

COLLEGE OF ENGINEERING

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www.engineering.iastate.edu (<http://www.engineering.iastate.edu>)

Aligning Education in Engineering with the University Mission

The mission of Iowa State University is to create, share, and apply knowledge to make Iowa and the world a better place. Students will become broadly educated, global citizens who are culturally informed, technologically adept, and ready to lead. The College of Engineering echoes this philosophy and emphasizes preparing its graduates to meet the challenges of the 21st century.

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 at state, national and global levels.

The focus of each curriculum is to strengthen students' critical thinking, creative abilities, and communication skills. Students in engineering will have the opportunity for interdisciplinary and experiential learning through learning communities, service learning, internships and cooperative education, as well as research, capstone, and study abroad experiences.

The problem-solving skills learned from an engineering education at Iowa State University also provide an excellent launching pad for careers not only in engineering, but also medicine, law, business, and many other fields.

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 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.

Concurrent Graduate/ Undergraduate Programs

Several engineering programs offer the opportunity for well-qualified undergraduate juniors and seniors to pursue a graduate degree in their program while finishing the undergraduate requirements. The programs offering concurrent undergraduate/graduate degrees are: aerospace engineering, agricultural engineering, biological systems engineering, chemical engineering, civil engineering, computer engineering, electrical engineering, industrial engineering, materials engineering, and mechanical engineering.

Programs offering concurrent bachelor of science/master of business administration degrees are: aerospace engineering, agricultural engineering, biological systems engineering, civil engineering, computer engineering, electrical engineering, industrial engineering and mechanical engineering. For more information, refer to the graduate study sections for each engineering program. Advanced work in engineering is offered in the post-graduate programs. See the Graduate College (<http://catalog.iastate.edu/previouscatalogs/2016-2017/graduatecollege>) section of this catalog.

Joint Undergraduate Programs

A bachelor of science degree in software engineering is offered in the College of Engineering and the College of Liberal Arts and Sciences. This program is jointly administered by the Department of Electrical and Computer Engineering and the Department of Computer Science.

Accreditation

Twelve undergraduate engineering programs are accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

These twelve programs are: aerospace, agricultural, biological systems, chemical, civil, computer, construction, electrical, industrial, materials, mechanical and software engineering. Accreditation status is indicated in the Courses and Programs section for each engineering program.

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 should complete the requirements of the basic program before proceeding to a professional program.

Preparation for the Engineering Curricula

In addition to the standard university admission requirements, the college also requires 2 years of a foreign language. Other high school credits particularly important to students wishing to study engineering include:

- 2 years of algebra,
- 1 year of geometry
- 1/2 year of trigonometry
- 1/2 year of pre-calculus
- 1 year each of chemistry, biology, and physics
- 3 years of social science
- 4 years of English

See Index (<http://catalog.iastate.edu/previouscatalogs/2016-2017/azindex>) 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.

Engineering Basic Program

Please see "Basic Program for Engineering Curricula" section.

Requirement for Graduation

In order to graduate in a professional engineering curriculum, students 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 semester credits.

Engineering Minors

The College of Engineering offers four undergraduate minors which are open only to students in the College of Engineering. These are minors in biomedical engineering, energy systems, engineering sales and nondestructive evaluation. These minors must include at least nine credits which are beyond the total used to meet curriculum requirements.

The biomedical engineering minor is a 16 credit interdisciplinary program that complements a student's major discipline by providing additional insight into the interactions between various engineering disciplines and Biological systems. The minor is administered by a supervisory faculty committee. For minor course requirements, refer to Biomedical Engineering in Courses and Programs.

The energy systems minor is a 15 credit program that provides engineering students with focused educational opportunities in the broad area of energy systems. Students will understand broad energy perspectives, the language of energy systems and the economic, environmental, and policy issues related to energy. The minor is administered by a supervisory faculty committee. For minor course requirements, refer to Energy Systems in Courses and Programs or see <http://www.me.iastate.edu/energy-systems-minor/>.

The engineering sales minor is a 15 credit minor that complements the technical training in the student's major discipline by providing the tools and knowledge required for technical (i.e. business-to-business) sales careers. The minor is administered by a supervisory faculty committee. For minor course requirements, refer to Engineering Sales in Courses and Programs.

