cr 3 F *Prereq Junior classification* An interdisciplinary study of the international significance of technology and of the societal and human issues attending its development and adoption

T SC 342 World Food Issues Past and Present (Same as Agron 342) See *Agronomy* Nonmajor graduate credit

T SC 343 Philosophy ofTechnology (Same as Phil 343) See *Philosophy* Nonmajor graduate credit

T SC 474 CommunicationTechnology and Social Change (Same as Jl MC 474) See *Journalism and Mass Communication*

T SC 490 Independent Study Cr var *Prereq 341 permission of instructor and of T SC coordinator*

Courses Primarily for Graduate Students, Open To Qualified Undergraduate Students

T SC 541 Technological Innovation, Social Change, and Development (Same as Soc 541) See *Sociology*

T SC 574 CommunicationTechnologies and Societies (Same as Jl MC 574) See *Journalism and Mass Communication*

T SC 590F SpecialTopics Technology and Social Change (Same as U St 590F) Cr var *Prereq 541 permission of instructor and of T SC coordinator* Individual study of topics concerning global and local implications of technological change

Courses for Graduate Students

T SC 640 Seminar inTechnology and Social Change (Same as U St 640) Cr var *Prereq 541* Consideration of global issues and consequences arising from technological change Specific topics vary each time offered

Textiles and Clothing

(Administered by the Department of Apparel Educational Studies and Hospitality Management)

Mary B Gregoire Chair of Department

University Professors Farrell Beck

Professors Kadolph Littrell Stone

Distinguished Professors (Emeritus) Winakor

Professors (Emeritus) Burnet Danielson

Associate Professors Damhorst Fiore

Associate Professors (Emeritus) Brackelsberg Kundel Kunz

Assistant Professors Campbell Niehm Park Parsons Pisut

Assistant Professors (Adjunct) Glock

Instructors (Adjunct) Fratzke Wise

Undergraduate Study

The program offers study for the degree bachelor of science with a major in apparel merchandising design and production The program offers students a broad understanding of textile and apparel products merchandising and marketing strategies design and production processes and business practices leading to a wide range of careers at state national and international levels in business and industry Courses in the program provide scientific technical and humanistic knowledge about textiles apparel and related products basic to career preparation Courses also provide knowledge applicable to the development and use of apparel and textile products by individuals families and institutions The program can be used as a foundation for graduate study Graduates understand the production distribution and use of textiles and apparel with special attention to human concerns for protection and comfort health and safety aesthetic expression and communication They are prepared to plan develop and present textile and apparel products to meet the needs of consumers They understand the issues involved in textile and apparel production and marketing both nationally and internationally Graduates appreciate the interdependence of nations and cultures as producers and consumers of textile products

The major in apparel merchandising design and production (AMDP) provides a broad based program of study with flexibility in creating an individualized program option Courses are required in the following groups general education family and consumer sciences core and the AMDP core To complete the program a student combines structured clusters of courses to form an option in merchandising design or production

An option in merchandising prepares students for the planning development and presentation of market oriented product lines Career opportunities are in product development buying promotion and management in both manufacturing and retailing sectors of the textile and apparel industry

An option in apparel design is appropriate for those interested in the aesthetic creative and technical aspects of design product or line development or promotion of textiles and apparel

An option in production prepares students for positions related to apparel engineering plant management quality assurance costing product development sourcing and buying piece goods or trim for apparel manufacturing or retailing firms

In addition a student selects a secondary option from the other primary options or from business consumer behavior/marketing creative design history/theatre costume human relations/communications international trade quality assurance or technical design The combinations of primary and secondary options allow students to individualize their programs

The program offers a minor in apparel merchandising design and production The minor can be earned by taking T C 131 or 165 204 225 231 or 245 6 credits at the 300-400 level for a total of 15 to 17 credits Also available is an apparel merchandising design and production designated area of concentration combined with a major in journalism and mass communication in the College of Liberal Arts and Sciences see program for details

Grade point requirement All students majoring in apparel merchandising design and production are required to earn a C– or better in all TC courses applied toward the degree including transfer credits

English proficiency Undergraduate English proficiency is certified when the student has received a grade of C– or better in English 104 and 105 Students who receive a D+ D or D– in English 104 or 105 may take English 302 309 314 instead of repeating the lower level course

Graduate Study

The program offers work for the master of science and doctor of philosophy with a major in textiles and clothing The program also participates in the Master of Family and Consumer Sciences degree by offering a specialization within that program For all programs the field of study is highly interdisciplinary programs of study are tailored to students background and interests

Graduates understand how textiles and apparel are essential in meeting individual and societal needs and understand the interdependence of nations and cultures as producers and consumers Graduates understand diverse philosophies of scholarship and apply multiple methods to research and teaching Strong writing and oral communication skills help graduates disseminate scholarship and compete successfully for awards and grants

Graduates accept positions relevant to their academic experience All doctoral graduates have teaching experience Masters and doctoral graduates have experience working in team-oriented and interactive environments Graduates are prepared to adapt to future changes in their professions and to provide leadership in professional and public practice They bring a strong sense of ethics to research teaching and business endeavors

Program emphases for graduate study include consumer behavior entrepreneurship craft marketing merchandising and marketing aspects of textiles and clothing acquisition and use of textiles and apparel within cultures U S costume and textiles of the 19th and 20th centuries textiles social/psychological aspects of dress aesthetics product quality and development textile conservation and computer-aided design

The program participates in the interdepartmental minor programs of gerontology and housing

Courses open for nonmajor graduate credit 354

Courses Primarily for Undergraduate Students

T C 121 Apparel Assembly Processes (1-4) Cr 3 FS Principles of garment assembly Use of mass production equipment and methods to develop and assemble garments

T C 131 Introduction to Apparel Product Development (2 2) Cr 3 FS Concepts related to and issues in the development of apparel products for consumers Basics of computer aided design for product development

T C 165 Appearance in Society (3-0) Cr 3 FS Social science approaches to understanding clothing and appearance in contemporary U S society Examination of diversity among consumers and future trends in consumer behavior

T C 204 Textile Science I (3 3) Cr 4 FS WWW lectures *Prereq Sophomore standing* Textile fibers yarns fabrication coloration and finishes Quality and performance application to apparel furnishing and industrial textiles

T C 225 Patternmaking I (2-4) Cr 4 FS *Prereq 121 131 204 recommended permission of instructor* Basic flat pattern and draping methods for women's men's and children's wear Pattern making by computer

T C 231 Apparel Manufacturing (3 2) Cr 4 FS *Prereq 204 131* Analysis of apparel manufacturing processes product development sourcing and production Focus on specifications relative to quality performance and cost

T C 245 Aesthetics of Apparel (2-0) Cr 2 FS *Prereq 131 165* Analysis of multisensory aesthetic aspects of apparel products and promotional settings affecting the consumer

T C 245L Aesthetics of Apparel Laboratory (0-2) Cr 1 FS *Prereq 131 165 245 or concurrent enrollment* Computer aided design applied to analysis development and presentation of textiles and apparel

T C 257 Introduction to Museums (Same as Anthr 257) (3-0) Cr 3 F *Prereq Sophomore standing* History and theory of museums Overview of museums in modern society careers in museums and future needs Object research and exhibit development

T C 278 Fashion Illustration (0-6) Cr 3 FS *Prereq 131 245 Art 108 or 130* Drawing the fashion figure and apparel using mixed media and computer aided design Studies and compositions appropriate to advertising fashion presentation and portfolio development Survey of historical and contemporary fashion artists

T C 305 Quality Assurance of Textiles and Apparel (Dual listed with 505) (2 2) Cr 3 F S *Prereq 231 one course in natural science Stat 101 226 or 401* Principles of product and materials evaluation and quality assurance Developing specifications and using standard practices for evaluating materials product characteristics performance and quality

T C 321 Computer Integrated Textile and Fashion Design (0-6) Cr 3 S *Prereq 245L 278 recommended* Analysis and advanced use of industry specific software for textile and fashion design

T C 325 Patternmaking II (Dual listed with 525) (2-4) Cr 3 F *Prereq 204 225 278 recommended* Principles of advanced patternmaking by flat pattern and draping techniques Interaction of fabric characteristics with style features Analysis of fit problem solving Patternmaking by computer

T C 326 Experimental Design and Presentation (2 2) Cr 3 Alt F offered 2003 *Prereq 225 278 325 recommended* Use of traditional non traditional and recycled materials to create innovative garments

T C 331 Apparel Production Management (2 3) Cr 3 S *Prereq 231 Com S 103 T C 121 recommended* Procedures and experiences related to application and use of process controls method analysis work measurement costing and production planning Resource management technology applications and quality assurance

T C 342 Aesthetics of Everyday Experience (3 0) Cr 3 S Design principles aesthetic concepts and philosophies applied to everyday living Influence of individual differences and cultural patterns on aesthetic preferences

T C 354 History of European and North American Costume (3 0) Cr 3 F *Prereq 3 credits from Hist or Art H* Clothing and adornment of women men and children in Europe and the United States from antiquity to present social economic technological and cultural context of costume Nonmajor graduate credit

T C 355 History of Asian Costume (Dual listed with 555) (3-0) Cr 3 Alt S offered 2005 *Prereq 3 credits from Hist or Art H 204 recommended* Clothing and adornment of men women and children in selected countries of Asia from prehistoric times through the 19th century

T C 362 Cultural Perspectives in Clothing and Textiles (3-0) Cr 3 S *Prereq 165 or 3 credits in anthropology psychology or sociology* Analysis of multiple factors related to clothing and textiles in selected societies including technology aesthetics social organization ritual stability and change Applications to apparel business

T C 375 Merchandising (Dual listed with 575) (3-0) Cr 3 FS *Prereq 165 3 credits in Math junior classification* Principles of merchandising as applied in manufacturing and retailing business organizations Study of planning and development of primarily apparel and related product lines

T C 375L Merchandising Analysis (0 2) Cr 1 FS *Prereq Credit or concurrent enrollment in 375 Acct 284 Com S 103* Interpretation of financial results of merchandising decisions based on computer simulation

T C 376 Merchandise Planning and Control (3-0) Cr 3 S *Prereq 375* Theories and procedures in planning sourcing and controlling retail inventories for the profitable management and operation of apparel and related product lines Computer applications in strategic retail management

T C 377 Merchandise Presentation (1 2) Cr 2 Alt S 2005 SS 2004 *Prereq 245 and 375* Merchandise presentation and promotion at wholesale and retail levels as related to image sales and aesthetics Group project presentations of apparel and related products to diverse markets

T C 380 Field Study Cr 2 May be repeated FS SS *Prereq 9 credits in textiles and clothing junior classification Permission by application* Study of and tours to textile mills apparel manufacturers design studios showrooms markets retailers museums testing laboratories trade seminars and exhibitions and other areas of interest within the textile and apparel industry

T C 381 International Field Study Cr 2 to 4 May be repeated Alt S offered 2005 and Alt SS offered 2004 *Prereq 9 credits in textiles and clothing junior classification Permission by application* Study of and tours to textile mills apparel manufacturing design studios showrooms markets retailers museums testing laboratories trade seminars and exhibitions and other areas of interest within the textile and apparel industry Countries vary

T C 398 Cooperative Education Cr R F S SS *Prereq Permission of department chair junior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

T C 404 Textile Science II (Dual-listed with 504) (3-0) Cr 3 Alt S offered 2005 *Prereq 204 245 one natural science course* Theories and principles of textile science emphasis on fiber chemistry dyeing and detergency Examination of product failure current research and environmental impact

T C 410 Synthesis of Merchandising, Design and Production (2 3) Cr 3 FS *Prereq Senior classification permission by application 165 231 245 375* Multi functional team approach to creative problem solving and development of apparel Synthesis and presentation of line plans creative design and technical design

T C 411 Seminar on Current Issues Cr 1 to 3 each time taken *Prereq Senior classification 12 credits in textiles and clothing* Trends and issues in textiles and apparel

T C 467 Consumer Behavior and Apparel (2-2) Cr 3 F *Prereq Stat 101 or 226 T C 165 or 3 credits in marketing psychology or sociology* Application of concepts and theories from the social sciences to the study of consumer behavior related to apparel and adornment Experience in conducting research

T C 470 Supervised Experience Cr 2 to 6 FS SS *Prereq Minimum 2 0 GPA permission by application junior or senior classification* Supervised work experience with a cooperating firm or organization
A Textile Industry *Prereq 305*
B Historic Textiles and Clothing *Prereq 6 credits from 354 355 362 3 credits in anthropology recommended*
C Apparel Design *Prereq 225 231 245 278 recommended*
I Merchandising Cr 4 or 6 *Prereq 375*
J Extension *Prereq 6 credits in textiles and clothing*
M Museum Cr 2 to 6 *Prereq 257*
N Apparel Production Management *Prereq 331 I E 271 recommended*
O Technical Design *Prereq 231 225 305 331 recommended*
Q Quality Assurance *Prereq 305*
T Public Relations *Prereq T C 375 and JI MC 230*

T C 472 Global Issues in Textiles and Apparel (Dual listed with 572) (3-0) Cr 3 F *Prereq 375 Econ 101* Evaluation of key issues facing textiles and apparel businesses in global markets considering ethical economic political social and professional implications

T C 474 Entrepreneurship in Family and Consumer Sciences (Dual listed with 574 same as HD FS 474 HRI 474) (3-0) Cr 3 S *Prereq 6 credits in T C at 300 level or above* Explores entrepreneurship for family and consumer sciences related businesses Includes family home based rural and women-owned businesses Development of a feasibility analysis Guest speakers

T C 490 Independent Study Cr arr May be repeated FS *Prereq 6 credits in textiles and clothing permission of the instructor adviser and department chair*
A Textile Science
B History of Textiles
C Textile and Apparel Design
D Aesthetics
E History of Costume
F Sociological and Psychological Aspects of Clothing and Textiles
G Consumer Behavior
H Honors
I Merchandising
K Cultural Analysis
M Museums
N Apparel Production Management
O Technical Design
Q Quality Assurance
S Small Business Entrepreneurship in Apparel

T C 495 Advanced Apparel Design (1 5) Cr 3 S *Prereq 225 278 321 325 or 326 senior classification* Creation of a line of apparel from concept through completion Development of portfolio using manual and computer aided techniques Line must be submitted to a local regional or national competition

T C 498 Cooperative Education Cr R FS SS *Prereq Permission of department chair senior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

T C 499 Undergraduate Research Cr 1 to 3 each time taken FS SS *Prereq Senior classification 15 credits in textiles and clothing permission of instructor adviser and department chair* Research experience in textiles and clothing with application to a selected problem

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

T C 504 Textile Science II (Dual listed with 404) (3 0) Cr 3 Alt S offered 2005 *Prereq 204 245 one natural science course* Theories and principles of textile science emphasis on fiber chemistry dyeing and detergency Examination of product failure current research and environmental impact

T C 505 Quality Assurance of Textiles and Apparel (Dual listed with 305) (2 3) Cr 3 Alt F offered 2003 *Prereq 231 375 Stat 101 226 or 401 one natural science course* Principles of product and materials evaluation and quality assurance Developing specifications and using standard practices for evaluating materials product characteristics performance and quality Proposal and research project

T C 510 Foundation of Scholarship in Textiles and Clothing (2 0) Cr 2 F *Prereq Graduate classification* Overview of scholarship in textiles and clothing with emphasis on current and future directions and interdisciplinary nature of the field Introduction to theory and philosophy of science

T C 521 Digital Textile and Apparel Design (1-4) Cr 3 *Prereq Permission of instructor experience with flat pattern or draping techniques and image manipulation software required* Design development analysis and application of digital textile printing to textile products and garment forms Projects required

T C 525 Patternmaking II (Dual listed with 325) (2-4) Cr 3 Alt F offered 2004 *Prereq 204 225 278 recommended* Principles of advanced patternmaking by flat pattern and draping techniques Interaction of fabric characteristics with style features Analysis of fit problem solving Patternmaking by computer

T C 545 Interdisciplinary Approach to Aesthetics (3 0) Cr 3 Alt F offered 2003 *Prereq Undergraduate course in design elements and principles consumer behavior or marketing* Examination of the role of aesthetic features of the product or consumer focused environment in marketing and the effects on consumers Emphasis on consumer behavior design environmental psychology and marketing literature

T C 555 History of Asian Costume (Dual listed with 355) (3 0) Cr 3 Alt S offered 2005 *Prereq 3 credits from Hist or Art H 204 recommended* Clothing and adornment of men women and children in selected countries of Asia from prehistoric times through the 19th century

T C 557 Conservation of Textiles and Costume (3-0) Cr 3 Alt S offered 2004 *Prereq 204 354 or 355* Preventive and interventive approaches to textile conservation Focus on understanding textiles and costume and factors related to aging storage and exhibition research methods

T C 562 Dress and Culture (3 0) Cr 3 Alt F offered 2004 *Prereq 362 or 6 credits in social science or cultural anthropology* Analysis of dress as artifact behavior and symbol in selected cultures

T C 564 Clothing Consumption (3-0) Cr 3 *Prereq Econ 101 Stat 404* Theories of clothing consumption factors affecting family expenditures and levels and standards of consumption for clothing and household textiles

T C 567 Consumer Behavior and Apparel (3 0) Cr 3 Alt F offered 2003 *Prereq 467 or Mkt 447 Stat 101* Application of concepts and theories from the social sciences to the study of consumer behavior involving apparel and adornment Experience in conducting research grant proposal and manuscript writing

T C 570 Practicum in Textiles and Clothing Cr 1 to 3 FS SS *Prereq 510 6 graduate credits in textiles and clothing permission by application* Supervised experience related to career objective Proposal must be approved semester before placement

T C 572 Global Issues in Textiles and Apparel (Dual listed with 472) (3-0) Cr 3 Alt F offered 2003 *Prereq 375 or 575 Econ 101* Evaluation of key issues facing textile and apparel businesses in global markets considering ethical economic political social and professional implications Theoretical foundations of sourcing

T C 574 Entrepreneurship in Family and Consumer Sciences (Dual listed with 474) (3-0) Cr 3 Alt S offered 2004 *Prereq 6 credits in T C at 300-level or above* Explores entrepreneurship for family and consumer sciences related businesses Includes family home based rural and women-owned businesses Development of a feasibility analysis Guest speakers

T C 575 Merchandising (Dual listing with 375) (3-0) Cr 3 Alt S offered 2005 *Prereq 165 3 credits of Math* Principles of merchandising as applied in manufacturing and retailing business organizations Study of planning and development of primarily apparel and related product lines Computer applications and theoretical foundations in merchan dising

T C 581 International Study Cr var Alt S offered 2005 and Alt SS offered 2004 *Prereq 9 credits in textiles and clothing permission by application* Study abroad of apparel and textile design merchandising production distribution and consumption textiles in museums Countries vary May be repeated

T C 590 Special Topics Cr arr *Prereq Permission of department chair and instructor(s)* Individually designed textile and clothing related projects that reflect the special interests of the student
A Textile Science
B History of Textiles
C Textile and Apparel Design
D Aesthetics
E History of Costume
F Sociological and Psychological Aspects
G Consumer Behavior
I Merchandising
J Extension
K Cultural Analysis
L Conservation
M Museums
N Apparel Production Management
O Technical Design
P Interdisciplinary
Q Quality Assurance
S Small Business/Entrepreneurship in Apparel

T C 593 Workshop Cr arr SS

Courses for Graduate Students

T C 610 Philosophical Issues of Textiles and Clothing Scholarship (2-0) Cr 2 Alt S offered 2004 *Prereq FCEdS 511 or ResEv 550 6 graduate credits in textiles and clothing* Models theory alternative philosophies and ethics of science as applied in textiles and clothing scholarship Process of grant application and research program development

T C 611 Seminar Cr 1 to 3 each time taken *Prereq 6 graduate credits in textiles and clothing permission of instructor* Discussion of scholarship and current issues Topics vary

T C 650 Advanced History of Costume and Textiles (3-0) Cr 3 Alt S offered 2004 *Prereq 204 354 or 355* Philosophy and techniques of history based research applied to clothing and textiles inter relationship of artifacts and documents individual and group projects

T C 665 Social and Psychological Theories of Appearance (3-0) Cr 3 Alt S offered 2005 *Prereq 467 or 6 credits in sociology or psychology* Analysis of social science theories and concepts applicable to clothing and appearance research

T C 690 Advanced Topics *Cr arr Prereq Enrollment in doctoral program permission of instructor and approval of department chair*

T C 699 Research

Theatre and Performing Arts

www theatre iastate edu

(Administered by the Department of Music)

Undergraduate Study

Students interested in theatre as a major area of concentration declare a major in Performing Arts and select an emphasis in Theatrical Design or Acting/ Directing Students implement the theories and principles explored in the classroom by participating in production work During the academic year Iowa State University Theatre presents up to ten mainstage and second stage productions in Fisher Theater and works in close collaboration with ISU Music and Dance

The major in Performing Arts offers the undergraduate student a cross-disciplinary concentration in Music Dance and Theatre The core curriculum consists of 24 credit hours in the three areas Students elect a 24 credit hour emphasis in either Dance Theatrical Design or Acting/Directing In addition to coursework Performing Arts majors and minors participate in concert (Orchesis Footfalls) workshop (Opera Studio Minority Theatre Workshop) and production (Barchje Stars Over Veishea ISU Theatre/Music Theatre/Second Stage and Studio) experiences

Performing Arts graduates in addition to a solid theoretical and experiential background in the areas of performance theatrical design dance and music are prepared to meet the challenges of the work force or graduate school with their strengths in collaboration *creative problem solving meeting deadlines and* processing diverse input to yield cohesive output Two required professional internships prior to graduation are vital to the student s appreciation and practical understanding of the rigors of the field

The theatre area offers a wide variety of courses Students may select from courses in acting design (costume scenic lighting/sound) make up stage direction playwriting stage management and theatre history Independent study and special topics courses supplement formal course offerings to provide opportunities to intensify study in a particular aspect of theatre

Auditions for ISU Theatre productions are open to all students irrespective of academic major Similarly participation in areas of production other than acting is open to both majors and nonmajors Qualified students also present experimental laboratory and Minority Theatre Workshop productions Student actors directors designers and technical crew heads are required to maintain a grade point average of at least 2 0 to participate in productions

Theatre scholarships are awarded on a yearly basis to students who make significant contributions to Iowa State University Theatre

Bachelor of Arts - Performing Arts Major (Perf)

The Core for the Performing Arts Major (24 cr)

(for individual Dance and Music course descriptions see *Index* for individual department listing)

Music 102 105
Dance 130–Ballet I 220–Modern Dance Composition
Dance 270–Dance Appreciation
Thtre 255 263 365
Perf 105–(six semesters) Perf 310 (2) Perf 401

Emphasis in Theatrical Design (24 cr)
Thtre 250 (2 cr) 360 366 455 461 465 466 Music 133

Emphasis in Dance (24 cr)
Art 292 Music 133 Ex Sp 355
Dance 222 224 (2 cr) 232 360 370
Select 2 credits from Dance 140 150 160 170 211 (instead of 160 170)
Select 2 credits from Dance 223 233 242 243 262
Select 3 credits from Dance 320 384 385 386
All students enrolled in the Dance Emphasis must register for one dance technique course every semester of residence up to a total of 8 credits and must complete one computer course (Com S 103 107 207 C I 201)

Emphasis in Acting/Directing (24 cr)
Thtre 151 250 (2 cr) 251 351 451 455 465 466 Music 133

Minor in Performing Arts (21 cr)
Perf 105 (three semesters)
Music 101 102
Dance 120 or 130 270
Thtre 255 263 or 251
plus six credits 300+ in Dance Thtre or Perf

English proficiency requirement Select one course from Advanced Writing Engl 302 303 304 305 306 307 309 314 315 316 366 370

Graduate Study

The department offers graduate courses as supporting work in other fields

Courses open for nonmajor graduate credit Thtre 316 465 466 Perf 401

Performing Arts

Courses Primarily for Undergraduate Students

Perf 105 Issues in the Performing Arts (1-0) Cr R FS Cross disciplinary analysis and discussion of topics in the performing arts Six semesters required of performing arts majors

Perf 310 Performing Arts Internship Cr R FS SS Required of performing arts majors A job or internship with a professional or semi-professional performing arts organization

Perf 401 Performing Arts Seminar (2 0) Cr 2 Alt S offered 2004 Intensive collaborative study and practice of topics in music dance and theatre Required of performing arts majors Nonmajor graduate credit

Theatre

Courses Primarily for Undergraduate Students

Thtre 106 Introduction to the Performing Arts (3 0) Cr 3 FS SS An audience oriented broad based team taught survey of the performing arts which emphasizes theatre and includes segments on television radio film dance and music

Thtre 110 Theatre and Society (3-0) Cr 3 FS An introduction to Theatre focusing on its impact on society from the Greeks to modern times Particular emphasis on the contemporary world theatre

Thtre 151 The Actor s Voice (3 0) Cr 3 S Study and practice of fundamentals of vocal production breathing quality articulation projection and expressiveness for the performing artist

Thtre 224 Concert and Theatre Dance (Same as Dance 224) See *Health and Human Performance Dance*

Thtre 250 Theatre Practicum Cr 1 or 2 each time taken maximum of 6 credits FS *Prereq Permission of instructor* Practice in various aspects of technical theatre production Offered on a satisfactory fail grading basis only

Thtre 251 Acting I (3 0) Cr 3 FS Theory and practice in fundamentals of acting

Thtre 252 African American Theatre Production (Same as Af Am 252) (3-0) Cr 3 An exploration of African American Theatre in production aesthetic foundations history and contributions to American Theatre

Thtre 255 Introduction to Theatrical Production (3 3) Cr 4 FS Standard structure and procedures historical overview of performing arts production including the design and creation of scenery costumes and lighting

Thtre 263 Script Analysis (3 0) Cr 3 FS Theory and analysis of scripts for production

Thtre 290 Special Projects Cr 1 to 3 each time taken maximum of 6 credits FS SS *Prereq 3 credits in theatre permission of instructor approval of written proposal*

Thtre 316 Creative Writing—Playwriting (Same as Engl 316) (3-0) Cr 3 S *Prereq Engl 105 not open to freshmen* Progresses from production of scenes to fully developed one act plays Emphasis on action staging writing analytical reading workshop criticism and individual conferences Nonmajor graduate credit

Thtre 351 Acting II (3-0) Cr 3 S *Prereq 251 Dance 120 recommended* Theory and practice of techniques of acting with emphasis on character and scene analysis

Thtre 352 Stage Combat (1 2) Cr 2 Alt S offered 2004 *Prereq 351* Theory history and practice of theatrical combat Includes tumbling hand to hand quarterstaff broadsword rapier and dagger

Thtre 354 Musical Theatre I (2 2) Cr 3 *Prereq 251 or Music 232 or 3 credits in Dance* Theory history and practice of musical theatre techniques Designed to develop the musical theatre performance skills of singers dancers and actors

Thtre 355 Musical Theatre II (2-2) Cr 3 *Prereq 354* Theory history and practice of musical theatre techniques Designed to develop the musical theatre performance skills of singers dancers and actors

Thtre 357 Stage Make up (1 2) Cr 2 F Theory and practice of make up and hair styling techniques for the performing arts Theatre Opera Dance Television and Film Lab required

Thtre 358 Oral Interpretation (3-0) Cr 3 F Principles of oral interpretation practice in analysis in reading aloud of literary selections and in reader s theatre

Thtre 359 Theatre for Children and Youth (3 0) Cr 3 Study and practice of directing acting and the production of theatre for children and youth

Thtre 360 Stagecraft (3 2) Cr 4 S *Prereq 255* Tools materials and techniques of planning constructing and painting of performing arts scenography Basic principles of lighting technology Technical drawing for performing arts production

Thtre 365 Theatrical Design I (2 2) Cr 3 F *Prereq 255* An exploration of the elements principles and art of theatrical design

Thtre 366 Theatrical Design II (2 2) Cr 3 S *Prereq 365* Intensive application of the principles introduced in 365 In depth study and practice of the graphic skills of rendering and drafting

Thtre 367 Stage Management (3-0) Cr 3 F *Prereq 255* The responsibilities and techniques of stage management for the performing arts

Thtre 393 Workshop Cr 3 each time taken maximum of 9 FS SS *Prereq 3 credits in theatre* Offered to explore special topics
A Minority Theatre
B Repertory
C Children s Theatre
D Musical Theatre
E Creative Dramatics
F International Storytelling

Thtre 451 Acting III (3 0) Cr 3 F *Prereq 351 and permission of instructor* Analysis and practice of period scenes

Thtre 455 Directing I (3 0) Cr 3 F *Prereq 255 263 251 recommended* Theory techniques and practice of directing

Thtre 456 Directing II (2 2) Cr 3 S *Prereq 455* Practical and theoretical experience in directing the stage play

Thtre 461 Theatrical Design Studio (3 2) Cr 4 each time taken maximum of 12 FS *Prereq Permission of instructor* Focuses on the art and craft of specific areas of theatrical design Each semester the student will focus on one or two of the following scenic costume or lighting design

Thtre 465 History of Theatre I (3 0) Cr 3 F *Prereq Hist 201 or equivalent* Theatre history from ancient times to 1800 Nonmajor graduate credit

Thtre 466 History of Theatre II (3-0) Cr 3 S *Prereq 465* Theatre history from 1800 to present Nonmajor graduate credit

Thtre 469 Advanced Theatre Practicum Cr 1 to 3 each time taken maximum of 3 credits per semester maximum of 6 credits total FS SS *Prereq 9 credits in theatre courses junior classification* Practicum in production with ISU Theatre with opportunities for specialization within various areas Required Approval of written proposal

Thtre 490 Independent Study Cr 1 to 3 each time taken FS SS *Prereq 9 credits in theatre approved written proposal junior classification* Only one independent study enrollment within the department is permitted per semester no more than 9 credits in Thtre 490 may be counted toward graduation

Thtre 497 Senior Seminar (3-0) Cr 3 S *Prereq 15 credits in theatre courses senior classification* Directed study of a theatre issue or problem identified by each student Students synthesize relevant theory and research culminating in senior project or paper

Thtre 499 Theatre Internship Cr var 1 to 8 each time taken maximum of 8 FS SS *Prereq 18 credits in theatre other courses deemed appropriate by faculty adviser 2nd semester junior or senior standing cumulative GPA of at least 2 5 overall and 3 0 in theatre courses* Supervised application of theatre in professional settings

Courses Primarily for Graduate Students, open to qualified undergraduates

Thtre 504 Seminar Cr 1 to 3 each time taken FS SS *Prereq 9 credits in theatre* Topics may include the following
A Musical Theatre
B Acting Techniques
C Acting Styles
D Design and Technical Theatre
E Arts Management

Thtre 590 Special Topics Cr 1 to 4 each time taken maximum of 12 credits *Prereq Approved written proposal*

Toxicology

www toxicology iastate edu

toximajor@iastate edu

(Interdepartmental Graduate Major)

Supervisory Committee A Kanthasamy Chair J Beetham J Coats G Kraus

Work is offered for the degrees master of science and doctor of philosophy with a major in toxicology in various cooperating departments Agricultural and Biosystems Engineering Animal Ecology Animal Science Biochemistry Biophysics and Molecular Biology Biomedical Sciences Botany Chemistry Entomology Food Science and Human Nutrition Geological and Atmospheric Sciences Microbiology Plant Pathology Veterinary Diagnostic and Production Animal Medicine Veterinary Microbiology and Preventive Medicine Veterinary Pathology and Zoology and Genetics

The prerequisites for entrance into the graduate toxicology major include an undergraduate degree in a relevant area of study for example chemical engineering biology biochemistry chemistry ecology entomology food science and technology microbiol ogy nutritional science zoology or veterinary medicine Minimum undergraduate coursework should include the following or their equivalent 1 year of college mathematics including calculus 1 year of inorganic chemistry with quantitative analysis 1 course in physics 1 year of organic chemistry 2 years of biological sciences including 1 course in physiology

Other courses that are considered desirable in the undergraduate preparation include biochemistry physical chemistry qualitative analysis and some specialized courses such as histology or advanced physiology Prospective students not meeting these requirements may be admitted on a provisional basis with approval of the admissions committee and the program of study committee

Facilities and faculty are available in these depart ments for fundamental research in such areas as aquatic toxicology environmental fate and effects of chemicals food safety neurotoxicology nutritional toxicology pesticides and veterinary toxicology

Students majoring in toxicology will be affiliated with a cooperating department and choose a major professor from the participating faculty in that department All Ph D students take a core curriculum consisting of Tox 501 and 502 2 credits of Tox 504 (Toxicology Seminar) 7 additional credits in toxicology 8 credits in biochemistry (from BBMB 404 405 420 451 511 542) 3 graduate credits in physiology histology or pathology Stat 401 and 402 M S students take a core of Toxicology 501 and 502 1 credit of Toxicology 504 Seminar 3 additional credits in toxicology BBMB 404 and 405 Stat 401 Additional coursework is selected to meet departmental requirements and to satisfy individual student research interests toxicology courses may be chosen from those listed below The foreign language requirement is determined by the student s major department

Graduates of the Toxicology major will be able to carefully design execute and analyze experiments that extend the knowledge of toxicology and closely related sciences They will be able to clearly communicate research findings and thoroughly evaluate the literature of toxicology contributing significantly to the advancement of the field

A graduate minor in toxicology is available for students enrolled in other majors A minor for an M S degree includes Tox 504 and 501 and 3 credits in other toxicology courses A minor at the Ph D level includes Tox 504 501 and 6 credits in other toxicology course work One member of the student s program of study committee will be a member of the toxicology faculty

Courses open for nonmajor graduate credit 419 420

Courses Primarily for Undergraduate Students

Tox 419 Foodborne Hazards (Same as FS HN 419) See *Food Science and Human Nutrition* Nonmajor graduate credit

Tox 420 Food Microbiology (Same as Micro 420) See *Microbiology* Nonmajor graduate credit

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Tox 501 Principles of Toxicology (Same as VDPAM 501 Zool 501) (3 0) Cr 3 F *Prereq BBMB 404 or equivalent* Principles of toxicology governing entry fate and effects of toxicants on living systems Includes toxicokinetics and foreign compound metabolism relative to toxification or detoxification

Fundamentals of foreign compound effects on metabolism physiology and morphology of different cell types tissues and organ systems

Tox 502 Toxicology Methods (Same as VDPAM 502 Zool 502) (0-6) Cr 3 Alt S offered 2004 *Prereq 501* Provides demonstrations or laboratory experience in the application of methods used in toxicology including safety procedures calculation and data analysis teratologic and morphologic evaluation electrophysiologic measures in vitro enzyme induction/biotransformation neural and behavioral toxicology testing

Tox 504 Toxicology Seminar (1 0) Cr 1 each time taken FS *Prereq Permission of instructor* Presentation of a seminar about a current topic in toxicology as part of a weekly series of seminars by graduate students faculty and guest lecturers from off campus

Tox 513 Ecological Toxicology (Same as A Ecl 513) See *Animal Ecology*

Tox 519 Food Toxicology (Same as FS HN 519) See *Food Science and Human Nutrition*

Tox 526 Veterinary Toxicology (Same as VDPAM 526) (3 0) Cr 3 S *Prereq Permission of instructor* A study of disease processes in animals caused by toxicants and the use of differential diagnostic and therapeutic procedures

Tox 544 Aquatic Toxicology (Same as A Ecl 544) See *Animal Ecology*

Tox 546 Clinical and Diagnostic Toxicology (Same as VDPAM 546) (0 3 to 0 9) Cr 1 to 3 each time taken FS SS *Prereq VDPAM 526 or DVM degree* Advanced study of current problems and issues in toxicology Emphasis on problem solving utilizing clinical epidemiological and laboratory resources

Tox 550 Pesticides in the Environment (Same as Ent 550) See *Entomology*

Tox 554 General Pharmacology (Same as B M S 554) See *Biomedical Sciences*

Tox 555 Neurobehavioral Toxicology (Same as VDPAM 555) (3-0) Cr 3 Alt F offered 2003 *Prereq VDPAM 501* Advanced study of neurotoxicology and behavior Emphasis on methods in neurobehavioral toxicology and the effects of a broad spectrum of neurotoxic agents

Tox 565 Methods of Biostatistics (Same as Stat 565) See *Statistics*

Tox 590 Special Topics

Courses for Graduate Students

Tox 626 Advanced Food Microbiology (Same as FS HN 626) See *Food Science and Human Nutrition*

Tox 643 Natural Toxins (Same as FS HN 643 Pl P 643) (1-6) Cr 3 Alt S offered 2005 *Prereq Courses in biochemistry and physiology* Naturally occurring toxins in foods and feeds plant-derived toxins mechanisms of action regulatory issues

Tox 675 Insecticide Toxicology (Same as Ent 675) (2 3) Cr 3 Alt F offered 2003 *Prereq Ent 555 or Tox 501* Coats Principles of insecticide toxicology classification mode of action metabolism and environmental effects of insecticides

Tox 699 Research

Transportation

(Interdepartmental Graduate Major)

Supervisory Committee R R Souleyrette Chair M R Crum R G Mahayani

Work is offered for the degree master of science (thesis option only) with a major in transportation under a cooperative arrangement with various departments including Civil and Construction Engineering (CCE) Community and Regional Planning (CRP) and Logistics Operations and Management Information Systems (LOMIS) Opportunities are afforded for research in such areas as modeling and performance of transportation systems techniques for urban and regional transportation system planning environmental and social policy analysis of transportation systems transportation policy analysis analysis of transportation technologies commodity distribution public administration of the transportation planning process regional development and transportation system interrelationships transportation economics and finance and planning for logistics management

Students majoring in transportation will develop a program of study under the guidance of a committee nominated by the administrative department head approved by the departmental transportation supervisory committee representative and appointed by the dean of the Graduate College For administrative purposes the student s home department will be the department originally admitting the student A major professor may be selected from any of the three participating departments A student must designate at least one member of the POS committee from his or her home department and at least one member from outside the home department

A student must complete at least 36 credit hours of acceptable work including preparation of a thesis A structured minor requires 12 credits of approved transportation courses and a thesis on a transportation *related topic*

A required core includes C E 551 Trans 691 Stat 401 and at least one course from all three cooperating departments (CRP CCE and LOMIS) Detailed requirements are available from the chair of the supervisory committee

Graduate students pursuing a major in any of the cooperating departments who have an interest in transportation are encouraged to consider a formal declared minor in transportation Students considering a declared minor should consult with the chair of the supervisory committee about the requirements for it

Students typically focus their program of study to support a career in one of four areas regional and statewide transportation planning transportation service operations and transportation management transportation policy and economic analysis and transportation planning and operation for local and state governments Graduates will have specific knowledge in one or more of these focus areas and the skills to conduct research and analysis of transportation issues These skills allow graduates to be productive immediately in positions related to a focus area or to continue in more advanced transportation graduate work

Courses Primarily for Graduate Students

Trans 555 Economic Analysis of Transportation Investments (3-0) Cr 3 F *Prereq C E 350 or 353 or 354 or 355* Application of economic analysis methodologies to evaluate transportation projects Multi modal approaches to evaluate impacts of transportation investments and maximize economic efficiency while considering equity and other social issues related to investment options

Trans 691 Seminar in Transportation Planning Cr 1 to 3 S Provides an overview of current transportation issues lecturers provide seminars on a variety of timely transportation topics

Trans 699 Research

Transportation and Logistics

(Administered by the Department of Logistics Operations and Management Information Systems)

Richard F Poist, Jr , Interim Chair of Department

Distinguished Professors Allen Baumel

Professors Crum Poist

Professors (Emeritus) Thompson Voorhees

Associate Professors Hendrickson Larson Lummus Mennecke Nilakanta Premkumar Ruben Townsend Walter

Assistant Professors Hackbarth Johnson Montabon Strader Suzuki Zhu

Instructors (Adjunct) Blanshan Chang Choobineh Clayton Tandradinata

Undergraduate Study

For the undergraduate curriculum in business major in transportation and logistics see *College of Business Curricula*

Transportation and logistics management is a discipline concerned with the efficient flow of materials through our industrial and economic system Transportation management deals with the management of the domestic and international modes of transportation in today s rapidly changing economic environment Logistics management assumes the *systems approach to the management of a wide* variety of activities such as inventory control warehousing traffic management location analysis packaging materials handling and customer service

The study of transportation and logistics serves as a specialized program for those who plan careers in transportation or logistics with shippers carriers and government agencies It is a broad based educational program which emphasizes the managerial aspects of transportation and logistics systems and concepts

The requirements for the transportation and logistics major are met by completion of the following courses TrLog 460 461 plus four of the following courses two of which must be TrLog courses TrLog 462 463 466 468 469 490 POM 420 422 424 or MIS 434