The nondestructive evaluation minor (16 credit minimum) open to engineering students who have met the basic program requirements and are not on academic warning or probation. The minor is supervised by an inter-disciplinary Engineering faculty committee. For minor course requirements, refer to Nondestructive Evaluation Engineering in Courses and Programs.

Engineering Minor (Interdisciplinary)

The College of Engineering offers undergraduate minors in wind energy and nuclear engineering which are open to all students at ISU who meet the prerequisites. The wind energy minor is a 15 credit minor which enables students to acquire an interdisciplinary knowledge of the wind energy industry. There are two required courses; the remaining credits are chosen from a list of elective courses that are related to wind energy. The minor is administered by a supervisory faculty committee from several departments. For minor course requirements, refer to Wind Energy Minor in Courses and Programs. The nuclear engineering minor is a 15 credit minor which enables engineering students to acquire a

basic and fundamental knowledge of nuclear sciences and engineering. Courses are provided at Iowa State University and also transfer courses that have been evaluated as substitutes for ISU courses may be used toward the minor. For minor course requirements, refer to Nuclear Engineering in Courses and Programs.

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 provide a resource contact person for 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. Transfer students may also complete orientation online. All entering students are encouraged to attend orientation which includes meeting with an academic adviser to register for classes. Placement assessments given during the orientation program help determine the student's current level of proficiency which enables the academic adviser to prepare an appropriate course schedule 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, an experiential education program. Enrollment in the program allows students to gain practical work experience in their career field while attending college. In general, students enrolled in the co-op program will require an additional semester to complete curriculum requirements.

Cooperative programs are a mechanism by which a student may work full-time for one semester per academic or calendar year. 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 allowed.

Cooperative education students pay no tuition 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 (398) for fall or spring 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.** The College of Engineering offers, through its curricula, an experiential education program. Internships are a mechanism by which a student may work full-time for the summer.

Enrollment in the program allows students to gain practical work experience in their career field while attending college. Internship students pay no tuition to the university during their work periods and do not receive credit hours for their work experience. Students who register for the internship course (396) for the summer 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 (<http://catalog.iastate.edu/previouscatalogs/2016-2017/azindex>)). 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 Engagement.** 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.

The College of Engineering 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 abroad, visit the Engineering International Engagement website: <http://www.engineering.iastate.edu/studyabroad/>

Departments of the College

For information on undergraduate options refer to the following curriculum sections, and for graduate specializations or certificate programs, refer to the Courses and Programs section of the catalog.

- Aerospace Engineering
- Agricultural and Biosystems Engineering
- Chemical and Biological Engineering
- Civil, Construction and Environmental Engineering
- Electrical and Computer Engineering
- Industrial and Manufacturing Systems Engineering
- Materials Science and Engineering
- Mechanical Engineering

Degree Programs

Aerospace Engineering (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/aerospaceengineering>)

Agricultural Engineering (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/agriculturalengineering>)

Biological Systems Engineering (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/biologicalsystemsengineering>)

Chemical Engineering (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/chemicalengineering>)

Civil Engineering (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/civilengineering>)

Computer Engineering (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/computerengineering>)

Construction Engineering (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/constructionengineering>)

Electrical Engineering (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/electricalengineering>)

Engineering Mechanics (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/engineeringmechanics>)

Industrial Engineering (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/industrialengineering>)

Information Assurance (<http://catalog.iastate.edu/previouscatalogs/2016-2017/interdisciplinaryprograms/graduate/informationassurance>)

Materials Engineering (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/materialsengineering>)

Materials Science and Engineering (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/materialsscienceandengineering>)

Mechanical Engineering (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/mechanicalengineering>)

Software Engineering (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/softwareengineering>)

Systems Engineering (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/systemsengineering>)

Minors

Biomedical Engineering (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/biomedicalengineering>)

Energy Systems (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/energy-systems-minor>)

Engineering Sales (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/engineeringsales>)

Non-Destructive Evaluation Engineering (http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/non_destructiveevaluationengineering)

Nuclear Engineering (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/nuclearengineering>)

Wind Energy (<http://catalog.iastate.edu/previouscatalogs/2016-2017/interdisciplinaryprograms/minor/windenergy>)

Engineering

Engineering (<http://catalog.iastate.edu/previouscatalogs/2016-2017/collegeofengineering/engineering>)

Basic Program for Engineering Curricula

The first year program is much the same for all professional curricula in the College of Engineering. Students normally enroll in the majority of the basic program courses during their first year. The basic program is a set of courses common to all engineering curricula. Since students may also begin curriculum designated requirements during their first year, they will want to select a curriculum as soon as possible. This will enable them to receive the bachelor's degree in a minimum time.