The department also offers a minor for non Transportation Logistics majors in the College of Business The minor requires 15 credits from an approved list of courses of which 9 credits must stand alone Students with declared majors have priority over students with declared minors in courses with space constraints

Graduate Study

The department participates in two graduate degree programs the M S in Business and the M B A full-time day and part time weekend programs The M S degree in Business is a 30-credit curriculum culminating in a thesis The M B A program is a 48 credit nonthesis noncreative component curriculum *Twenty four of the 48 credit hours are core courses* and the remaining 24 are graduate electives The department also participates in the interdepartmental transportation major

Courses open for nonmajor graduate credit 461 462 463 466 468 and 469

Courses Primarily for Undergraduate Students

TrLog 360 Business Logistics (3 0) Cr 3 *Prereq Econ 101* Introduction and analysis of the logistics concept to include the management of transportation inventory packaging warehousing materials handling order processing facility location and customer service

TrLog 460 Advanced Logistics Management (3 0) Cr 3 *Prereq 360 and Stat 226* Development of logistics topics introduced in 360 Emphasis on managing inbound and outbound flows of products and associated information requirements in the logistics system

TrLog 461 Transport Economics (3 0) Cr 3 *Prereq Stat 226 Econ 101* The role of transportation in the economy The economic characteristics of the various modes of transportation including the nature of transport demand and cost functions economic dimensions of transport service transport market structures and transport pricing theory and practice Emphasis on managerial implications of transport economic principles Nonmajor graduate credit

TrLog 462 Transportation Carrier Management (3-0) Cr 3 *Prereq Credit or enrollment in 461* Analysis of transport users requirements Carrier management problems involving ownership and mergers routes competition labor and other decision areas Nonmajor graduate credit

TrLog 463 Purchasing Management (3-0) Cr 3 *Prereq 360* Principles and policies in acquiring goods and services for the firm Emphasis on purchasing as it relates to materials management Nonmajor graduate credit

TrLog 466 International Transportation and Logistics (3 0) Cr 3 *Prereq 360* Logistics systems and legal framework for the international movement of goods Operational characteristics of providers of exporting and importing services The effects of government trade policies on global logistics Nonmajor graduate credit

TrLog 468 Transportation and Public Policy (3 0) Cr 3 *Prereq Credit or enrollment in 461* Analysis of current policies affecting transportation providers and users The roles of carrier and shipper organizations government agencies and other interest groups in policy development Evaluation of impact of programs policies and legislation on various transportation constituencies Nonmajor graduate credit

TrLog 469 Transportation and Logistics Issues (3-0) Cr 3 *Prereq 460 461* An integrative course designed to study contemporary problems and issues in transportation and logistics Nonmajor graduate credit

TrLog 490 Independent Study Cr 1-3 each time taken *Prereq 360 senior classification permission of instructor*

Courses Primarily for Graduate Students

TrLog 520 Decision Models for Supply Chain Management (Same as POM 520) See *Production Operations Management*

TrLog 560 Business Logistics Strategies (3 0) Cr 3 *Prereq Graduate classification* Management of the logistics functions in the firm including transportation inventory control warehousing packaging facility location materials handling and customer service Includes both theoretical aspects and practical applications in logistics

TrLog 561 Transportation Management and Policy (3 0) Cr 3 *Prereq Graduate classification* Analysis of contemporary issues and strategies in transportation management and policy Emphasis on evaluation of the impacts of transportation policies new technolo gies and strategic carrier and shipper management practices on the freight transportation industry and logistics systems

TrLog 590 Special Topics Cr 1 to 5 each time taken *Prereq Graduate classification and permission of instructor* For students who wish to do individual research in a particular area of transportation or logistics

University Studies

Howard Shapiro Vice Provost for Undergraduate Programs

Certain interdisciplinary courses are offered through university studies at the discretion of the vice provost for undergraduate programs and upon the advice of the Faculty Senate Curriculum Committee No major is available in university studies but credit obtained through university studies offerings may be applied toward a degree in any of the colleges consistent with the stipulations of the student s curriculum

Requests to make use of U St 101 290 and 490 should be directed to the vice provost for undergradu ate programs and should be accompanied by a positive recommendation from the department heads and deans of the instructors making the request The vice provost will refer requests to the Faculty Senate Curriculum Committee which will make recommenda tions to the vice provost regarding their disposition after consultation with appropriate college and university committees

The Graduate College sponsors U St 180 to help graduate students carry out instructional tasks as teaching assistants Placement in 180 is determined by examination (SPEAK/TEACH tests)

Courses open for nonmajor graduate credit 342

Courses Primarily for Undergraduate Students

U St 101 Interdisciplinary Studies Cr var Yr Offered when demand warrants Experimental interdisciplinary courses offered by an interdepartmental group Intended primarily for freshman and sophomore offerings

U St 105 Carver Academy Seminar Freshmen Cr 1 F *Prereq Acceptance in Carver Academy Program George Washington Carver scholarship recipient* Orientation to the university for Carver Academy students focusing primarily on transition and acclimation to the university environment Offered on a satisfactory fail grading basis only

U St 106 Carver Academy Seminar Freshmen Cr 1 S *Prereq Acceptance in Carver Academy Program George Washington Carver scholarship recipient* Introduction for Carver Academy students to resources at ISU to supplement classroom learning Offered on a satisfactoryy fail grading basis only

U St 111 Hixson Scholars Seminar (1 0) Cr 1 F *Prereq Recipient of the Hixson Opportunity Award* Orientation to Iowa State University and the Hixson Opportunity Awards Program Offered on a satisfactory fail grading basis only

U St 115 MVP Seminar (1 0) Cr 1 F *Prereq Recipient of the MVP Award* Orientation to Iowa State University and the MVP Program Offered on a satisfactory fail grading basis only

U St 131 Early Success Seminar (0-2) Cr 1 FS Orientation to the university for students in the Early Success Program Offered on a satisfactory-fail grading basis only

U St 150 Dialogues on Diversity Cr 1 FS An exploration of diversity within the context of the Iowa State University community through understanding human relations issues

U St 180 Communication Skills for International Teaching Assistants (Same as Engl 180) FS Placement based upon SPEAK/TEACH test results Persons whose native language is English cannot take 180 for credit No more than one section of 180 may be taken per semester up to two sections total Credit does not apply toward graduation Offered on a satisfactory fail grading basis only
A Speaking Skills Cr 3 Emphasis on pronunciation improvement and greater fluency in spoken English for teaching purposes
B Intermediate Spoken English Cr 3 Emphasis on classroom communication skills and strategies
C Advanced Spoken English Cr 3 For students who have completed 180A or 180B but have not reached the passing level on the SPEAK/TEACH test
D Presentation Skills Cr 3 Developing explanations leading discussions and handling questions in a teaching environment
E Supervised Independent Study Cr 1 Seminar with individual observation and consultation

U St 205 Carver Academy Seminar Peer Mentors Cr 1 F *Prereq U St 106 or permission of instructor* Leadership and peer mentor training for Carver Academy students who will be serving as peer mentors Development of mentoring and teaching skills Intended primarily for sophomores Offered on a satisfactory fail grading basis only

U St 206 Carver Academy Seminar Peer Mentors Cr 1 S *Prereq U St 106 or permission of instructor* Introduction to research training for Carver Academy students Development of research skills under faculty supervision Intended primarily for sophomores Offered on a satisfactory fail grading basis only

U St 240 Predeparture Orientation for China Study Abroad Cr 1 An examination of the culture language history economics and agriculture of China in preparation for participating in the ISU Study Abroad Program Offered on a satisfactory fail grading basis only

U St 290 Special Problems Cr var *Prereq Permission of the vice provost for undergraduate programs* Independent study on topics of an interdisciplinary nature Intended primarily for freshmen and sophomores
N Ncore The NcoreCourse Forum on Race and Ethnicity in the United States Cr 3 *Prereq Selection as an Ncore student scholar Attendance at Ncore* Exploration of issues of race and ethnicity in the United States

U St 305 Carver Academy Seminar Scholars Cr 1 F *Prereq U St 206 cumulative GPA 3 00 or permission of instructor* Training for research writing and presentations for Carver Academy students udner faculty supervision Research project with a faculty mentor is strongly encouraged Recitation peer mentors and program leaders for Carver Academy Freshment students Intended primarily for juniors Offered on a satisfactory fail grading basis only

U St 306 Carver Academy Seminar Scholars Cr 1 S *Prereq U St 206 cumulative GPA 3 00 or permission of instructor* Preparation for graduate and professional schools and career placement with continued preparation for research writing and presentation for Carver Academy students under faculty supervision Research project with faculty mentor is strongly encouraged Recitation peer mentors and program leaders for Carver Academy Freshmen students Intended primarily for juniors Offered on a satisfactory-fail grading basis only

U St 311 Leadership Seminar Cr 2 *Prereq 111 115 selection as leader for Hixson Seminar or MVP Seminar* For students serving as leaders under faculty supervision Development of facilitation and leadership skills Offered on a satisfactory fail grading basis only

U St 336 International Perspectives in Career Development Cr 3 The course will give a student the opportunity to study career related issues of career planning careers and work issues in career exploration the job search and cultural differences from international points of view The course will prepare the student to seek career related employment outside the United States for up to six months Offered on a satisfactory fail grading basis only

U St 342 World Food Issues Past and Present (Same as Agron 342) See *Agronomy* Nonmajor graduate credit

U St 405 Carver Academy Seminar Fellows Cr 1 F *Prereq U St 306 cumulative GPA 3 00 or permission of instructor* Continued preparation for graduate school professional school and/or chosen profession Research project experience with faculty mentor is required Recitation peer mentors and program leaders for Carver Academy Freshman and Sophomore students Intended primarily for seniors Offered on a satisfactory-fail grading basis only

U St 406 Carver Academy Seminar Fellows Cr 1 S *Prereq U St 306 cumulative GPA 3 00 or permission of instructor* Oral and written presentation of research under faculty supervision Recitations peer mentors and program leaders for Carver Academy Freshman and Sophomore students Intended primarily for seniors Offered on a satisfactory fail grading basis only

U St 471 Tones of Florence (Same as Music 471) See *Music*

U St 490 Independent Study Cr var *Prereq Permission of the vice provost for undergraduate programs* Independent study on topics of an interdisciplinary nature Intended primarily for juniors and seniors
I International Studies

Courses Primarily for Graduate Students, Open To Qualified Undergraduate Students

U St 541 Technological Innovation Social Change and Development (Same as Soc 541) See *Sociology*

U St 590 Special Topics *Prereq Permission of graduate college* Independent study on topics of an interdisciplinary nature Intended primarily for graduate students
F Technology and Social Change (Same as T SC 590F) Contact person Eric Abbott

Courses for Graduate Students

U St 640 Seminar in Technology and Social Change (Same as T SC 640) See *Technology and Social Change*

Veterinary Clinical Sciences

Robert E Holland Interim Chair of Department

Professors Betts Evans Grier Hoefle Holland Hopkins Jackson McGee Merkley Noxon D Riedesel Ware

Professors (Collaborators) Carpenter

Professors (Emeritus) Carithers Clark Eness

Associate Professors Baldwin Booth Conzemius Fox Jergens Kline Miles Nieves Obrien Reinertson E Riedesel Wagner

Associate Professors (Adjunct) King

Assistant Professors Butt Hopper McClure

Instructors (Adjunct) Aquino Caston Crandell Fisher Gordon Helle Horstman Kersh Kingsbury Mason Morrison Pendry Pressel Sponseller Wilke

Clinicians McLellan Miller

Professional Program of Study

For the professional curriculum in veterinary medicine leading to the degree doctor of veterinary medicine see *Veterinary Medicine Curriculum*

The study of medicine and surgery expands the training previously received in anatomy physiology pharmacology pathology and microbiology

The department presents coursework in animal reproduction concerning interferences with parturition diseases of the newborn and infertility

The teaching of radiology emphasizes the production and interpretation of radiographs and the dangers of ionizing radiation to humans and animals Alternate imaging modalities including ultrasonography and nuclear medicine are also taught

Hospital assignments during the fourth year provide the student an opportunity to participate in the application of clinical skills and knowledge

Graduate Study

The department offers work for the degree master of science with major in veterinary clinical science and minor work for students majoring in other departments Within the veterinary clinical sciences major the student may specialize in veterinary medicine swine production medicine surgery or theriogenology The D V M degree or equivalent is prerequisite to a major graduate work

Both thesis and nonthesis options are available and require the completion of a minimum of 30 graduate credits and a final examination

Foreign language requirements may be established by the student s program of study committee

Courses Primarily for Professional Curriculum Students

V C S 385 Seminar (Same as VDPAM 385) (1 0) Cr R each time taken FS *Prereq Classification in veterinary medicine* Seminars and case discussions on selected clinical subjects by staff and fourth year students of the College of Veterinary Medicine Offered on a satisfactory fail grading basis only

V C S 391 Radiology (2 0) Cr 1 S 8 weeks *Prereq First year classification in veterinary medicine* Essentials of radiology and radiobiology with special emphasis on radiation safety Introduction to diagnostic imaging methods image interpretation and radiation therapy

V C S 397 Principles of Surgery (6 0) Cr 6 S *Prereq Second-year classification in veterinary medicine* General principles of surgery of domestic animals

V C S 398 Anesthesiology (1 0) Cr 1 S *Prereq Second-year classification in veterinary medicine* Anesthetic equipment agents and procedures for domestic animals

V C S 399 Ophthalmology (1 0) Cr 1 S *Prereq Third year classification in veterinary medicine* Principles and techniques of medical and surgical ophthalmology

V C S 401 Advanced Small Animal Orthopedics (1 0) Cr 1 S *Prereq Third or Fourth year classification in veterinary medicine* Elective course in advanced small animal orthopedics

V C S 402 Electrocardiology (1 0) Cr 1 Alt S offered 2004 *Prereq V C S 444* Elective course in electrocardiology

V C S 405 Pet Bird and Exotic Species Medicine (1-3) Cr 2 S *Prereq Classification in veterinary medicine* Elective course in management and diseases of pet birds and exotic species

V C S 407 Feline Internal Medicine (1-0) Cr 1 F *Prereq Third-year classification in veterinary medicine* Elective course in feline internal medicine

V C S 412 Veterinary Accounting and Operations Management (2 4) Cr 3 FS *Prereq Classification in Veterinary Medicine* Introduction to accounting and fiscal concepts related to the operation of a vetrinary practice

V C S 414 Companion Animal Nutrition (1 0) Cr 1 S *Prereq Third or Fourth year classification in veterinary medicine* Elective course in small animal and equine nutrition

V C S 415 Advanced Small Animal Dermatology (1 0) Cr 1 F *Prereq Third or Fourth year classification in veterinary medicine* Elective course in dermatology

V C S 419 Preceptorship in Veterinary Medical Practice Cr 1 to 6 each time taken FS SS *Prereq Fourth-year classification in veterinary medicine permission of department chair* Elective course in veterinary practice under the guidance of veterinarians in approved practice settings

V C S 421 Husbandry and Diseases of Non traditional Species (2 0) Cr 1 Alt F offered 2004 *Prereq Second third or fourth-year classification in veterinary medicine* Husbandry management and common diseases of rabbits guinea pigs hamsters gerbils rats and mice

V C S 440 Introduction to Clinics (Same as VDPAM 440) (0-4) Cr R F 8 weeks *Prereq Third year classification in veterinary medicine*

V C S 443 Equine Lameness (1 0) Cr 1 S *Prereq Third year classification in veterinary medicine* Orthopedic diseases of the equine

V C S 444 Clinical Medicine I (5-0) Cr 5 F *Prereq Third year classification in veterinary medicine* Clinical diagnostic methods and consideration of diseases of domestic animals

V C S 445 Clinical Medicine II (Same as VDPAM 445) (5 0) Cr 5 S *Prereq Third year classification in veterinary medicine* Clinical diagnosis and treatment of diseases of equine swine beef dairy and sheep

V C S 446 Clinical Neurology (0-40) Cr 2 *Prereq Fourth year classification in veterinary medicine* Forty hours per week Clinical rotation in neurology with an emphasis on neurolocalization disease processes use of diagnostics in medical and surgical neurology and treatment options Exposure to neurosurgical techniques

V C S 448 Radiology (2 0) Cr 2 S *Prereq Third year classification in veterinary medicine* Essentials of diagnostic imaging and radiobiology with emphasis on diagnostic interpretation and protection from radiation

V C S 449 Junior Surgery Laboratory (1-4) Cr 3 F *Prereq Third year classification in veterinary medicine* Pre laboratory presentations and laboratories introducing the student to appropriate companion animal surgical methods and techniques
A Alternative Laboratory - neutering of Humane Society cats and dogs
B Traditional Laboratory

V C S 450 Disturbances of Reproduction (Same as VDPAM 450) (4-0) Cr 4 F *Prereq Third year classification in veterinary medicine* General principles of diseases causing disturbances in reproduction

V C S 451 Advanced Junior Surgery Laboratory (1-6) Cr 2 8 weeks *Prereq VCS 397 398 399 449* Advanced small animal soft tissue surgical procedures involving the abdominal cavity Less emphasis will be placed on the thoracic cavity and head and neck injury
A Alternative Laboratory neutering of Humane Society cats and dogs
B Traditional Laboratory

V C S 452 Clinical Dermatology Cr 2 *Prereq Fourth year classification in veterinary medicine small animal option* Study of clinical dermatological problems via computer aided instruction case simulations and/or lectures Clinical management of cases presented to Veterinary Teaching Hospital

V C S 453 Small Animal Medicine I Cr 2 each time taken *Prereq Fourth year classification in veterinary medicine* Clinical assignment in small animal medicine

V C S 454 Small Animal Medicine II Cr 2 each time taken *Prereq Fourth year classification in veterinary medicine* Clinical assignment in small animal medicine

V C S 455 Small Animal Soft Tissue Surgery Cr 2 each time taken *Prereq Fourth year classification in veterinary medicine* Clinical assignment in soft tissue surgery

V C S 456 Small Animal Orthopedic Surgery Cr 2 each time taken *Prereq Fourth-year classification in veterinary medicine* Clinical assignment in orthopedic surgery

V C S 457 Equine Medicine Cr 3 each time taken *Prereq Fourth year classification in veterinary medicine* Clinical assignment in equine medicine

V C S 458 Equine Surgery Cr 3 each time taken *Prereq Fourth year classification in veterinary medicine* Clinical assignment in equine surgery

V C S 459 Small Animal Overpopulation Medicine and Surgery FS SS (0-40) Cr 2 A 2 week rotation at a humane society that emphasizes the issues facing veterinarians and non veterinary Humane society personnel in dealing with the animal population problems facing this country

V C S 460 Radiology Cr 3 *Prereq Fourth year classification in veterinary medicine* Clinical assignment in veterinary radiology

V C S 463 Community Practice (0 40) Cr 2 each time taken *Prereq Fourth year classification in veterinary medicine* Forty hours per week Clinical experience in hospital based general practice

V C S 464 Equine Field Services FS SS (0-40) Cr 2 each time taken *Prereq Fourth year classification* Clinical assignment in equine ambulatory practice

V C S 465 Farrier FS SS (0-40) Cr 2 each time taken *Prereq Fourth year classification* Elective clinical assignment on the principles and practices of normal and therapeutic horseshoeing and equine foot care

V C S 466 Anesthesiology Cr 3 *Prereq Fourth year classification in veterinary medicine* Clinical assignment in small animal and large animal anesthesiology

V C S 468 Intensive Care Cr 4 *Prereq Fourth year classification in veterinary medicine* Clinical assignment to provide supervision of hospital cases requiring intensive care and including emergency cases

V C S 469 Special Senses Cr 2 each time taken *Prereq Fourth year classification in veterinary medicine* Clinical assignment in ophthalmology

V C S 470 Radiology Cr var each time taken *Prereq Fourth year classification in veterinary medicine* Elective clinical assignment in veterinary radiology

V C S 471 Animal Reproduction Cr var each time taken *Prereq Fourth year classification in veterinary*

medicine Elective clinical assignment in animal reproduction Equine and small animal reproduction only

V C S 472 Small Animal Medicine Cr var each time taken *Prereq Fourth year classification in veterinary medicine* Elective clinical assignment in small animal medicine

V C S 473 Small Animal Surgery Cr var each time taken *Prereq Fourth year classification in veterinary medicine* Elective clinical assignment in small animal surgery

V C S 474 Equine Medicine and Surgery Cr var each time taken *Prereq Fourth year classification in veterinary medicine* Elective clinical assignment in equine medicine and surgery

V C S 476 Anesthesiology Cr var each time taken *Prereq Fourth year classification in veterinary medicine* Elective clinical assignment in small animal and large animal anesthesiology

V C S 478 Intensive Care Cr var each time taken *Prereq Fourth year classification in veterinary medicine* Elective clinical assignment in intensive care

V C S 479 Special Senses Cr var each time taken *Prereq Fourth year classification in veterinary medicine* Elective clinical assignment in ophthalmology

V C S 480 Veterinary Dentistry Cr 1 Alt F offered 2004 *Prereq Third or Fourth year classification in veterinary medicine* All aspects of veterinary dentistry prophylaxis endodontics and orthodontics

V C S 490 Independent Study Cr 1 to 5 *Prereq Permission of instructor and department chair*

V C S 495 Seminar (Same as VDPAM 495) Cr R S *Prereq Fourth year classification in veterinary medicine* Seminars and case discussions on selected subjects by staff of the College of Veterinary Medicine and others including student presentations Offered on a satisfactory fail grading basis only

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

V C S 590 SpecialTopics Cr 1 to 3 *Prereq Permission of instructor*
A Medicine
B Surgery
C Theriogenology
D Radiology
E Anesthesiology

V C S 599 Creative Component Cr var *Prereq Enrollment in nonthesis master s degree program*

Courses for Graduate Students

V C S 604 Seminar Cr 1 each time taken FS

V C S 640 Advanced Radiology (2 0) Cr 2 Alt F offered 2003 *Prereq 448* Detailed principles of clinical radiology with particular reference to radiographic interpretation

V C S 671 Advanced General Surgery (1 3) Cr 2 Alt S offered 2004 *Prereq 441* An advanced course designed to investigate and discuss the responses of the body to surgical and anesthetic procedures

V C S 672 Advanced Special Surgery (1 3) Cr 2 Alt S offered 2005 *Prereq 449* Advanced procedures in both clinical and research techniques in abdominal thoracic orthopedic cardiovascular and neurological surgery

V C S 676 Advanced Medicine (2-0) Cr 2 Alt F offered 2003 *Prereq 445* Principles of general medicine A study in depth of factors that contribute to the development of clinical signs as related to the pathogenesis of disease

V C S 677 Advanced Medicine (2 0) Cr 2 Alt F offered 2004 *Prereq 445* An advanced study of metabolic diseases

V C S 699 Research
A Medicine
B Surgery
C Theriogenology
E Anesthesiology

Veterinary Diagnostic and Production Animal Medicine

Robert E Holland, Chair of Department

University Professors McKean

Professors Carson Evans Harris Hartwig Hoffman Holland Hopkins Hopper Hyde Osweiler Trampel

Professors (Emeritus) Kunesh Wass

Associate Professors Apley Halbur Janke Kersting Larson Thompson Uhlenhopp Yaeger Yoon Youngs Zimmerman

Assistant Professors Carr Evans O Connor Zhou

Assistant Professors (Adjunct) Harmon Imerman Kinyon Kozak Schwartz

Assistant Professors (Collaborators) Hurd

Instructors (Adjunct) Ameri Mahabadi Pogranichniy Schmidt Villar

Professional Program of Study

For the professional curriculum in veterinary medicine leading to the degree doctor of veterinary medicine see *Veterinary Medicine Curriculum*

The study of veterinary diagnostic and production animal medicine provides the student with basic and advanced skills in diagnostics reproduction medicine surgery production and health management of the major livestock species Students in the fourth year of the curriculum in veterinary medicine may elect to take advanced courses in beef dairy swine poultry or sheep production medicine Elective courses may include preceptorships in private practices other veterinary schools research and disease control laboratories

Production animal medicine emphasizes the integration of veterinary medicine with nutrition genetics economics food safety and other disciplines enabling graduates to use a broad knowledge base to support the health and production of food and fiber animals

Graduate Study

Veterinary Preventive Medicine is a multidisciplinary program focused on the study of health and disease in populations The various disciplines represented in the program are unified by a common approach based on the application of statistical methods to problem solving in populations Through their research and course work students will learn to understand and apply a variety of disciplines principles and techniques to population health issues involving environmental ecological nutritional genetic infectious or non infectious diseases

Graduate study in Veterinary Preventive Medicine will provide valuable skills and experience to persons interested in public health food safety emerging infectious diseases zoo or wildlife health management and livestock health A degree in Veterinary Preventive Medicine may be valuable for individuals considering a future in the biological or pharmaceutical industries government regulatory agencies public veterinary practice or international service agencies responsible for population health

Veterinary Preventive Medicine is an interdepartmental major administered by the Department of Veterinary Diagnostic and Production Animal Medicine (VDPAM) with participating faculty from colleges and departments across the University and collaborators from the National Animal Disease Center (USDA ARS) and the National Veterinary Services Laboratories (USDA APHIS) located in Ames Iowa

Both thesis and nonthesis options are available and require the completion of a minimum of 30 graduate credits for thesis and 36 graduate credits for nonthesis and a final examination

Courses Primarily for Professional Curriculum Students

VDPAM 401 Introductory Aquatic Animal Health and Medicine (Same as A Ecl 401) (1 2) Cr 1 F 8 weeks Introductory course with focus on fin fish production health and medicine Course content will help define future roles for veterinarians producers and service providers Emphasis will be placed on anatomy pathology infectious diseases nutrition regulatory constraints in production food safety and current research Field trip to aquaculture facility

VDPAM 408 Poultry Medicine and Disease Prevention (Dual-listed with VDPAM 508) Cr 2 S *Prereq Enrollment in College of Veterinary Medicine* Bacterial viral parasitic and nutritional diseases of domestic poultry and gamebirds biosecurity immunization and management procedures to prevent poultry diseases

VDPAM 409 Management Pathways in Veterinary Medicine (3 15) Cr 4 F 7 weeks Introduction to veterinary operations management and marketing Skills development related to being a valued practice associate Self development to assist the student in successfully balancing elements of fiscal responsibility and personal and professional success Out of class work will be assigned

VDPAM 411 Production Animal Medicine Cr 4 each time taken FS SS *Prereq Fourth year classification in veterinary medicine* Seasonal enrollment limit Clinical assignment in food animal production medicine and service Emphasis on diagnosis medicine surgery theriogenology and treatment skills

VDPAM 414 Veterinary Practice Entrepreneurship (Dual listed with 514) Cr 3 S To provide a formal exposure to the entrepreneurial and business skills necessary to own and operate a successful veterinary practice

VDPAM 416 Bovine Reproduction Evaluation Laboratory (0-4) Cr 1 FS *Prereq Third year classification in veterinary medicine* 10 students per section Bovine rectal palpation techniques will be repetitively taught in 7 four hour sessions Students will also learn techniques of epidural anesthesia artificial insemination and ultrasonic imaging University-owned cattle will be used

VDPAM 420 Preceptorship in Veterinary Medical Practice Cr 1 to 6 each time taken FS SS *Prereq Fourth year classification in veterinary medicine permission of department chair* Elective course in veterinary practice under the guidance of veterinarians in approved practice settings

VDPAM 426 VeterinaryToxicology (Dual listed with 526) Cr 3 S *Prereq Third year classification in veterinary medicine* A study of the disease processes in animals caused by toxicants and the use of differential diagnostic and therapeutic procedures

VDPAM 436 Beef Records Analysis Cr 1 per semester FS *Prereq Classification in Veterinary Medicine* Students will learn to conduct and critically assess production and financial data using Standardized Performance Analysis (SPA) in beef herds Students will be matched with individual herds and work with producers to identify areas for improving profitability health and sustainability Enrolling in the class for multiple semesters will be encouraged

VDPAM 437 InvestigationalTechniques in Dairy Production Medicine Dairy Herd Problem Identification (7 33) Cr 2 FS SS *Prereq Fourth year classification in veterinary medicine* Seven hours recitation/discussion and 33 hours clinical experience per week Course taken for two weeks at University of Wisconsin Madison on a space available basis Identify equipment facilities and management characteristics of dairy farms Understand dairy herd records and use to examine health and productivity Prioritize herd health and production problems and evaluate adequacy of ventilation and housing systems

VDPAM 438 Milk Quality in Dairy Production Medicine Mastitis/Milk Quality (9 31) Cr 2 FS SS *Prereq Fourth year classification in veterinary*

medicine Nine hours recitation/discussion and 31 hours clinical experience per week Course taken for two weeks at University of Wisconsin Madison on a space available basis Analysis of somatic cell counts Bulk tank milk cultures individual cow microbiology Milking system analysis and milking management Evaluate milking practices assess dairy environment and partial budget techniques

VDPAM 439 Nutrition in Dairy Production Medicine Applied Dairy Nutrition (3 37) Cr 2 FS SS *Prereq Fourth-year classification in veterinary medicine* Three hours lecture 37 hours clinical experience per week Course taken for two weeks at University of Wisconsin Madison on a space available basis Production and metabolic disease problems Evaluate feeding management Forage and feedstuff analysis dry matter determinations Ration analysis using trilogic computer programs

VDPAM 440 Introduction to Clinics (Same as V C S 440) (0 4) Cr R F 8 weeks *Prereq Third-year classification in veterinary medicine*

VDPAM 445 Clinical Medicine (Same as V C S 445) (5 0) Cr 5 S *Prereq Third year classification in veterinary medicine* Clinical diagnosis and treatment of diseases of equine swine beef dairy and sheep

VDPAM 450 Disturbances of Reproduction (Same as V C S 450) (4 0) Cr 4 F *Prereq Third year classification in veterinary medicine* Endocrinology and general principles of diseases causing disturbance in reproduction

VDPAM 455 Diagnostic Laboratory Practicum Cr 2 each time taken FS *Prereq Fourth year classification in veterinary medicine* Practical experience in livestock diagnostics

VDPAM 477 Food Animal Medicine and Surgery Cr var each time taken Seasonal enrollment *Prereq Fourth-year classification in veterinary medicine* Elective clinical assignment in food animal medicine and surgery

VDPAM 478 Introduction to Swine Production Medicine (15 20) Cr 2 FS SS *Prereq Fourth year classification in veterinary medicine* Two week introductory topics in swine production medicine with emphasis on contemporary production practices monitoring disease disease prevention environmen tal assessment and production records Fifteen hours recitation/discussion and 20 hours clinical experience per week

VDPAM 479 Swine Production Medicine Preceptorship (0-40) Cr 1 6 each time taken FS SS *Prereq 478* Two week advanced course in swine production medicine with emphasis on herd management production analysis and problem solving Forty hours clinical experience per week *Assignments will include preceptorships with a* practicing veterinarian and/or a production unit

VDPAM 480 Advanced Swine Production Medicine (15 20) Cr 2 S *Prereq 478* Two week advanced clinical rotation in swine production medicine Fifteen hours recitation/discussion and 20 hours clinical experience per week The instructor will lead field trips as well as problem solving exercises where the student will apply concepts of herd management production analysis economic analysis and disease prevention

VDPAM 481 Introduction to Beef Production Medicine (2 0) Cr 2 S *Prereq Third year classification in veterinary medicine* Introductory topics in beef production medicine with emphasis on monitoring disease disease prevention and production economics Two hours lecture per week

VDPAM 482 Beef Production Medicine Preceptorship (0-40) Cr 1-6 each time taken FS SS *Prereq 481* Two week advanced course in beef production medicine with emphasis on herd management production analysis and problem solving Forty hours clinical experience per week Assignments will include preceptorships with a practicing veterinarian and/or a production unit

VDPAM 483 Advanced Beef Production Medicine (15 20) Cr 2 FS *Prereq 481* Two week advanced clinical rotation in beef production medicine Fifteen hours recitation/discussion and 20 hours clinical experience per week The instructor will lead field trips as well as problem solving exercises where the student will apply concepts of herd management production analysis and disease prevention

VDPAM 484 Introduction to Dairy Production Medicine (15 20) Cr 2 FSS *Prereq Fourth-year classification in veterinary medicine* Two week introductory topics in dairy production medicine with emphasis on monitoring disease disease prevention and production economics Fifteen hours recitation/ discussion and 20 hours clinical experience per week

VDPAM 485 Dairy Production Medicine Preceptorship (0-40) Cr 1 6 each time taken FS SS *Prereq VDPAM 484* Two week advanced course in dairy production medicine with emphasis on herd management production analysis and problem solving Forty hours clinical experience per week Assignments will include preceptorships with a practicing veterinarian and/or a production unit

VDPAM 486 Introduction to Small Ruminant Production Medicine (15-20) Cr 2 FSS *Prereq Fourth year classification in veterinary medicine* Two week introductory topics in small ruminant production medicine with emphasis on monitoring disease disease prevention and production economics Fifteen hours recitation/discussion and 20 hours clinical experience per week

VDPAM 487 Livestock Disease Prevention (3-0) Cr 3 F A survey of diseases of large domestic animals including discussion of causes transmission and control Designed for students majoring in agricultural sciences

VDPAM 488 Laboratory in Clinical Microbiology Cr 1 each time taken FS SS *Prereq Fourth year classification in veterinary medicine* Application of microbiological and immunological procedures to the diagnosis of infectious and immunologically mediated diseases

VDPAM 489 Issues in Food Safety (Same as An S 489 FS HN 489 HRI 489) (1 0) Cr 1 Alt S offered 2005 *Prereq Credit or enrollment in FS HN 101 or 272 or HRI 233 FS HN 419 or 420 FS HN 403* Capstone seminar for the food safety minor Case discussions and independent projects about safety issues in the food system from a multidisciplinary perspective

VDPAM 490 Independent Study Cr 1 to 5 FS SS *Prereq Permission of department chair*

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

VDPAM 501 Principles of Toxicology (Same as Tox 501 Zool 501) (3 0) Cr 3 S *Prereq BBMB 404 or equivalent* Principles of toxicology governing entry fate and effects of toxicants on living systems Includes toxicokinetics and foreign compound metabolism relative to toxification or detoxification Fundamentals of foreign compound effects on metabolism physiology and morphology of different cell types tissues and organ systems

VDPAM 502 Toxicology Methods (Same as Tox 502 Zool 502) (0-6) Cr 3 Alt F offered 2003 *Prereq 501* Provides demonstrations or laboratory experience in the applications of methods used in toxicology including safety procedures calculation and data analysis mutagenicity tests cell culture residue analysis teratologic and morphologic evaluation electrophysiologic measures in vitro enzyme induction/biotransformation neural and behavioral toxicology testing

VDPAM 508 Poultry Medicine and Disease Prevention (Dual listed with VDPAM 408) Cr 2 S *Prereq Graduate student status in Vet Med Animal Science Animal Ecology or Biology* Bacterial viral parasitic and nutritional diseases of domestic poultry and gamebirds biosecurity immunization and management procedures to prevent poultry diseases

VDPAM 514 Veterinary Practice Entrepreneurship (Dual listed with 414) Cr 3 S *Prereq Graduate Veterinarian* To provide a formal exposure to the entrepreneuarial and business skills necessary to own and operate a successful veterinary practice

VDPAM 522 Principles of Epidemiology and Population Health (Same as V MPM 522) (3 0) Cr 3 S *Prereq Micro 310 or equivalent* Epidemiology and ecology of disease in populations Disease causality and epidemiologic investigations Issues in disease prevention control and eradication

VDPAM 526 VeterinaryToxicology (Dual listed with 426 Same as Tox 526) (3 0) Cr 3 S *Prereq Permission of instructor* A study of the disease processes in animals caused by toxicants and the use of differential diagnostic and therapeutic procedures

VDPAM 527 Applied Statistical Methods in Population Studies (3 0) Cr 3 Alt F offered 2003 *Prereq Stat 401* Measures of agreement assess ment of diagnostic tests logistic regression correlated data analysis survival analysis bioinformatics linear models comparing multiple groups

VDPAM 529 Epidemiological Methods in Population Research (3-0) Cr 3 Alt F offered 2004 *Prereq Stat 401* Designing conducting and analyzing data from field based studies including cross-sectional case control cohort and ecological studies Sampling Surveys Cost benefit analyses Clinical trials Modeling disease in populations

VDPAM 542 Introduction to Molecular Biology Techniques (Same as Zool 542) See *Zoology*

VDPAM 546 Clinical and DiagnosticToxicology (Same as Tox 546) (0 3 or 0 9) Cr 1 to 3 each time taken FS SS *Prereq D V M degree or 526* Advanced study of current problems and issues in toxicology Emphasis on problem solving utilizing clinical epidemiological and laboratory resources

VDPAM 551 Postmortem Veterinary Diagnostic Laboratory (0 3 to 0 9) Cr 1 to 3 each time taken FS SS *Prereq 455* Necropsy techniques of animals with emphasis on gross and microscopic lesions and diagnosis Offered on a satisfactory fail grading basis only

VDPAM 555 NeurobehavioralToxicology (Same as Tox 555) (3-0) Cr 3 Alt F offered 2003 *Prereq 501* Advanced study of neurotoxicology and behavior Emphasis on methods in neurobehavioral toxicology and the effects of a broad spectrum of neurotoxic agents

VDPAM 590 SpecialTopics Cr 1 to 3 *Prereq Permission of instructor* Topics in medicine surgery theriogenology beef swine dairy or sheep production medicine

VDPAM 599 Creative Component Cr var *Prereq Enrollment in nonthesis master s degree program*

Courses for Graduate Students

VDPAM 650 Swine Diagnostic Medicine Cr 1-4 SS *Prereq DVM degree Permission of instructor* A detailed study of swine diseases emphasizing the pathogenesis and diagnosis of swine respiratory enteric reproduction metabolic and septicemic diseases

VDPAM 651 Disease Dynamics in Swine Produc tion Medicine Cr 2 F *Prereq DVM degree permission of instructor* A detailed study of disease dynamics prevention and control in food producing animal populations emphasis on swine epidemiologi-cal issues pertinent to production medicine

VDPAM 652 Analytical Methods in Swine Production Medicine Cr 2 S *Prereq DVM degree permission of instructor* An overview of experimental and observational study designs analytical techniques and data interpretation emphasis on methodologies pertinent to swine production medicine

VDPAM 653 Clinical Trials in Production Medicine Cr 1 SS *Prereq DVM degree permission of instructor* Application of clinical trials in production

medicine Study design and execution and data analysis interpretation and reporting

VDPAM 654 Comparative Antimicrobial Clinical Pharmacology Cr 2 Alt S offered in 2004 *Prereq Graduate student resident or intern in College of Veterinary Medicine* Initial antimicrobial selection for infectious diseases of domestic animals The antimicrobial drug groups will be examined stressing pharmacokinetics minimal inhibitory concentrations and the use of these parameters to select appropriate compounds and dosages for maximum efficacy

VDPAM 655 Advanced Swine Production Medicine Cr 1 4 S *Prereq DVM degree and permission of instructor* Detailed overview of applied techniques used in swine production medicine production modeling and record analysis production economics and financial analysis therapeutic and vaccination strategies quality control procedures and food safety

VDPAM 699 Research

Veterinary Medicine

Norman F Cheville Dean

Elizabeth A Riedesel Interim Associate Dean

Donald L Reynolds Associate Dean

Courses Primarily for Professional Curriculum Students

For the professional curriculum in veterinary medicine leading to the degree doctor of veterinary medicine see *Veterinary Medicine Curriculum*

V Med 301 Professional Orientation (1 0) Cr R F 8 weeks *Prereq First year classification in veterinary medicine* An orientation to the College of Veterinary Medicine at ISU and the veterinary medicine profession

V Med 403 International Preceptorship (0 40) Cr 1-12 each time taken FS SS *Prereq Second year classification in veterinary medicine* International preceptorships and Study Abroad Group programs This course will provide opportunities for students to be involved in applied clinical production and/or research experiences in international locations The course consists of 40 hour per week experiential learning opportunities

V Med 404 Orientation for International Experience (2 0) Cr 1 S 8 weeks *Prereq Classification in veterinary medicine* Predeparture orientation for group study abroad Cultural considerations for the study abroad experience and a conversational language introduction Out of class work will be assigned

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

V Med 503 International Preceptorship (0-40) Cr 1 12 each time taken FS SS *Prereq Admission to the Graduate College* International preceptorships and Study Abroad Group programs This course will provide opportunities for students to be involved in applied clinical production and/or research experiences in international locations The course consists of 40 hour per week experiential learning opportunities

Veterinary Microbiology and Preventive Medicine

Donald L Reynolds, Interim Chair of Department

Distinguished Professors Cheville Ross Roth

Professors Carpenter Dickson Moon Platt Reynolds Rosenbusch Thoen

Professors (Collaborators) Donham Larsen Mengeling Nystrom Dean O Berry Schmerr Schultz Tabatabai