Students enrolled in the College of Engineering must satisfy the following requirements before enrolling in engineering courses (200-level and above):

1. Completion of the Basic Program with a minimum Basic Program grade point average of 2.00.
2. An ISU cumulative grade point average of at least 2.00.
3. The College of Engineering requires a grade of C or better for any transfer credit course that is applied to the Basic Program but transfer grade will not be computed as part of the Basic Program GPA.

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 three basic program requirements, may enroll for not more than two semesters in 200-level engineering courses.
- b. Iowa State students not pursuing an engineering degree may generally take engineering courses without restrictions provided they meet the prerequisites and space is available.
- c. 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.

Entering undergraduates must demonstrate proficiency in trigonometry based on test scores, or by having transfer credits from a college trigonometry course, or by passing MATH 143 Preparation for Calculus before enrolling in MATH 165 Calculus I.

The Department of English may recommend placement in one or more sections of ENGL 099 (<http://catalog.iastate.edu/previouscatalogs/2016-2017/azcourses/engl>) or ENGL 101 English for Native Speakers of Other Languages if the placement test administered to students whose first language is not English indicates deficiencies. Satisfactory completion of the recommended English course(s) will be required of students to complete their Basic Program.

Basic Program

(A minimum GPA of 2.00 required for this set of courses. Transfer courses are not used in the Basic Program GPA computation).

MATH 165	Calculus I	4
MATH 166	Calculus II	4
ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
CHEM 167	General Chemistry for Engineering Students *	4
or CHEM 177	General Chemistry I	
PHYS 221	Introduction to Classical Physics I	5
ENGR 101	Engineering Orientation ***	R
LIB 160	Information Literacy	1
ENGR 160	Engineering Problems with Computer Applications Laboratory	3

Or one of the following in place of ENGR 160**

AER E 160	Aerospace Engineering Problems With Computer Applications Laboratory	
A B E 160	Systematic Problem Solving and Computer Programming	
C E 160	Engineering Problems with Computational Laboratory	

CH E 160	Chemical Engineering Problems with Computer Applications Laboratory	
CPR E 185	Introduction to Computer Engineering and Problem Solving I	
E E 185	Introduction to Electrical Engineering and Problem-Solving I	
I E 148	Information Engineering	
M E 160	Mechanical Engineering Problem Solving with Computer Applications	
S E 185	Problem Solving in Software Engineering	

Total Credits **27**

ENGL 250 Written, Oral, Visual, and Electronic Composition is normally taken in the second year. However, students who advance place into this course may be able to enroll during their first year. Credit for ENGL 150 Critical Thinking and Communication is earned upon successful completion of ENGL 250 Written, Oral, Visual, and Electronic Composition, but only when ENGL 250 Written, Oral, Visual, and Electronic Composition is completed at Iowa State.

In addition to the basic program courses listed above, curriculum designated courses normally taken the first year of each engineering curricula are listed below.

Curriculum Designated Requirements

Aerospace Engineering

AER E 161	Numerical, Graphical and Laboratory Techniques for Aerospace Engineering	3
AER E 192	Aerospace Seminar	R
GenEd Electives		3

Agricultural Engineering

CHEM 167L	Laboratory in General Chemistry for Engineering	1
A B E 110	Experiencing Agricultural and Biosystems Engineering	1
A B E 170	Engineering Graphics and Introductory Design	3
SSH Elective		3

Biological Systems Engineering

CHEM 167L	Laboratory in General Chemistry for Engineering	1
A B E 110	Experiencing Agricultural and Biosystems Engineering	1
A B E 170	Engineering Graphics and Introductory Design	3
SSH Elective		3

Chemical Engineering

CHEM 177	General Chemistry I *	4
CHEM 177L	Laboratory in General Chemistry I	1
CHEM 178	General Chemistry II	3
CHEM 178L	Laboratory in College Chemistry II	1
SSH Elective		3

Civil Engineering

CHEM 177	General Chemistry I *	4
CHEM 177L	Laboratory in General Chemistry I	1
C E 105	Introduction to the Civil Engineering Profession	1
C E 170	Graphics for Civil Engineering	2
C E 111	Fundamentals of Surveying I	3