Distinguished Professors (Emeritus) Beran Kaeberle Switzer

Professors (Emeritus) Hogle Kramer

Associate Professors Griffith Holland Minion Phillips Thacker Uhlenhopp Wannemuehler Yoon Zimmerman

Associate Professors (Collaborators) Frey Harp Panigrahy Richt Sharma Zuerner

Assistant Professors Cornick Davis

Assistant Professors (Adjunct) Flaming

Assistant Professors (Collaborators) Anderson Currier Halling Hesse Hurd Sacco Stabel Stanton Waters Wesley

Instructors (Adjunct) Brown

Instructors (Collaborators) Schlater

The Department of Veterinary Microbiology and Preventive Medicine offers instruction in the areas of bacteriology mycology virology immunology epidemiology and public health at the graduate level

Microbiologic immunologic regulatory and preventive medical aspects of infectious diseases of animals are emphasized in courses for students in the veterinary curriculum

Professional Program of Study

For the professional curriculum in veterinary medicine leading to the degree doctor of veterinary medicine see *Veterinary Medicine Curriculum*

The Department of Veterinary Microbiology and Preventive Medicine provides instruction on pathogenic bacteria fungi and viruses and their interaction with host animal species Principles and applications of infectious diseases immunity to disease diagnostic methods for infectious diseases and vaccinology are covered Principles and applications of epidemiology public health preventive veterinary medicine regulatory veterinary medicine and food safety are also emphasized

Graduate Study

The department offers opportunities for the degree doctor of philosophy with a major in veterinary microbiology A specialization in preventive medicine is an option for this degree Graduates in the Veterinary Microbiology and Preventive Medicine programs have a broad understanding of the fundamental processes involved in infectious diseases pathogenesis and immunology They are able to effectively establish research programs which involve complex biological systems and disease syndromes They are also prepared to address microbial based social ethical and environmental problems Graduates acquire effective written and oral communication skills which lead to successful research and teaching careers in the medical and veterinary sciences The department also offers work towards the master of science with majors in veterinary microbiology or veterinary preventive medicine A non thesis master s option is available for majors in preventive medicine Courses are open for students majoring in other graduate programs

Prerequisite to graduate study is completion of coursework in general microbiology biology biochemistry mathematical sciences and physics Candidates for the majors in veterinary microbiology should possess an undergraduate degree in biomedical science with emphasis in medical microbiology or the D V M degree Candidates for the major in preventive medicine should possess the D V M degree

The department also participates in the interdepartmental majors and programs in genetics immunobiology and MCDB (molecular cellular and developmental biology see Index)

Each graduate student must demonstrate proficiency in English composition within two semesters in residence

Courses Primarily for Professional Curriculum Students

V MPM 378 Case Study IV (0 4) Cr 2 S *Prereq Second year classification in veterinary medicine* Case based applied learning that relates to the basic science courses Emphasis on early integration of basic and clinical science concepts

V MPM 380 Veterinary Immunology (2 0) Cr 2 S *Prereq First-year classification in veterinary medicine* Structure and function of the immune system in animals

V MPM 386 Veterinary Microbiology (3 5) Cr 5 F *Prereq Second year classification in veterinary medicine* Bacteria and fungi of veterinary importance with emphasis on mechanisms of disease production and laboratory diagnostic procedures

V MPM 387 Veterinary Virology (3 0) Cr 3 S *Prereq Second year classification in veterinary medicine* The nature and ecology of animal viruses Pathogenesis of viral diseases The role of the immune response in pathogenesis and immunity to viral diseases

V MPM 388 Public Health (3 0) Cr 3 S *Prereq Second-year classification in veterinary medicine* Fundamental epidemiology food safety occupational health and zoonnoses

V MPM 390 Topics in Veterinary History (2 0) Cr 1 S 8 weeks Significant persons noteworthy events and pivotal scientific discoveries in the course of the development and advancement of veterinary medicine from ancient times to the present

V MPM 409 Infectious Diseases of Captive Wild Animals (1 0) Cr 1 F *Prereq Second year classification in veterinary medicine* Infectious diseases (bacterial viral and mycotic) of non human primates birds ruminants cold blooded animals marine mammals and carnivores

V MPM 436 Infectious Diseases and Preventive Medicine (2 0) Cr 2 F *Prereq Third year classification in veterinary medicine* Etiology epidemiology laboratory diagnosis regulatory control and preventive medicine aspects of the infectious diseases of small domestic animals

V MPM 437 Infectious Diseases and Preventive Medicine (3 0) Cr 3 S *Prereq Third year classification in veterinary medicine* Etiology epidemiology laboratory diagnosis regulatory control and preventive medicine aspects of the infectious diseases of swine sheep goats cattle and horses

V MPM 486 Laboratory in Public Health Cr 1 each time taken FS *Prereq Fourth-year classification in veterinary medicine* Discussions lectures exercises and field trips related to veterinary public health

V MPM 490 Independent Study Cr 1 5 FS SS *Prereq Permission of instructor and department chair*

V MPM 494 Zoo Preceptorship Cr 1 8 each time taken FS SS *Prereq Fourth year classification in veterinary medicine* Elective course in zoo veterinary practice under guidance of approved veterinarians

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

V MPM 502 Microbial Genetics (Same as Micro 502) See *Microbiology*

V MPM 504 Microbial Physiology (Same as Micro 504) See *Microbiology*

V MPM 520 Medical Immunology I (4-0) Cr 4 F *Prereq Micro 310 or V MPM 386 3 credits in biochemistry* Nature of the immune system and its role in health and disease Credit for either 520 or 575 but not both may be applied toward graduation

V MPM 522 Principles of Epidemiology and Population Health (Same as VDPAM 522) (3-0) Cr 3 S *Prereq Micro 310 or equivalent* Epidemiology and ecology of disease in populations Disease causality and epidemiologic investigations Issues in disease prevention control and eradication

V MPM 536 Zoonoses and Environmental Health (3 0) Cr 3 Alt S offered 2004 *Prereq V MPM 522* Pathogensis and control of zoonotic diseases Factors influencing transmission and survival of pathogenic microorganisms in the environment

V MPM 540 Livestock Immunogenetics (Same as An S 540) See *Animal Science*

V MPM 542 Introduction to Molecular Biology Techniques (Same as Zool 542) See *Zoology*

V MPM 565 *Professional Practice in the Life* Sciences (Same as Pl P 565) See *Plant Pathology*

V MPM 575 Immunology (Same as Micro 575) See *Microbiology*

V MPM 586 Medical Bacteriology (Same as Micro 586) (4 0) Cr 4 F *Prereq Permission of instructor* Bacteria associated with diseases of vertebrates including virulence factors and interaction of host responses

V MPM 586L Medical Bacteriology Laboratory (0 6) Cr 2 F *Prereq credit or enrollment in 586 or 625* Procedures used in isolation and identification of pathogenic bacteria including molecular and genetic techniques used in research

V MPM 587 Animal Virology (4-0) Cr 4 *Prereq Permission of instructor* The biology of animal viruses and pathgenic mechanisms in viral diseases

V MPM 587L Laboratory in Animal Virology (0 3) Cr 1 *Prereq Permission of the instructor* Basic laboratory techniques in virology

V MPM 590 Special Topics Cr 1 to 5 each time elected FS SS *Prereq Permission of instructor*

V MPM 599 Creative Component Cr arr *Prereq Nonthesis M S Option only* A written report based on laboratory research library reading or topics related to the student s area of specialization and approved by the student s advisory committee

Courses for Graduate Students

V MPM 604 Seminar (1-0) Cr 1 each time taken F Offered on a satisfactory fail grading basis only

V MPM 608 Molecular Virology (Same as Pl P 608) (3 0) Cr 3 Alt S offered 2004 *Prereq BBMB 405 or Gen 511* Advanced study of virus host-cell interac tions Molecular mechanisms of viral replication and pathogenesis

V MPM 615 Molecular Immunology (Same as BBMB 615) See *Biochemistry Biophysics and Molecular Biology*

V MPM 625 Mechanisms of Bacterial Pathogen esis (Same as Micro 625) (4-0) Cr 4 Alt S offered 2005 *Prereq 386 and 520* Advanced study of virulence mechanisms of bacteria and current knowledge of host defenses in the pathogenesis of bacterial infections

V MPM 629 Advanced Topics in Cellular Immunol ogy (2 0) Cr 2 Alt S offered 2004 *Prereq 520 and 575* Current topics and literature in cellular immunol- ogy Topics include thymocyte development and selection T cell interactions with antigen presenting cells and lymphocyte effector functions

V MPM 690 Current Topics Cr 1 to 3 each time elected FS SS *Prereq Permission of instructor* Colloquia or advanced study of specific topics in a specialized field
A Immunology
B Infectious Diseases

V MPM 698 Seminar in Molecular Cellular and Developmental Biology (Same as MCDB 698) See *Molecular Cellular and Developmental Biology*

V MPM 699 Research

Veterinary Pathology

Claire B Andreasen, Chair of Department

Distinguished Professors Cheville

Professors Ackermann Carson Haynes Hopper Hyde Moon Myers Osweiler

Professors (Collaborators) Brogden Meador Murray

University Professors (Emeritus) Kluge

Professors (Emeritus) Daniels Greve Hagemoser Holter Jeska Ledet Miller Niyo Seaton Stahr

Associate Professors Andreasen Bender Halbur Janke Jarvinen Larson Sorden Yaeger

Assistant Professors Beetham Brockus Fales Hostetter Jones

Assistant Professors (Collaborators) Palmer

Instructors (Adjunct) Greenlee Grubor Jones Meyerholz Preast

Lecturers Danielson Mills Vermeer

Professional Program of Study

For the professional curriculum in veterinary medicine leading to the degree doctor of veterinary medicine see *Veterinary Medicine Curriculum*

The Department of Veterinary Pathology offers a systematic study of basic disease mechanisms with emphasis on the changes in cells tissues organs and body fluids associated with disease The theory and practice of veterinary pathology veterinary clinical pathology veterinary parasitology veterinary toxicology and related disciplines provide the basis for accurate diagnosis and a rational approach to the treatment and prevention of animal diseases

Graduate Study

The department offers work for the degree master of science and doctor of philosophy with a major in veterinary pathology As an option students within the veterinary pathology major may choose an area of specialization in cellular and molecular pathology veterinary clinical pathology veterinary toxicology or veterinary parasitology The master of science degree is available on a thesis or nonthesis basis in the veterinary pathology major with or without an area of specialization

Graduates have a broad understanding of veterinary pathology and related disciplines They are able to communicate with clinicians other scientists and other colleagues on scientific matters and with the general public on science policy matters that relate to veterinary pathology

Graduates are able to address complex problems facing the agricultural and biomedical sciences and are able to make appropriate diagnoses and investigations of animal diseases They consider ethical social legal and environmental issues and are skilled at carrying out research communicating research results and writing concise and persuasive grant proposals

A minor in veterinary pathology requires a minimum of 12 graduate credits at the Ph D level and 8 graduate credits at the M S level These credits must be from departmental courses Additionally a faculty member from the department must be a member of the student s program of study committee

A veterinary degree (doctor of veterinary medicine or equivalent) is required for the major in veterinary pathology and Veterinary Clinical Pathology Other specializations do not required the veterinary degree A minimum score of 550 is required on the TOEFL examination for students whose native language is not English Scores on the standardized Graduate Record Examination (GRE) General Test are required of students not having a veterinary degree from the United States or Canada The GRE General Test is strongly recommended for all other applicants The foreign language requirement will be determined by the student s program of study committee with the approval of the departmental chair The Graduate English Examination is a graduate college requirement for native English speakers

The M S thesis degree in veterinary pathology with or without an area of specialization requires a minimum of 30 graduate credits Following comple tion of all other requirements a comprehensive final examination is administered covering all graduate work including the thesis The examination is typically oral but a written component may be specified by the program of study committee The degree candidate must submit a thesis including at least one manuscript suitable for publication to the major professor at least one week prior to the final examination The departmental requirement for graduate courses includes 3 credits of basic biological sciences (biochemistry genetics cell biology) 4 credits of statistics (Stat 401) 4 credits of systemic pathology (from V Pth 570 or 571) 1 credit of postmortem pathology (V Pth 551) 1 credit of seminar (V Pth 605) and a significant number of research credits (V Pth 699)

The M S nonthesis degree in veterinary pathology with or without an area of specialization requires a minimum of 40 graduate credits including at least 10 graduate credits earned outside the department Every nonthesis master s degree program requires evidence of individual accomplishment demonstrated by completion of a creative component special report or scientific study A minimum of 3 credits of such independent work (V Pth 599) and a practical diagnostic examination (V Pth 606) corresponding to the area of specialization are required on every program of study The final examination is comprehen sive and consists of written and oral questions The departmental requirement for graduate courses includes those for the M S thesis degree plus additional courses corresponding to the area of degree emphasis of specialization Contact the department for a more complete list of requirements and information on areas of specialization

The Ph D degree in veterinary pathology with or without an area of specialization requires a minimum of 72 graduate credits including at least 12 graduate credits earned outside the department A minor is encouraged but not required The preliminary examination consisting of written and oral compo- nents is comprehensive and not restricted to the content of graduate courses The degree candidate must submit a dissertation including at least two manuscripts suitable for publication to the major professor at least one week prior to the final examination The final examination is primarily a defense of the dissertation but it may include questions on other areas of specialized knowledge The department also offers a combined DVM/PhD program designed for completion of courses for the PhD degree in Veterinary Pathology simultaneously with study in the professional curriculum in the College of Veterinary Medicine Contact the department for a more complete list of requirements for the Ph D degree and information on areas of specialization

Minor work is recommended in other departments in the College of Veterinary Medicine or departments or programs in other colleges The department participates in the interdepartmental program in immunobiology and the interdepartmental major in toxicology (See *Index*)

Courses open for nonmajor graduate credit 478

Courses Primarily for Professional Curriculum Students

V Pth 342 General Pathology (Dual listed with 542) (3 2) Cr 2 S 8 weeks Offered second half semester only *Prereq First year classification in veterinary medicine* Basic pathology with emphasis on disease in animals

V Pth 372 Systemic Pathology (2-3) Cr 3 F *Prereq 342* Response to injury by each body system

V Pth 376 Veterinary Parasitology (Dual listed with 576) (3 3) Cr 4 F *Prereq Second-year classification in veterinary medicine* Parasitic diseases of domestic animals and their control

V Pth 377 Case Study III (0 4) Cr 2 F *Prereq Second year classification in veterinary medicine* Clinical applications of the basic sciences taught concurrently in the fall semester of the second year curriculum in veterinary medicine

V Pth 401 Basics of Medical Terminology (1 0) Cr 1 F 8 weeks offered second half semester only Discussion of prefixes suffixes and roots (mostly from Latin and Greek) that comprise medical terms

V Pth 408 Clinical Pathology Interpretation (1-0) Cr 1 S *Prereq 425* Interpretation of laboratory data

on a series of clinical cases supplemented by current literature review

V Pth 409 Introduction to Veterinary Cytology (1-0) Cr 1 S *Prereq Second or third year classification in veterinary medicine* Description and interpretation of cellular preparations from tissues and body fluids

V Pth 410 Llama Medicine (1-0) Cr 1 S *Prereq Second or third year classification in veterinary medicine* Introduction to basic camelid medicine including anatomy behavior restraint handling husbandry herd health common diseases surgical conditions and anesthesia protocols

V Pth 422 Special Pathology (3 3) Cr 4 S *Prereq 372* Pathogenesis of diseases in domestic animals

V Pth 425 Clinical Pathology (1-4) Cr 3 F *Prereq 372* Principles of clinical hematology and clinical chemistry in domestic animals

V Pth 456 Necropsy Laboratory Practicum Cr 1 each time taken *Prereq Fourth year classification in veterinary medicine* Practicum in postmortem examination and diagnosis

V Pth 457 Clinical Pathology Laboratory Practicum Cr 1 each time taken *Prereq Fourth-year classification in veterinary medicine* Methodology in clinical chemistry hematology and cytology practice in interpretation of laboratory data

V Pth 478 Global Protozoology Molecular Biology of Protozoa (Dual listed with 578 same as Ent 478) (2-1) Cr 3 F *Prereq Permission of instructor* Analysis of cellular systems molecules and organelles of pathogenic protozoan parasites Emphasis is placed on processes and systems that are unique to protozoa are important to understanding vector-parasite host biology/ecology or are targets of disease prevention/treatment programs for international disease control Nonmajor graduate credit

V Pth 490 Independent Study Cr arr *Prereq Permission of instructor and department chair*

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

V Pth 542 General Pathology (Dual-listed with 342) (3-2) Cr 2 S 8 weeks offered second half semester only *Prereq Graduate classification and BMS 330 332 or Zool 322 for graduate credit* Basic pathology with emphasis on disease in animals

V Pth 548 Diagnostic Parasitology Laboratory (0-3 to 0 9) Cr 1 to 3 FS SS *Prereq 376 or 576* A laboratory experience in the technical and applied aspects of veterinary parasitology

V Pth 549 Clinical Pathology Laboratory (0-3) Cr 1 each time taken FS SS *Prereq 457* Laboratory procedures and clinical interpretations with emphasis on hematology cytology and clinical chemistry Offered on a satisfactory fail grading basis only

V Pth 550 Surgical Pathology Laboratory (0 3 to 0-9) Cr 1 to 3 each time taken FS SS *Prereq 422 570 or 571* Diagnosis of lesions in biopsy specimens classification of neoplasms Course includes rotation through departmental biopsy service and review of selected cases from departmental archives Offered on a satisfactory fail grading basis only

V Pth 551 Postmortem Pathology Laboratory (0-3 to 0-9) Cr 1 to 3 each time taken FS SS *Prereq 542 or 422* Necropsy techniques of animals with emphasis on gross and microscopic lesions and diagnosis Offered on a satisfactory fail grading basis only
A Veterinary Pathology
B Veterinary Diagnostic Laboratory

V Pth 554 Ethics in Scientific Research and Writing (1 0) Cr 1 Alt SS offered 2004 *Prereq Graduate classification* Ethical conduct in biomedical research criticism writing and adherence to regulations Offered on a satisfactory fail grading basis only

V Pth 570 Systemic Pathology I (2-4) Cr 1 to 4 Alt F offered 2004 *Prereq 342 or 542* Pathology of the respiratory reproductive endocrine musculoskeletal and cardiovascular systems Emphasis on pathogenesis and anatomic pathology correlated with interpretive clinical pathology where appropriate

V Pth 571 Systemic Pathology II (2-4) Cr 1 to 4 Alt F offered 2003 *Prereq 342 or 542* Pathology of the integumentary urinary digestive lymphoid and nervous systems and special senses Emphasis on pathogenesis and anatomic pathology correlated with interpretive clinical pathology where appropriate

V Pth 576 Veterinary Parasitology (Dual listed with 376) (3 3) Cr 4 F *Prereq Graduate classification and 542* Parasitic diseases of domestic animals and their control

V Pth 578 Global Protozoology Molecular Biology of Protozoa (Dual listed with 478 same as Ent 578) (2 1) Cr 3 F *Prereq Permission of instructor* Analysis of cellular systems molecules and organelles of pathogenic protozoan parasites Emphasis is placed on processes and systems that are unique to protozoa are important to understanding vector parasite-host biology/ecology or are targets of disease prevention/treatment programs for international disease control

V Pth 590 Special Topics Cr 1 to 4 FS SS *Prereq Permission of instructor*
A Veterinary Pathology
B Veterinary Parasitology
D Veterinary Clinical Pathology

V Pth 599 Creative Component Research
A Veterinary Pathology
B Veterinary Parasitology
D Veterinary Clinical Pathology

Courses for Graduate Students

V Pth 604 Pathology Case Seminar Cr 1 to 2 each time taken FS Description and interpretation of microscopic lesions and clinical pathology data collected from cases of natural and experimental disease Offered on a satisfactory-fail grading basis only

V Pth 605 Current Topics Seminar Cr 1 each time taken FS SS

V Pth 606 Diagnostic Interpretation Cr R FS SS A comprehensive examination in the diagnostic description and interpretation of case materials relevant to veterinary pathology and areas of specialization
A Veterinary Pathology
B Veterinary Parasitology
D Veterinary Clinical Pathology

V Pth 652 Pathologic Hematology (2 2) Cr 3 Alt S offered 2004 *Prereq 425* Pathologic changes in blood constituents of domestic animals

V Pth 653 Research Methods in Pathobiology (2-0) Cr 2 Alt F offered 2003 *Prereq Permission of instructor* Introduction to laboratory techniques for study of pathologic changes in cells and tissues including microscopy cytochemistry and molecular pathology techniques Offered on a satisfactory fail grading basis only

V Pth 655 Cellular and Molecular Pathology I (3 0) Cr 3 Alt S offered 2003 *Prereq Graduate course in biochemistry genetics or cell biology* Cellular and molecular mechanisms of cell injury circulatory dysfunction and the inflammatory response

V Pth 656 Cellular and Molecular Pathology II (3 0) Cr 3 Alt S offered 2004 *Prereq Graduate course in biochemistry genetics or cell biology* Cellular and molecular mechanisms of neoplasia and toxicologic pathology

V Pth 660 Pathology of Parasitic Diseases (2 0) Cr 2 Alt S offered 2004 *Prereq 372 376* Pathologic tissue changes caused by parasites and mechanisms of host response

V Pth 663 Clinical Chemistry (2-2) Cr 3 Alt S offered 2003 *Prereq 425* The pathophysiology methodology and clinical application of laboratory medicine

V Pth 679 Histopathology of Laboratory Animals (0-4) Cr 2 Alt SS offered 2004 *Prereq 570 or 571* Study of microscopic lesions in laboratory animals with emphasis on description etiology pathogenesis and diagnosis

V Pth 699 Research
A Veterinary Pathology
B Veterinary Parasitology
D Veterinary Clinical Pathology

Water Resources

www grad-college iastate edu/waterresources/

(Interdepartmental Graduate Major)

Supervisory Committee William G Crumpton Chair

Water resources is a university wide interdisciplinary program involving biological chemical physical and social sciences Faculty from departments in the colleges of Agriculture Engineering and Liberal Arts and Sciences cooperate to offer courses and research opportunities leading to the M S and Ph D degrees with a major in water resources

Although broadly trained water resources majors specialize in some technical aspect of water resources and applicants should have completed the equivalent of an undergraduate or masters degree in one of the biological chemical physical or engineering sciences

The water resources program emphasizes fundamental concepts and research which at the same time address water resources issues having regional and national significance The curriculum is designed to provide the interdisciplinary approach needed in water resources education and research In addition to work in their chosen area of specialization students may obtain a broad background in water resources encompassing physical chemical and biological aspects of water resources Cooperating departments offer courses covering surface water and groundwater hydrology meteorology climatology water quality aquatic and wetland ecology water resources engineering and sociological political and economic aspects of water resources planning and management

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

W Res 583 Water Resources (Same as Econ 583) (3 0) Cr 3 F *Prereq Graduate classification not for economics majors* Analysis of water resource management issues from economic legal political and sociological perspectives Topics include rational water allocation systems market failure investment pollution control strategies and resource management Administered by Economics in cooperation with Political Science and Sociology

W Res 590 Special Topics Cr var *Prereq Permission of major professor in water resources faculty* Literature reviews and conference in accordance with needs and interest of the student

W Res 599 Creative Component Cr var *Prereq Permission of major professor in water resources faculty* Creative component for nonthesis master of science degree

W Res 690 Seminar in Water Resources Management (1-0) FS
A Cr 1 Presentation required
B Cr R Attendance only

Women's Studies

www public iastate edu/~wsprogram/homepage html

(Interdepartmental Undergraduate Major)

Program Director J Bystydzienski

Core Faculty Jacquelyn Litt (Sociology) Karen Kessel (Anthropology)

Affiliated Faculty Cynthia Anderson (Sociology) Nikki

Bado-Fralick (Religious Studies) Robert Baum (Religious Studies) Sharon Bird (Sociology) Amy Bix (History) J Herman Blake (African American Studies) Leslie Bloom (Curriculum & Instruction) Dawn Bratsch Prince (Foreign Languages and Literatures) Dianne Bystrom (Political Science) Barbara Caldwell (Art & Design) Susan Carlson (English) Alicia Cast (Sociology) Joanna Courteau (Foreign Languages and Literatures) Susan Cross (Psychology) Brenda Daly (English) Jane Davis (English) Betty Dobratz (Sociology) Eugenia Farrar (Zoology & Genetics) Carla Fehr (Religious Studies) Cornelia Flora (Sociology) Linda Galyon (English) Kristin Gerhard (Library) Margaret Graham (English) Katherine Hannigan (Art & Design) Wendy Harrod (Sociology) Carolyn Heising (IMSE Engineering) Madeline Henry (Foreign Languages and Literatures) Carl Herndl (English) Kathleen Hickok (English) Clare Hinrichs (Sociology) Gloria Jones Johnson (Sociology) Debbie Kilgore (Educational Leadership and Policy Studies) Christiana Langenberg (English) Maggie LaWare (Speech Communication) Kathy Leonard (Foreign Languages and Literatures) Barbara Mack (Journalism and Mass Communication) Ardith Maney (Political Science) Peter Mattila (Economics) Michelle Mattson (Foreign Languages and Literatures) Theresa McCormick (Curriculum and Instruction) Olga Mesropova (Foreign Languages & Literatures) Julie Minkler Tsivakou (English) Mumbi Mwangi (Curriculum and Instruction/ Women's Studies) Tracey Owens Patton (Journalism and Mass Communication) Christie Pope (History) Constance Post (English) Diane Price Herndl (English) Whitney Sandford (Religious Studies) Mary Sawyer (Religious Studies) David Schweingruber (Sociology) Amy Slagell (English) Dawn Stinchcomb (Foreign Languages & Literatures) Gary Tartakov (Art & Design) Jane Vallier (Speech Communication) Jill Wagner (Anthropology) Betty Wells (Sociology) Laura Winkiel (English) Mary Winter (Human Development and Family Studies) Daniell Wirth (Philosophy) Tanya Zanish Belcher (Library)

Undergraduate Study

Women's Studies in the College of Liberal Arts and Sciences is a cross-disciplinary program in which students may elect a minor or a major Women's Studies provides an opportunity for students to examine women's roles contributions and status in social and cultural context and to investigate a variety of disciplines from feminist perspectives Women's Studies creates an understanding that interrelated factors —e g race ethnicity class age disability religion national origin and sexual orientation — inform knowledge of women's history culture and social roles Women's Studies seeks to improve critical thinking and to provide students with the intellectual means to question prevailing assumptions It encourages students to explore the contexts and ideological origins of knowledge and to examine the relationship between knowledge and power in society It promotes social responsibility by examining the connections between personal experience and political activity and validates student contributions and voices Women's Studies graduates are skilled in critical thinking research methods and effective communication Because they have developed a thorough understanding of gender race and class they can understand and work effectively with employers colleagues and clients to analyze and address complex social problems Women's Studies graduates acquire strong backgrounds for careers in such areas as counseling education human resources public policy politics business or law The program includes at various times core courses in Women's Studies and cross listed courses in anthropology art history classical studies economics English foreign languages and literatures history health and human performance political science psychology religion sociology speech communication and zoology

An undergraduate major requires 33 credits of core cross listed and independent study courses (Core Courses are those courses that originate in Women's Studies) Women's Studies majors must satisfy the following requirements

1 18 credits selected from women's studies core courses (W S)

A Required core courses W S 201 301 and 401 or 402 Students must also choose between a thesis W S 499 (3 cr) or an internship W S 491 (3 cr)

B The remaining 6 credits should be chosen from the Women's Studies core courses (W S 450 and 301 may be taken more than once)

C No more than 6 credits of W S 490 may be counted toward the W S major

2 15 credits selected from W S cross-listed courses or W S core courses

Women's Studies majors must also declare either a minor or a second major in a different program or department

English proficiency requirement The Women's Studies major requires an average grade of C- or better in English 104 and 105 (or 105H) and W S 301

Undergraduate students may minor in Women's Studies by taking 15 semester hours of Women's Studies classes including W S 201 301 and one 400 level core Women's Studies course plus 6 additional credits of core or cross listed courses

Because course listings vary from year to year any student interested in a minor or major in Women's Studies should contact the chair of the program committee for advising (See *Index Cross-Disciplinary Programs*)

The following women's studies courses are applicable to the human relations requirement for teachers 201 327 340 345 346 370 385 386 (See *Index Teacher Education Program*)

Graduate Study

Courses open for nonmajor graduate credit 301 321 323 336 340 345 350 394 401 402 422 and 450

Courses Primarily for Undergraduate Students

W S 201 Introduction to Women's Studies (3 0) Cr 3 FS Introduction to the interdisciplinary field of Women's Studies Contemporary status of women in the U S and worldwide from social economic historical political philosophical and literary perspectives Analysis of intersection of gender race class and sexuality Topics include work health sexuality and violence Background for the other courses in the program

W S 203 Lesbian Cultures and Communities (3-0) Cr 3 S An exploration of contemporary and historical lesbian cultures and communities in the United States examining their roots politics populations and conflicts from multiple perspectives

W S 258 Human Reproduction (Same as Zool 258) See *Zoology*

W S 301 International Perspectives on Women and Gender (3 0) Cr 3 May be repeated for up to 6 credits F *Prereq 201 or 3 credits in Women's Studies at the 300 level or above* Study of women in a range of cultures depending on faculty expertise Special emphasis on women in development seen in postcolonial context Nonmajor graduate credit

W S 321 Economics of Discrimination (Same as Econ 321) See *Economics* Nonmajor graduate credit

W S 323 Gender and Communication (Same as Sp Cm 323) See *Speech Communication* Nonmajor graduate credit

W S 327 Sex and Gender in Society (Same as Soc 327) See *Sociology*

W S 328 Sociology of Masculinities and Manhood (Same as Soc 328) See *Sociology*

W S 336 Women and Religion (Same as Relig 336) See *Religious Studies* Nonmajor graduate credit

W S 340 Survey of Women's Literature (Same as Engl 340) See *English* Nonmajor graduate credit

W S 345 Women and Literature Selected Topics (Same as Engl 345) See *English* Nonmajor graduate credit

W S 346 Psychology of Women (Same as Psych 346) See *Psychology*

W S 350 African American Women (Same as Af Am 350) (3-0) Cr 3 S *Prereq 201 or Af Am 201 or 3 credits in Women's Studies or African American Studies at the 300 level or above* Economic social political and cultural roles of African American women in the U S Includes literary philosophical and artistic expressions Myths and realities explored Nonmajor graduate credit

W S 374 Women in the Ancient Mediterranean World (Same as Cl St 374) See *Classical Studies*

W S 380 History of Women in Science, Technology and Medicine (Same as Hist 380) See *History*

W S 383 Women in Science and Engineering (Same as Zool 383) See *Zoology*

W S 385 Women in Politics (Same as Pol S 385) See *Political Science*

W S 386 History of Women in America (Same as Hist 386) See *History*

W S 394 Women in Art (Same as Art H 394) See *Art History* Nonmajor graduate credit

W S 401 Feminist Theories (3 0) Cr 3 F *Prereq 201 or 3 credits in Women's Studies at the 300 level or above* Current theories of feminism the feminine and sexual difference Topics in race class sexuality and ethnicity as they are addressed in diverse feminisms May include readings in lesbian Black postcolonial psychoanalytic and postmodern thought Nonmajor graduate credit

W S 402 Feminist Research Methodologies and Scholarship (3-0) Cr 3 S *Prereq 201 and 301* Introduction to feminist research methods and the history and influence of feminist research Examination of scholarly works by U S and international feminists Nonmajor graduate credit

W S 422 Women Men and the English Language (Same as Engl 422) See *English* Nonmajor graduate credit

W S 430 Seminar in International Studies (Same as IntSt 430) See *International Studies*

W S 444 Sex and Gender in Cross-cultural Perspective (Dual listed with 544 same as Anthr 444) See *Anthropology*

W S 450 Topics in Women's Studies (3-0) Cr 3 each time taken maximum of 6 S *Prereq 201 or 3 credits in Women's Studies at the 300 level or above* Special and/or experimental topics in a specific discipline e g women and education women and religion women and the law women and science Nonmajor graduate credit

W S 490 Independent Study Cr 1 to 3 each time taken maximum of 6 *Prereq Any two courses in Women's Studies permission of instructor consultation with the Women's Studies Program Director* Independent study on a topic in Women's Studies

W S 491 Senior Internship (3 0) Cr 3 FS SS *Prereq Senior classification* Internship designed to provide an application of Women's Studies principles and methods in a workplace To be arranged with an internal or external employer and conducted under the supervision of a member of the Women's Studies faculty

W S 499 Senior Thesis (3 0) Cr 3 FS SS *Prereq Senior classification* Senior thesis to be independently researched and written under the supervision of a member of the Women's Studies faculty

Courses for Graduate Students, Open To Qualified Undergraduate Students

W S 523 Gender Roles and Sport (Same as Ex Sp 523) See *Health and Human Performance*

W S 528 Sociology of Gender (Same as Soc 528) See *Sociology*

W S 544 Sex and Gender in Cross cultural Perspective (Dual-listed with 444 same as Anthr 544) See *Anthropology*

W S 545 Women s Literature (Same as Engl 545) See *English*

W S 586 Proseminar in Women's History and Feminist Theory (Same as Hist 586) See *History*

W S 590 Special Topics Cr var *Prereq Permission of Women s Studies Program Director* Independent study on a topic in Women s Studies

W S 594 Women in Art (Same as Art H 594) See *Art History*

Courses Offered by Other Departments

Engl 304 Creative Writing - Fiction See *English* Acceptable only when offered as a course on women s writing

Frnch 370 French Studies in English See *Foreign Languages and Literatures* Acceptable only when offered as a course on women or feminism in French literature

Ger 370 German Studies in English See *Foreign Languages and Literatures* Acceptable only when offered as a course on women or feminism in German literature

Zoology and Genetics

www mbb iastate edu/htm/index html

M Duane Enger, Chair of Department

University Professors Dolphin

Professors Ackerman Atherly Brendel Campbell Drewes Enger Henderson Howell J Johansen K Johansen Lee Mayfield Myers Peterson Schnable Shen Voytas

Professors (Collaborators) Haydon Link Palmer Shoemaker

Distinguished Professors (Emeritus) Tauber Ulmer

University Professors (Emeritus) Stadler

Professors (Emeritus) Bishop Brown Buttrey Hollander Imsande Jeska Miller Mutchmor Pattee Pollak Redmond Robertson Welshons

Associate Professors Ambrosio Becraft Buss Dobbs Emery Farrar Ford Girton Gu Ingebritsen Janzen McCloskey Minion Naylor Peterson Powell Sakaguchi Viles C Vleck

Associate Professors (Adjunct) D Vleck

Associate Professors (Collaborators) Mahajan Tucker

Associate Professors (Emeritus) Shaw

Assistant Professors Adams Chou Dorman Powell-Coffman

Assistant Professors (Adjunct) Bronikowski Coffman Pleasants

Instructors (Adjunct) Doyle Leshem Ackerman Miller

Instructors (Collaborators) Bowman Sime

Undergraduate Study

The department offers majors in genetics zoology and co-administers biology The zoology and genetics majors are available to students in both the College of Agriculture and the College of Liberal Arts and Sciences The programs for these majors are listed below and under the Curricula in Agriculture College requirements can be found under Curricula in Agriculture and Curriculum in Liberal Arts and Sciences The department offers minors in both genetics and zoology B S /M S programs are available in which a student with proper planning can complete the requirements for both bachelor s and master s degrees in five years Students interested in the B S /M S program must apply during their sophomore year

Training in genetics zoology or biology may lead to employment in teaching research or any of a variety of health related professions In most cases students should plan on continuing their education in graduate or professional school Students with the B S degree may expect to find employment in the biotechnology health or food industries Recent graduates have also developed careers in conservation biology technical writing science journalism technical sales business and genetic counseling

The required course work and associated electives are designed to provide students with knowledge of the basic biological sciences mathematics chemistry and physics This background is essential for professions involving modern biological sciences As part of these courses students develop skills in problem solving critical thinking writing research related activities and an introduction to biological professions

The respective communications and English proficiency requirements of both colleges are met by an average of C or better in Engl 104 105 or 105H and an additional English writing course The lowest grade acceptable in any of these courses is C Students in the College of Agriculture must also achieve a C or better in an oral communications course

A grade of C- or better is required in all biological science courses within the majors with a cumulative GPA of at least 2 0

Specific entrance requirements for medical and health related professions are established by the professional schools Students interested in fulfilling preprofessional requirements for such professions as cytotechnology dental hygiene dentistry human medicine medical technology nursing optometry pharmacy physical therapy physicians assistant and veterinary medicine can major in either genetics or zoology while fulfilling the preprofessional requirements (See *Preprofessional Study*)

Genetics

Genetics is the scientific study of heredity The understanding of heredity is fundamental to all the biological sciences The department offers a full range of instruction in all aspects of genetics from the molecular genetics of microorganisms to population genetics

In addition to basic degree requirements listed in the Curricula in Agriculture or the Curriculum in Liberal Arts and Sciences genetics majors must satisfy the following requirements

1 Biol 201 201L 202 202L 301 301L 302 302L 303 and Micro 302

2 Gen 110 410 411 491 and either 462 or 563

3 Eleven credits of calculus and statistics including at least one course in each

4 Three years of chemistry and biochemistry

5 One year of general college physics

6 Nine credits for the degree in the College of Agriculture and 6 credits for the degree in the College of Liberal Arts and Sciences of support electives chosen from an approved list

7 Majors in the College of Liberal Arts and Sciences must take one course that involves both humanities and biology such as history of science or bioethics This course may also count toward a college group requirement A list of acceptable courses is available from the departmental office

8 Majors in the College of Agriculture must include Biol (A Ecl) 312 in their program

The department offers a minor in genetics that may be earned by completing Biol 301 301L 302 302L Gen 410 411 and 491 A Genetics major may not double major or minor in Biology

Zoology

The study of zoology includes all aspects of animal life The department offers instruction in a wide range of zoological subjects ranging from the structure and function of cells to the behavior of animals and their populations

In addition to the basic degree requirements listed in the Curricula in Agriculture and the Curriculum in Liberal Arts and Sciences zoology majors (including those preparing for professional programs in medical and other health related fields) must complete satisfactorily the following requirements

1 Zool 110 Biol 201 201L 202 202L 301 301L 302 302L and Zool 355

2 Zoology electives 17 credits in zoology at the 300 level or above are required including seven credits at the 400 level or above and two laboratory courses with at least one at the 400 level Biol 312 303 and Gen 462 or Gen 563 are also acceptable electives A maximum of 4 credits of 490R and no credits of 490S and 490U may be used toward the 17 credits however only 2 credits of 490R may be applied to the requirement of seven 400 or above credits and no 490R credits can be applied to the laboratory requirement The 17 credits must also include at least one organismal course

3 Two years of chemistry or biochemistry totaling 15 credits to include one year of general chemistry with laboratory and at least one semester of organic chemistry with laboratory

4 Eleven credits of calculus and statistics including at least one course in each

5 One year of general college physics

6 Majors in the College of Liberal Arts and Sciences must take one course that involves both humanities and biology such as history of science or bioethics This course may also count toward a college group requirement A list of acceptable courses is available in the department office

7 Majors in the College of Agriculture must take 6 credits of agricultural biology electives This requirement is satisfied by passing six credits at the 300 level or above from the departments of Animal Ecology Animal Science or Entomology

8 Majors in the College of Agriculture must include Biol (A Ecl) 312 in their program

Majors are encouraged to take advantage of special opportunities available in summer courses at the Iowa Lakeside Laboratory at Lake Okoboji and at the Gulf Coast Research Laboratory Ocean Springs Mississippi (See *Index*) Generally these credits may be applied toward the zoology elective requirement Interested students should consult their advisers

The department offers a minor in zoology which may be earned by receiving credit for Biol 301 301L 302 302L Zool 355 and 3 additional zoology credits taken at the 300 level or above A Zoology major may not double major or minor in Biology

Information of the faculty programs staff and course requirements for the genetics or zoology major can be found at the Zoology and Genetics web site www mbb iastate edu/htm/index html

Graduate Study

The department offers work for the master of science and doctor of philosophy degrees

A student majoring in zoology may specialize in animal behavior animal models of gene therapy cell biology comparative physiology developmental biology ecology endocrinology immunobiology molecular biology neurobiology or physiology

Students entering any graduate major or program in the department need a sound background in the biological physical and mathematical sciences and must be committed to research Applicants are required to submit Graduate Record Examination (GRE) scores for both the aptitude and the biology advanced tests