SSH Elective 3

CIVIL ENGINEERING: STUDENTS IN THE GENERAL EMPHASIS IN C E HAVE TWO CHEMISTRY/PHYSICS SEQUENCE OPTIONS. THE ENVIRONMENTAL EMPHASIS REQUIRES OPTION 1.**OPTION 1**

CHEM 177	General Chemistry I	4
CHEM 177L	Laboratory in General Chemistry I	1
CHEM 178	General Chemistry II	3
CHEM 178L	Laboratory in College Chemistry II	1
PHYS 221	Introduction to Classical Physics I	5

OPTION 2

CHEM 177	General Chemistry I	4
CHEM 177L	Laboratory in General Chemistry I	1
PHYS 221 & PHYS 222	Introduction to Classical Physics I and Introduction to Classical Physics II	10

Computer Engineering

COM S 227	Introduction to Object-oriented Programming	4
CPR E 166	Professional Programs Orientation	R
Gen Ed Elective		3

Construction Engineering

CON E 121	Cornerstone Learning Community: Orientation to Academic Life	1
CON E 122	Cornerstone Learning Community: Orientation to Professional Life	1
C E 170	Graphics for Civil Engineering	2

Electrical Engineering

E E 285	Problem Solving Methods and Tools for Electrical Engineering	4
E E 166	Professional Programs Orientation	R
Gen Ed Elective		3

Industrial Engineering

I E 101	Industrial Engineering Profession	R
SSH Elective		6

Materials Engineering

CHEM 177	General Chemistry I *	4
CHEM 177L	Laboratory in General Chemistry I	1
CHEM 178	General Chemistry II	3
CHEM 178L	Laboratory in College Chemistry II	1
ENGR 160	Engineering Problems with Computer Applications Laboratory	3
Gen Ed Elective		3
PHYS 221	Introduction to Classical Physics I (scheduled in sophomore year)	5

Mechanical Engineering

M E 170	Engineering Graphics and Introductory Design	3
Gen Ed Elective		3

Software Engineering

S E 166	Careers in Software Engineering	R
COM S 227	Introduction to Object-oriented Programming	4

COM S 228 Introduction to Data Structures 3

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 E¹, Ch E, or Mat E will find CHEM 177 General Chemistry I to be a better preparation for CHEM 178 General Chemistry II. However CHEM 167 General Chemistry for Engineering Students, is accepted as a substitute for CHEM 177 General Chemistry I for those students declaring one of these curricula after having completed CHEM 167 General Chemistry for Engineering Students.

**Recommended choices by program:

Credit hours for graduation will be given for any one of the following without increasing a curriculum's minimum number of credits required for graduation. It is recommended that students choose the class associated with their chosen major:

AER E 160	Aerospace Engineering Problems With Computer Applications Laboratory	3
A B E 160	Systematic Problem Solving and Computer Programming	3
C E 160	Engineering Problems with Computational Laboratory	3
CH E 160	Chemical Engineering Problems with Computer Applications Laboratory	3
ENGR 160	Engineering Problems with Computer Applications Laboratory	3
I E 148	Information Engineering	3
CPR E 185	Introduction to Computer Engineering and Problem Solving I	3
E E 185	Introduction to Electrical Engineering and Problem-Solving I	3
M E 160	Mechanical Engineering Problem Solving with Computer Applications	3
S E 185	Problem Solving in Software Engineering	3

***Students enrolled in the joint software engineering degree program will take S E 101 Software Engineering Orientation.

Engineering Courses (ENGR)

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. All courses are administered by the college and with the exception of ENGR 160 Engineering Problems with Computer Applications Laboratory, ENGR 340 Introduction to Wind Energy: System Design & Delivery, ENGR 466 Multidisciplinary Engineering Design and ENGR 467 Multidisciplinary Engineering Design II Multidisciplinary Engineering Design II are coordinated through Engineering Student Services in Engineering Academic and Student Affairs.

ENGR 160	Engineering Problems with Computer Applications Laboratory	3
ENGR 340	Introduction to Wind Energy: System Design & Delivery	3
ENGR 466	Multidisciplinary Engineering Design	3
ENGR 467	Multidisciplinary Engineering Design II	3

Courses primarily for undergraduates:**ENGR 101: Engineering Orientation**

Cr. R. F.S.