Many of the graduate students in the department are in interdepartmental graduate majors or interdepartmental graduate programs such as Ecology and Evolutionary Biology Bioinformatics and Computational Biology Immunobiology Interdepartmental Genetics Molecular Cellular and Developmental Biology and Neuroscience

The requirements for the genetics major can be found under Genetics in the separate interdepartmental listing

Specific course requirements for advanced degrees depend largely upon previous training and experience in the major area of specialization There is no foreign language requirement Certification in the use of written English is required All graduate students must acquire teaching experience usually in laboratory courses as part of their graduate program All graduate students will participate in a journal club seminar and a research seminar in their area of interest each academic year

Courses open for nonmajor graduate credit Zool 355 403l 404l 405 415l 419l 420l 428 454 456 459 462 464 Gen 410 411 462 495

Genetics (Gen)

Courses Primarily for Undergraduate Students

Gen 110 Genetics Orientation (1-0) Cr 0 5 F First 8 weeks Orientation to the area of genetics For students considering a major in genetics Specializa tions and career opportunities Offered on a satisfactory fail grading basis only

Gen 260 Human Heredity and Society (3 0) Cr 3 F *Prereq One semester of college biology or Anthr 202* A survey course in genetics for non biology majors interested in heredity and its importance and implications to self and society Not recommended for those intending to take advanced courses in genetics Credit for graduation will not be allowed for more than one of the following 260 301 320 Biol 301 and 301L and Agron 320

Gen 298 Cooperative Education Cr R FS SS *Prereq Permission of department cooperative education coordinator sophomore classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Gen 301 Principles of Genetics (Same as Biol 301) See *Biology* Credit for graduation will not be allowed for more than one of the following 260 301 and 301L 320 Biol 301 and 301L and Agron 320

Gen 301L Principles of Genetics Laboratory (Same as Biol 301L) See *Biology*

Gen 308 Biotechnology in Agriculture Food, and Human Health (Dual listed with 508) (3-0) Cr 3 F S SS *Prereq Biol 201 and 202* Scientific principles and techniques in biotechnology Products and applications in agriculture food and human health Ethical legal and social implications of biotechnology A research paper is required for graduate credit

Gen 320 Genetics Agriculture and Biotechnology (Same as Agron 320) (3 0) Cr 3 FS *Prereq Biol 202* Transmission genetics with an emphasis on applications in agriculture the structure and expression of the gene how genes behave in populations and how recombinant DNA technology can be used to improve agriculture Credit for graduation will not be allowed for more than one of the following 260 301 320 Biol 301 and 301L and Agron 320

Gen 340 Human Genetics (3 0) Cr 3 Alt S offered 2004 *Prereq Biol 301 or Gen 301* Fundamental concepts and current issues of human genetics Human chromosome analysis pedigree analysis gene mapping the human genome project sex determina tion genetics of the immune system genetics of cancer gene therapy the genetic basis of human diversity eugenics

Gen 398 Cooperative Education Cr R FS SS *Prereq Permission of department cooperative education coordinator junior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Gen 410 Transmission Genetics (3-0) Cr 3 F *Prereq Biol 301 or Gen 301* The principles and practice of transmission genetics The Mendelian concept of the gene mutational analysis of gene function linkage and gene mapping genetic fine structure analysis chromosomal aberrations aneuploidy and polyploidy extrachromosomal inheritance analysis of genetic pathways genetics of quantitative traits Nonmajor graduate credit

Gen 411 Molecular Genetics (3 0) Cr 3 S *Prereq Biol 302* The principles of molecular genetics gene structure and function at the molecular level including regulation of gene expression genetic rearrangement and the organization of genetic information in prokaryotes and eukaryotes Nonmajor graduate credit

Gen 462 Evolutionary Genetics (Dual listed with 562 same as Zool 462) (3 0) Cr 3 S *Prereq Biol 303* The genetic basis of evolutionary processes in higher organisms The role of genetic variation in adaptation natural selection adaptive processes and the influence of random processes on evolutionary change Nonmajor graduate credit

Gen 490 Independent Study Cr arr *Prereq 301 junior or senior classification permission of instructor* Students in the College of Agriculture may use no more than 6 credits of Gen 490 toward the total of 128 credits required for graduation students in the College of Liberal Arts and Sciences may use no more than 9 credits of Gen 490 toward graduation
R Genetics research Cr 1 to 5 each time taken
S Attendance and critique of genetics seminars Cr 1 Offered on a satisfactory fail grading basis only
U Laboratory teaching experience For students registering to be undergraduate laboratory assis tants Cr 1 to 2 Offered on a satisfactory fail grad ing basis only

Gen 491 Undergraduate Seminar (1-0) Cr 1 F *Prereq Junior classification* The investigation of current issues in genetics Graduate school and employment opportunities discussed Practice in résumé writing and interview techniques Required for majors in genetics

Gen 495 Molecular Biology for Computational Scientists (Same as BCB 495) (3 0) Cr 3 F Dobbs Survey of molecular cell biology and molecular genetics for non biologists especially those interested in bioinformatics/computational biology Basic cell structure and function principles of molecular genetics biosynthesis structure and function of DNA RNA and proteins regulation of gene expression selected topics Provides biological background for BCB/Gen/Com S/Math 594 Credit for graduation will not be allowed for more than one of the following Gen 411 and 495 Nonmajor graduate credit

Gen 498 Cooperative Education Cr R FS SS *Prereq Permission of department cooperative education coordinator senior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Gen 508 Biotechnology in Agriculture Food and Human Health (Dual-listed in 308) (3 0) Cr 3 FS *Prereq Biol 201 and 202* Scientific principles and techniques in biotechnology Products and applications in agriculture food and human health Ethical legal and social implications of biotechnology A research paper is required for graduate credit

Gen 510 Transmission Genetics (3 0) Cr 3 *Prereq 410 or graduate standing* An in-depth investigation of the modern research practices of transmission genetics Designed for students interested in genetic research Topics include Mendelian genetic analysis analysis of genetic pathways mutational analysis of gene function chromosomal mechanics gene mapping extranuclear inheritance human genetic analysis characteristics of popular genetic model organisms

Gen 511 Molecular Genetics (Same as MCDB 511) (3-0) Cr 3 S *Prereq Biol 301 and BBMB 405* The principles of molecular genetics gene structure and function at the molecular level including regulation of gene expression genetic rearrangement and the organization of genetic information in prokaryotes and eukaryotes

Gen 512 Plant Growth and Development (Same as Bot 512) See *Botany*

Gen 520 Genetic Engineering (Same as BBMB 520 MCDB 520) (3-0) Cr 3 Alt F offered 2003 *Prereq 411 or BBMB 405* Strategies and methods of gene cloning restriction endonuclease mapping southern hybridization isolation and manipulation of plasmid DNA and detection of specific genes in bacteria

Gen 536 Genetic Statistics (Same as Stat 536) See *Statistics*

Gen 537 Genetic Statistics (Same as Stat 537) See *Statistics*

Gen 548 Fundamental Algorithms in Computational Biology (Same as BCB 548) See *Bioinformatics and Computational Biology*

Gen 550 Evolutionary Problems for Computational Biologists (Same as BCB 550) See *Bioinformatics and Computational Biology*

Gen 556 Computational Genomics and Evolution (Same as BCB 556) (3-0) Cr 3 Alt S offered 2005 *Prereq Biol 301* Gu Introduction to evolutionary sequence analysis at the genome level Topics include sequence alignment phylogenetic inference molecular clock analysis ancestral state inference sequence/structure relation functional divergence and prediction evolutionary development genome duplication and comparative genomics Focus will be on data analysis and biological interpretation

Gen 557 Statistical Methods for Computational Biology (Same as BCB 557) (2 0) Cr 2 Alt S offered 2004 *Prereq BCB 594* Gu Advanced discussion about statistical modeling of DNA and amino acid sequences microarray expression profiles and other genome wide data interpretation

Gen 562 Evolutionary Genetics (Dual listed with 462 same as Bot 562 Zool 562) (3 0) Cr 3 S *Prereq Biol 303* Graduate study in conjunction with 462 The genetic basis of evolutionary processes in higher organisms The role of genetic variation in adaptation natural selection adaptive processes and the influence of random processes on evolutionary change

Gen 563 Molecular Phylogenetics (Same as Zool 563) See *Zoology*

Gen 565 Professional Practice in the Life Sciences (Same as Pl P 565) See *Plant Pathology*

Gen 566 Molecular Evolution (Same as Bot 566) See *Botany*

Gen 590 Special Topics Cr 1 to 3 *Prereq 301 or 320*

Gen 594 Computational Molecular Biology (Same as BCB 594 Com S 594 Math 594) (3 0) Cr 3 FS *Prereq BCB 484 BCB 495 Stat 432 or equivalent courses and programming experience (C C++ or Perl)* State-of the art introduction to bioinformatics with emphasis on concepts and principles combined with hands-on (keyboard) applications Topics typically include molecular databases score based sequence analysis amino acid substitution scoring matrices query search problems dynamic programming and other methods for pairwise sequence alignment motif identification multiple sequence alignment construction of phylogenetic trees from sequenceing data gene structure prediction protein structure prediction

Gen 596 Genomic Data Processing (Same as BCB 596 Com S 596) (3 0) Cr 3 F *Prereq Some knowledge of programming* Chou Practical aspects of genomic data processing Emphasis on projects that carry out major steps in data processing using important bioinformatics tools Topics include base-calling raw sequence cleaning and contaminant removal shotgun assembly procedures and EST

clustering methods genome closure strategies and practices sequence homology search and function prediction annotation and submission of GenBank reports and data collection and dissipation through the Internet

Courses for Graduate Students

Gen 615 Molecular Immunology (Same as BBMB 615) See *Biochemistry Biophysics and Molecular Biology*

Gen 675 Nucleic Acid Structure and Function (Same as BBMB 675) See *Biochemistry Biophysics and Molecular Biology*

Gen 696 Seminar in Plant Physiology and Molecular Biology (Same as Bot 696) See *Botany*

Gen 698 Seminar in Molecular Cellular, and Developmental Biology (Same as MCDB 698) See *Molecular Cellular and Developmental Biology*

Gen 699 Research

Zoology (Zool)

Courses Primarily for Undergraduate Students

Zool 110 Zoology Orientation (1 0) Cr 0 5 F First 8 weeks Orientation to the area of zoology For students considering a major in zoology Specializa tions and career opportunities in the zoological sciences including medically related professions Offered on a satisfactory fail grading basis only

Zool 155 Introduction to the Human Body (3 0) Cr 3 FS SS *Prereq H S biology and chemistry or Biol 109* A survey course of the human body including principal structures and functions of the body systems and the diseases and disorders associated with them Designed to meet general education requirements in natural science Not recommended for those seeking a career in the allied health professions or for students majoring in life science

Zool 156 Introduction to the Human Body Laboratory (0 3) Cr 1 FS *Prereq Credit or enrollment in 155* A hands-on introduction to selected aspects of the human body through the use of models specimens videos student conducted experiments and computerized demonstrations

Zool 255 Fundamentals of Human Anatomy and Physiology Part I (3 0) Cr 3 F Fundamentals of the human body systems including anatomy and physiology and related diseases and disorders Part 1 of a two semester sequence Designed for students preparing for careers in health professions dietetics and athletic training Not recommended for dental or medical school Part 1 covers the nervous muscular skeletal endocrine and integumentary systems Part 2 (offered spring semesters) covers the cardiovascular immune respiratory digestive urinary and reproductive systems Premed students and those majoring in biological sciences should consider Zool 320 and 355 for their anatomy and physiology background

Zool 255L Fundamentals of Human Anatomy and Physiology - Laboratory Part I (0 3) Cr 1 F *Prereq Credit or enrollment in 255* A hands-on learning experience of human anatomy and physiology through the use of models specimens videos student conducted experiments and computerized demonstra tions Part 1 covers the nervous muscular skeletal endocrine and integumentary systems

Zool 256 Fundamentals of Human Anatomy and Physiology Part II (3 0) Cr 3 S Fundamentals of the human body systems including anatomy and physiology and related diseases and disorders Part 2 of a two semester sequence Designed for students preparing for careers in the health professions dietetics and athletic training Not recommended for dental or medical school Part 2 covers the cardiovas cular immune respiratory digestive urinary and reproductive systems Part 1 (offered fall semesters) covers the nervous muscular skeletal endocrine and integumentary systems Premed students and those majoring in biological sciences should consider Zool 320 and 355 for their anatomy and physiology background

Zool 256L Fundamentals of Human Anatomy and Physiology - Laboratory - Part II (0 3) Cr 1 S *Prereq Credit or enrollment in 256* A hands-on learning experience of human anatomy and physiology through the use of models specimens videos student conducted experiements and computerized demonstrations Part 2 covers the cardiovascular immune respiratory digestive urinary and reproduc tive systems

Zool 258 Human Reproduction (Same as W S 258) (3 0) Cr 3 Alt F offered 2004 *Prereq 155 or Biol 109 or 201* Anatomy and physiology of human reproduc tive systems including fertility pregnancy and delivery

Zool 298 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator sophomore classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Zool 301I Iowa Natural History (Same as Ia LL 301I) See *Iowa Lakeside Laboratory*

Zool 303 Biological Evolution (Same as Biol 303) See *Biology*

Zool 304 Animal Behavior (3 0) Cr 3 F *Prereq Biol 202* Ethological and sociobiological approaches to animal behavior Genetic and developmental aspects of behavior biological rhythms orientation (including navigation migration) communication and social behavior (mating aggression parental care)

Zool 304L Laboratory in Animal Behavior (0 3) Cr 1 F *Prereq Credit or enrollment in Zool 304* Laboratory techniques for observation description and analysis of animal activities independent projects

Zool 310 Brain and Behavior (Same as Psych 310) See *Psychology*

Zool 311 Introduction to Parasitology (Same as Micro 311) (3 3) Cr 4 F *Prereq Biol 202* Biology and host parasite relationships of major groups of animal parasites and techniques of diagnosing and studying parasites

Zool 312I Ecology (Same as Ia LL 312I) See *Iowa Lakeside Laboratory*

Zool 320 Comparative Chordate Anatomy (3 4) Cr 5 F *Prereq Biol 202 junior classification* The evolution of chordates as reflected in the anatomy of extinct and living forms Lecture topics include the history and diversity of chordates comparisons of anatomic structures among major groups the adaptive significance of anatomic structures Laboratory involves dissection of representative species

Zool 322 Vertebrate Histology (3 3) Cr 4 S *Prereq Biol 202* Microscopic structure of vertebrate tissues and organs with an introduction to histological techniques

Zool 334 Embryology (2-0) Cr 2 S *Prereq Biol 202* Basic principles and processes of development Course will cover classical as well as current aspects of developmental biology Emphasis will be on vertebrate model systems Not acceptable for credit in the major for Genetics or Zoology majors

Zool 334L Embryology Laboratory (0 3) Cr 1 S *Prereq Credit or enrollment in 334* Selected experiments demonstrating basic concepts in development Mixture of live embryo experiments and vertebrate developmental anatomy

Zool 355 Principles of Physiology (3 4) Cr 5 FS *Prereq Biol 302* Introduction to systemic functions with emphasis on mammals Nonmajor graduate credit

Zool 383 Women in Science and Engineering (Same as W S 383) (3 0) Cr 3 Alt F offered 2003 *Prereq A 200 level course in science engineering or women s studies Engl 105* The interrelationships of women and science and engineering examined from historical sociological philosophical and biological perspectives Factors contributing to under representation feminist critiques of science examination of successful strategies

Zool 398 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator junior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Zool 403I Evolution (Same as Ia LL 403I) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

Zool 404I Behavioral Ecology (Same as Ia LL 404I) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

Zool 405 Biology of Invertebrates (Dual listed with 505) (3 0) Cr 3 or (3-2) Cr 4 F *Prereq Biol 302* Emphasis on diversity development physiology and behavior of invertebrate organisms the spineless wonders of the world Laboratory emphasizes hands on study and experimentation with living inverte brates Nonmajor graduate credit

Zool 415I Freshwater Invertebrates (Same as Ia LL 415I) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

Zool 419I Vertebrate Ecology and Evolution (Same as Ia LL 419I) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

Zool 420I Amphibians and Reptiles (Same as Ia LL 420I) See *Iowa Lakeside Laboratory* Nonmajor graduate credit

Zool 428 Cell Biology (3 0) Cr 3 S *Prereq Biol 302* Biological organization and function at the cellular level Emphasis on biomembranes Nonmajor graduate credit

Zool 433 Developmental Biology (Same as Biol 433) (3 0) Cr 3 S *Prereq Biol 302* Principles of multicellular development from gametogenesis and fertilization through reproductive maturity Emphasis is placed on understanding the underlying mechanisms that govern developmental processes

Zool 433L Developmental Biology Laboratory (Same as Biol 433L) (0 3) Cr 1 S *Prereq Credit or enrollment in 433* Experiments and explorations illustrating fundamental principles of multicellular development

Zool 454 General and Comparative Endocrinology (Dual listed with 554) (3 0) Cr 3 or (3 3) Cr 4 S *Prereq 355 and Biol 302* Chemical integration of vertebrate organisms The structure development and evolution of the endocrine glands and the function and structure of their hormones Laboratory techniques for studying hormonal phenomena Laboratory experiments require animal surgery and involvement outside of scheduled class time Nonmajor graduate credit

Zool 456 Neurobiology (Dual listed with 556) (3-0) Cr 3 or (3 3) Cr 4 F *Prereq 310 or 355 physics recommended permission of instructor to enroll in lab* Integration coding plasticity and development in nervous systems Nonmajor graduate credit

Zool 459 Environmental Physiology (Dual listed with 559) (3 0) Cr 3 or (3 3) Cr 4 Alt S offered 2005 *Prereq 355 or A Ecl 311 physics recom mended* Physiological adaptations to the environment with an emphasis on vertebrates Nonmajor graduate credit

Zool 462 Evolutionary Genetics (Dual listed with 562 same as Gen 462) See *Genetics* Nonmajor graduate credit

Zool 464 Morphometric Analysis (Dual listed with 564) (3 2) Cr 4 S *Prereq Stat 401* A comprehensive overview of the theory and methods for the analysis of biological shape with emphasis on data acquisition standardization statistical analysis and visualization of results Methods for both landmark and outline data will be discussed Nonmajor graduate credit

Zool 490 Independent Study *Prereq 15 credits in zoological sciences permission of instructor* Students in the College of Agriculture may use no more than 6

credits of 490 toward the total of 128 credits required for graduation students in the College of Liberal Arts and Sciences may use no more than 9 credits of 490 toward graduation
I Iowa Lakeside Laboratory
R Zoology research Cr 1 to 5 each time taken
S Attendance and critique of zoology seminars Cr 1 Offered on a satisfactory fail grading basis only
U Laboratory teaching experience Cr 1 to 2 For students registering to be undergraduate laboratory assistants Offered on a satisfactory fail grading basis only

Zool 498 Cooperative Education Cr R FS SS *Prereq Permission of the department cooperative education coordinator senior classification* Required of all cooperative education students Students must register for this course prior to commencing each work period

Courses Primarily for Graduate Students, Open to Qualified Undergraduate Students

Zool 501 Principles of Toxicology (Same as Tox 501 VDPAM 501) See *Toxicology or Veterinary Diagnostic and Production Animal Medicine*

Zool 502 Methods of Toxicology (Same as Tox 502 VDPAM 502) See *Toxicology or Veterinary Diagnostic and Production Animal Medicine*

Zool 505 Biology of Invertebrates (Dual listed with 405) (3 0) Cr 3 or (3 2) Cr 4 F *Prereq Biol 302* Emphasis on diversity development physiology and behavior of invertebrate organisms the spineless wonders of the world Laboratory emphasizes hands on study and experimentation with living invertebrates

Zool 507 Advanced Animal Behavior (2 0) Cr 2 S *Prereq 304 permission of instructor* Analysis of current research in animal behavior with emphasis on physiological or endocrine control mechanisms

Zool 511I Field Parasitology (Same as Ia LL 511I) See *Iowa Lakeside Laboratory*

Zool 515 Ecology of Freshwater Invertebrates (Same as A Ecl 515) See *Animal Ecology*

Zool 528 Cellular Growth and Regulation (Same as MCDB 528) (3-0) Cr 3 F *Prereq Courses in cell biology and biochemistry* Cell cycle regulation of cell growth cell division membranes transport processes and regulation of cellular activities

Zool 533 Principles of Developmental Biology (Same as MCDB 533) (3-0) Cr 3 Alt F offered 2003 *Prereq Biol 302* Fundamental principles in multicellular development Emphasis on understanding evolutionary conserved cellular and molecular regulatory processes as illustrated in classical studies and current literature

Zool 540 Signal Transduction (Same as BBMB 540 MCDB 540) (3 0) Cr 3 Alt S offered 2005 *Prereq 528 BBMB 404* Mechanisms and components of cellular signal transduction including receptors G proteins second messengers protein phosphorylation other post translational protein modifications and transcriptional regulation

Zool 542 Introduction to Molecular Biology Techniques (Same as BBMB 542 BCB 542 BMS 542 Bot 542 FS HN 542 Hort 542 NREM 542 VDPAM 542 V MPM 542) Cr 1 per module FS SS *Prereq Graduate classification* Workshops in basic molecular biology techniques and related procedures Offered on a satisfactory fail grading basis only
A DNA Techniques Includes genetic engineering procedures sequencing PCR and genotyping (FS SS)
B Protein Techniques Includes fermentation protein isolation protein purification SDS PAGE Western blotting NMR confocal microscopy and laser microdissection immunophenotyping and monoclonal antibody production (S SS)
C Cell Techniques Includes immunophyenotyping ELISA flow cytometry microscopic techniques and image analysis (FS)
D Plant Transformation Includes Agrobacterium and particle gun mediated transformation of tobacco Arabidopsis and maize and analysis of transformants (S)
E Proteomics Includes two-dimensional electrophoresis laser scanning mass spectrometry and database searching (F)

Zool 554 General and Comparative Endocrinology (Dual listed with 454) (3-0) Cr 3 or (3 3) Cr 4 S *Prereq 355 and Biol 302* Graduate study in conjunction with 454 Chemical integration of vertebrate organisms The structure development and evolution of the endocrine glands and the function and structure of their hormones Laboratory techniques for studying hormonal phenomena Laboratory experiments require animal surgery and involvement outside of scheduled class time

Zool 556 Neurobiology (Dual-listed with 456 same as Neuro 556) (3 0) Cr 3 or (3 3) Cr 4 F *Prereq 355 or 310 physics recommended permission of instructor to enroll in lab* Graduate study in conjunction with 456 Integration coding plasticity and development in nervous systems

Zool 557 Advanced Neuroscience Techniques (Same as Neuro 557) See *Neuroscience*

Zool 559 Environmental Physiology (Dual listed with 459) (3 0) Cr 3 or (3 3) Cr 4 Alt S offered 2005 *Prereq 355 or A Ecl 311 physics recommended* Graduate study in conjunction with 459 Physiological adaptations to the environment with emphasis on vertebrates

Zool 562 Evolutionary Genetics (Dual listed with 462 same as Gen 562) See *Genetics*

Zool 563 Molecular Phylogenetics (Same as Gen 563 Bot 563) (2 3) Cr 3 F *Prereq Biol 303 and 301* Estimation of phylogenetic trees from DNA sequence data Course provides an overview of uses for phylogenetic trees in bioinformatics genomics molecular genetic and systematics and explores the relationship between data models of molecular evolution and patterns of biological diversification

Zool 564 Morphometric Analysis (Dual listed with 464) (3-2) Cr 4 S *Prereq Stat 401* A comprehensive overview of the theory and methods for the analysis of biological shape with emphasis on data acquisition standardization statistical analysis and visualization of results Methods for both landmark and outline data will be discussed

Zool 566 Molecular Evolution (Same as Bot 566) See *Botany*

Zool 568 Advanced Systematics (Same as Ent 568) See *Entomology*

Zool 569 Biogeography (Same as Bot 579) see *Botany*

Zool 590 Special Topics (Same as Ia LL 590I) Cr 1 to 5 each time taken *Prereq Permission of instructor*

Zool 590I Graduate Independent Study (Same as Ia LL 590I) See *Iowa Lakeside Laboratory*

Courses for Graduate Students

Zool 632 Current Topics in Signal Transduction Cr 2 to 3 each time taken *Prereq Permission of instructor* Selected topics in signal transduction events their molecular mechanisms and their relation to cellular processes Topics may include cell recognition second messenger systems information integration and transfer cell cycle cell differentiation and pattern formation

Zool 660 Current Topics in Neurobiology and Behavior (Same as Neuro 660) Cr 2 to 3 each time taken *Prereq Permission of instructor* Topics may include communication hormones and behavior neural integration developmental neurobiology neuroanatomy and ultrastructure sensory biology social behavior techniques in neurobiology and behavior

Zool 690 Seminar in Zoology Cr 1 each time taken Journal article critique and discussion by faculty and graduate students Offered on a satisfactory-fail grading basis only
A Cellular Molecular and Developmental Biology
B Biology of Populations and Organisms
C Neurobiology
D Physiology
E Evolution
F Animal Models of Gene Therapy
G Behavior
H Bioinformatics

Zool 696 Research Seminar Cr 1 each time taken Research seminars by faculty and graduate students Offered on a satisfactory fail grading basis only
A Cellular Molecular and Developmental Biology
B Biology of Populations and Organisms
C Neurobiology
D Physiology
E Evolution
F Animal Models of Gene Therapy
G Behavior
H Bioinformatics

Zool 698 Seminar in Molecular Cellular, and Developmental Biology (Same as MCDB 698) See *Molecular Cellular and Developmental Biology*

Zool 699 Research
I Iowa Lakeside Laboratory See *Iowa Lakeside Laboratory*

Courses Offered at the Gulf Coast Research Laboratory (GCRL), Ocean Springs, Mississippi

The Gulf Coast Research Laboratory is affiliated with the University of Southern Mississippi Iowa State students may register for the following University of Southern Mississippi/ GCRL courses and transfer them to their ISU degree programs Written permission of the ISU coordinator for the GCRL 201 *Bessey is required for this arrangement* Inquire at 201 Bessey for further information

MAR 301 Marine Biology (3 2) Cr 5 SS *Prereq 8 semester hours of biological sciences* A general introduction to marine biology with emphasis on local fauna and flora

MAR 303 Beach Fauna Cr 2 SS *Prereq Consent of instructor* An intensive field oriented course in which students study the abiotic and biotic factors influencing the occurence and distribution of invertebrates in protected and open beach habitats of the northern Gulf of Mexico

MAR 401 Marine Mammals (3-2) Cr 5 SS *Prereq 13 semester hours of biology including Marine Biology or Marine Ichthyology* An examination of the natural history and population ecology of cetaceans including life history distribution population dynamics diet and feeding social structure evolution and zoogeography

MAR 403 Marine Invertebrate Zoology (3-3) Cr 6 SS *Prereq 16 credits in biology including general zoology and introduction to invertebrate zoology* Concentrated study of free living marine and estuarine invertebrates of the Mississippi Sound and adjacent continental shelf of the northeastern Gulf of Mexico Emphasis on structure classification phylogenetic relationships larval development and functional processes

MAR 408 Marine Ichthyology (3 3) Cr 6 SS *Prereq 16 semester hours of biology* Study of marine fishes including evolutionary relationships morphology physiology and zoogeography The course is intended to familiarize the upper level student with classic and current concepts in marine ichthyology

MAR 411 Special Topic Cetacean Behavior and Cognition Cr 3 SS This course will focus on the behavior and communication of marine mammals particularly dolphins and whales Particular attention will be given to the roles of maturation and learning in the development of social and communicative behavior and to the methodological difficulties inherent in the study of such behavior in marine mammals

The Faculty

Distinguished Professor denotes those faculty members who have been recognized for having attained outstanding national and international reputations within their professional disciplines.

University Professor denotes those faculty members who have been recognized for having made outstanding contributions to the quality of education at Iowa State University.

Inquiries concerning the faculty list should be directed to the Office of the Provost, 1550 Beardshear Hall.

ABBOTT, ERIC ALAN, Professor of Greenlee School Journalism/Communication. B.S., 1967, Iowa State; M.S., 1970, Ph.D., 1974, Wisconsin.
ABELSON, ABRAHAM G., Professor of Curriculum and Instruction. B.A., 1964, M.Ed., 1970, Pennsylvania State; Ph.D., 1976, Michigan.
ABENDROTH, ROBERT E., Associate Professor of Civil, Construction and Environmental Engineering. B.S., 1966, M.S., 1968, Ph.D., 1983, Wisconsin.
ABRAHAM, ROBERTA G., Emeritus Professor of English. B.A., 1953, Cornell; M.A., 1976, Iowa State; Ph.D., 1981, Illinois.
ABRAHAM, WILLIAM H., Emeritus Professor of Chemical Engineering. B.Ch.E., 1952, Cornell; Ph.D., 1957, Purdue.
ACKER, DAVID G., Professor of Agricultural Education and Studies; Assistant Dean of the College of Agriculture. B.A., 1975, Wilmington; M.Ed., 1980, M.S., 1980, California (Davis); Ph.D., 1989, Oregon State.
ACKER, DUANE, Professor of Animal Science (Collaborator). B.S., 1952, M.S., 1953, Iowa State; Ph.D., 1957, Oklahoma State.
ACKERMAN, RALPH A., Professor of Zoology. B.A., 1967, Rutgers; Ph.D., 1975, Florida.
ACKERMANN, MARK R., Professor of Veterinary Pathology. D.V.M., 1986, Ph.D., 1990, Iowa State.
ADAMS, DEAN, Assistant Professor of Zoology and Genetics; Assistant Professor of Statistics. B.A., 1992, Franklin and Marshall College; M.Sc., 1994, Louisiana; Ph.D., 1999, New York (Stony Brook).
ADAMS, DONALD R., Emeritus Professor of Biomedical Sciences; University Professor. A.B., 1960, California (Davis); M.A., 1967, Chico State; Ph.D., 1970, California (Davis).
ADAMS, JEAN W., Emeritus Professor of Economics. B.A., 1969, M.A., 1971, Ph.D., 1973, Illinois.
ADAMS, ROY DEAN, Emeritus Professor of Economics. B.A., 1968, M.A., 1971, Ph.D., 1972, Illinois.
ADAMS, SAMUEL KEITH, Associate Professor of Industrial and Manufacturing Systems Engineering. B.Mgt.E., 1960, Rensselaer; M.S.E., 1962, Ph.D., 1966, Arizona State.
ADURI, PAVANKUMAR R., Assistant Professor of Computer Science. B.Tech., 1993, Jawaharlal Nehru Technological; M.S., 1995, Indian Institute of Technology; Ph.D., 2001, New York (Buffalo).
AGARWAL, SANJEEV, Associate Professor of Marketing. B.E., 1979, Roorkee (India); M.S., 1980, California (Davis); Ph.D., 1986, M.A., 1986, Ohio State.
AHMANN, JOHN STANLEY, Emeritus Professor of Educational Leadership and Policy Studies; Emeritus Professor of Psychology; Distinguished Professor in Education. B.A., 1943, Trinity; B.S., 1947, M.S., 1949, Ph.D., 1951, Iowa State.
AHN, DONG UK, Associate Professor of Animal Science. B.S., 1978, M.S., 1983, Seoul National; Ph.D., 1988, Wisconsin.
AHRENS, FRANKLIN A., Emeritus Professor of Biomedical Sciences. B.S., 1959, D.V.M., 1959, Kansas State; M.S., 1965, Ph.D., 1968, Cornell.
AIGNER, STEPHEN M., Associate Professor of Sociology. B.A., 1967, Knox; M.S.W., 1969, M.A., 1972, Ph.D., 1976, Michigan.
AITCHISON, GARY L., Emeritus Associate Professor of Management. B.A., 1956, Northern Iowa; M.A., 1961, Northern Colorado; Ph.D., 1972, Iowa State.
AJJARAPU, VENKATARAMANA, Associate Professor of Electrical and Computer Engineering. B.Tech., 1979, Jawaharal Nehru Tech; M.Tech., 1981, Indian Institute of Technology; Ph.D., 1986, Waterloo.
AKERS, ARTHUR, Emeritus Professor of Aerospace Engineering. B.Sc., 1953, London; M.Sc., 1955, Cranfield; Ph.D., 1969, London.
AKILI, SANA, Lecturer in Marketing. B.A., 1996, Qatar; M.B.A., 1999, Iowa State.
AKINC, MUFIT, Professor of Materials Science and Engineering and Chair of the Department. B.S., 1970, M.S., 1973, Middle East Technical (Turkey); Ph.D., 1977, Iowa State.
AKKURT, CIGDEM T., Associate Professor of Art and Design. B.A., 1961, Cornell College; M.A., 1970, Iowa; M.S., 1982, Massachusetts.
AL-KAISI, MAHDI, Assistant Professor of Agronomy. B.S., 1974, Baghdad; M.S., 1982, Ph.D., 1986, North Dakota State.
ALCORN, JANET W., Emeritus Associate Professor of Music. B.Mus., 1958, Northwestern; M.Mus., 1960, Boston University.
ALEKEL, D. LEE, Associate Professor of Food Science and Human Nutrition. B.S., 1979, Cornell; M.S., 1985, Pennsylvania State; Ph.D., 1993, Illinois.
ALEXANDER, ROGER K., Associate Professor of Mathematics. B.A., 1968, Kansas; M.A., 1974, Ph.D., 1975, California (Berkeley).
ALEXANDER, TERRY J., Adjunct Associate Professor of Economics. B.A., 1980, M.A., 1984, Ph.D., 1989, Maryland.
ALLEN, BENJAMIN J., Professor of Logistics, Operations and Management Information Systems; Professor of Economics; Distinguished Professor in Business; Vice President for Academic Affairs and Provost. B.S., 1969, Indiana; M.A., 1973, Ph.D., 1974, Illinois.
ALLEN, BEVERLYN LUNDY, Assistant Professor of Sociology. BSW, 1975, M.S.W., 1977, Temple; Ph.D., 1995, Iowa State.
ALLEN, CRAIG MARSHALL, Associate Professor of Human Development and Family Studies. B.S., 1972, M.S., 1975, Brigham Young; Ph.D., 1980, New Hampshire.
ALLEN, LINDA QUINN, Assistant Professor of Foreign Languages and Literatures; Assistant Professor of Curriculum and Instruction. B.A., 1978, Purdue; M.A., 1982, Ball State; Ph.D., 1994, Purdue.
ALLEN, PHILIP MANNING, Emeritus Professor of Art and Design. B.F.A., 1960, M.F.A., 1961, Drake.
ALLEN, VIRGINIA, Associate Professor of English; Associate Professor of Curriculum and Instruction. B.A., 1965, Florida State; M.A., 1972, Chicago State; Ph.D., 1980, Florida State.
ALREAD, JASON, Assistant Professor of Architecture. B.A., 1988, Florida; M.Arch., 1991, Yale.
ALSBURY, THOMAS L., Assistant Professor of Educational Leadership and Policy Studies. B.A., 1983, B.S., 1983, M.Ed., 1987, Washington; Ed.D., 2001, Washington State.
ALURU, SRINIVAS, Associate Professor of Electrical and Computer Engineering; Associate Professor of Computer Science. B.Tech., 1989, Indian Institute of Technology; M.S., 1991, Ph.D., 1994, Iowa State.
AMAYA, JOSE M., Assistant Professor of English. B.A., 1987, California State (Northridge); Ph.D., 1995, California (Los Angeles).
AMBROSIO, LINDA, Associate Professor of Zoology and Genetics. B.S., 1976, New York (Stony Brook); Ph.D., 1985, Princeton.
AMEMIYA, YASUO, Professor of Statistics. B.S., 1977, Tokyo Science University; M.S., 1980, Ph.D., 1982, Iowa State.
AMENSON, JERRY L., Adjunct Instructor in Civil, Construction and Environmental Engineering.
AMERI-MAHABADI, MEHRDAD, Adjunct Instructor in Veterinary Diagnostic and Production Animal Medicine. D.V.M., 1991, Ph.D., 1996, Tehran (Iran).
AMIDON, KEVIN SCOTT, Assistant Professor of Foreign Languages and Literatures. M.A., 1995, Ph.D., 2001, Princeton.
AMIN, VIREN R., Adjunct Assistant Professor of Electrical and Computer Engineering; Adjunct Assistant Professor of Animal Science. B.S., 1987, NHL Medical College; M.S., 1989, Ph.D., 1992, Iowa State.
AMOS, ROSALIE JEANNE, Emeritus Associate Professor of Family and Consumer Sciences Education and Studies; Emeritus Associate Professor of Curriculum and Instruction. B.S., 1953, Iowa State; M.S., 1960, Ph.D., 1976, Cornell.
ANANTHARAM, VELLAREDDY, Adjunct Assistant Professor of Biomedical Sciences. B.S., 1980, St. Josephs College, Bangalore, India; M.S., 1982, St. Josephs, Bangalore Univ, India; Ph.D., 1987, Indian Institute of Science (India).
ANDERSEN, PATRICIA G., Adjunct Assistant Professor of Educational Leadership and Policy Studies. B.S., 1967, Denver; M.S., 1972, Shippensburg; Ed.D., 1982, Rutgers.
ANDERSON, CARL E., Emeritus Associate Professor of Agricultural and Biosystems Engineering. B.S.A.E., 1962, Pennsylvania State; M.S.A.E., 1965, Arizona; Ph.D., 1975, Kansas State.
ANDERSON, CRAIG A., Professor of Psychology and Chair of the Department. B.A., 1976, Butler; M.A., 1978, Ph.D., 1980, Stanford.
ANDERSON, CYNTHIA D., Associate Professor of Sociology. B.A., 1987, William and Mary; M.S., 1990, Virginia Polytechnic Institute; Ph.D., 1996, North Carolina State.
ANDERSON, DEAN, Professor of Health and Human Performance. B.S., 1968, M.A., 1972, Ph.D., 1978, Minnesota.
ANDERSON, E. WALTER, Professor of Physics and Astronomy. A.B., 1959, Harvard; M.A., 1961, Ph.D., 1965, Columbia.
ANDERSON, IRVIN C., Emeritus Professor of Agronomy. B.S., 1951, Iowa State; M.S., 1954, Ph.D., 1957, North Carolina State.
ANDERSON, IVER ERIC, Adjunct Professor of Materials Science and Engineering. B.S., 1975, Michigan Tech; M.S., 1977, Ph.D., 1982, Wisconsin.
ANDERSON, JEAN A., Adjunct Instructor in Food Science and Human Nutrition. B.S., 1981, M.S., 1989, Iowa State.
ANDERSON, JULIA F., Emeritus Professor of Family and Consumer Sciences Education and Studies. B.S., 1941, Iowa State; M.S., 1947, Washington.
ANDERSON, KEVIN F., Assistant Professor of Veterinary Microbiology and Preventive Medicine (Collaborator). B.S., 1975, Iowa Wesleyan; M.S., 1983, Western Illinois.
ANDERSON, LINDA LOU, Adjunct Instructor in English. B.S., 1969, Northwest Missouri; M.A., 1974, Louisiana State.
ANDERSON, LLOYD LEE, Professor of Animal Science; Charles F. Curtiss Distinguished Professor in Agriculture. B.S., 1957, Ph.D., 1961, Iowa State.
ANDERSON, MARVIN A., Emeritus Professor of Agronomy. B.S., 1939, M.S., 1949, Ph.D., 1955, Iowa State.
ANDERSON, PAUL F., Professor of Landscape Architecture; Professor of Agronomy. B.S.L.A., 1972, M.L.A., 1974, Iowa State.

ANDERSON, ROBERT M., Emeritus Professor of Electrical and Computer Engineering. B.S.E., 1961, M.S.E., 1963, M.S., 1965, Ph.D., 1967, Michigan.
ANDERSON-HSIEH, JANET, Emeritus Professor of English. BPH, 1967, Northwestern; M.A., 1972, Ph.D., 1976, Illinois.
ANDRE, THOMAS, Professor of Curriculum and Instruction and Chair of the Department; Professor of Psychology. B.S., 1967, Massachusetts; M.A., 1970, Ph.D., 1971, Illinois.
ANDREASEN, CLAIRE B., Associate Professor of Veterinary Pathology and Chair of the Department. B.S., 1979, D.V.M., 1982, Texas A and M; M.S., 1987, Ph.D., 1990, Georgia.
ANDREOTTI, ALEJANDRO, Adjunct Assistant Professor of Curriculum and Instruction. B.A., 1989, Brandeis; Ph.D., 1994, Princeton.
ANDREOTTI, AMY, Assistant Professor of Biochemistry, Biophysics and Molecular Biology. B.A., 1989, Bowdoin; Ph.D., 1994, Princeton.
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