Introduction to the College of Engineering and the engineering profession. Information concerning university and college policies, procedures, and resources. Undeclared sections: Considerations in choosing an engineering curriculum. Opportunities to interact with departments. Declared sections: Introduction to major-specific topics. Offered on a satisfactory-fail basis only.

ENGR 104: LEAD Program Orientation

(1-0) Cr. 1. F.

Orientation for LEAD Learning/Living Community participants. Introduction to college and university resources, tools and techniques to promote academic, professional and social/cultural development and success. Focus on building support networks with peers, faculty, and staff. Introduction to core engineering competencies including but not limited to initiative, communication, teamwork, and cultural adaptability. Offered on a satisfactory-fail basis only.

ENGR 105: LEAD Program Seminar

(1-0) Cr. 1. S.

Seminar for LEAD Learning/Living Community participants. Focus on professional development and exposure to various engineering disciplines through hands-on lab experiences, industry visits and networking opportunities with alumni, faculty, and staff. Development of core competencies: engineering/technical knowledge, communication and teamwork. Offered on a satisfactory-fail basis only.

ENGR 131: Learning Community Seminar

Cr. R. F.S.

Peer-mentored review of course topics in engineering undeclared learning communities. Offered on a satisfactory-fail basis only.

ENGR 150: Foundations of Leadership Development and Learning

(1-0) Cr. 1. F.S.

Prereq: ELP students only

Leadership development with focus on global context and awareness of events shaping the context. Exposure to theory of leadership with examples. Necessary characteristics of a leader, and strategies for leadership skills development. Exposure to non-traditional career paths for engineers. Outline of personalized leadership development. Offered on a satisfactory-fail basis only.

ENGR 160: Engineering Problems with Computer Applications Laboratory

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

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

Solving engineering problems and presenting solutions through technical reports. Significant figures. Use of SI units. Graphing and curve-fitting. Flowcharting. Introduction to mechanics, 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).

ENGR 160H: Engineering Problems with Computer Applications Laboratory

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

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

Solving engineering problems and presenting solutions through technical reports. Significant figures. Use of SI units. Graphing and curve-fitting. Flowcharting. Introduction to mechanics, 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).

ENGR 260: Engineering: Getting from Thought to Thing

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

What is engineering, technology and their roles in society? Investigation of engineering methods through case studies of everyday objects. Explore questions about the impact of technology in society. Apply engineering methods to design and failure analysis.

ENGR 265: Survey of the Impacts of Engineering Activity

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

Survey of the economic, environmental, societal, and political benefits and problems resulting from engineering activity. Effects of engineering projects on human health, social structures, and the environment. Examination of improvements in economic opportunities and quality of life resulting from engineering activity. Case studies of the effects of engineering activity.

ENGR 270: Survey of How Things Work

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

Removing mysteries surrounding science and technology. Identify key concepts from applied science and technology to obtain better understanding on how things work. Review and explain the principles behind the technologies which define our modern way of life. A survey of broad range of technology could include: cell phones, GPS, radio, television, computers, ultrasound, microwave ovens, automobile, bioengineering and other industrial and consumer technologies. Common day technology examples illustrating scientific knowledge and applications.

ENGR 320: International Experience Report

Cr. 3. F.S.

Prereq: Satisfactory completion of international work experience of at least ten weeks or nine credits of approved course work taken abroad. Permission of student's department prior to departure

Critique of work/study abroad experience as it relates to professional development. Taken the semester after completion of work abroad or study abroad. Written report and presentation. Offered on a satisfactory-fail basis only.

Meets International Perspectives Requirement.

ENGR 327: Voices of Public Policy

(3-0) Cr. 3. F.

Prereq: Sophomore classification in engineering

Role and impact of legislative process, partisan politics, government, lobbyists, the media, expert testimony and grassroots activism on public policy. Critical analysis of context; of claims, assumptions, premises, and evidence of both sides; represented and disenfranchised populations; the ethical issues to develop personal position and courses of action to impact public policy process.

ENGR 340: Introduction to Wind Energy: System Design & Delivery

(3-0) Cr. 3. F.

Prereq: MATH 166, PHYS 222

Introduction to wind energy. Economic analysis related to wind energy. Electrical power generation, transmission, and grid operations. Tower, blade and nacelle materials and manufacturing. Tower design. Construction, transportation, supply chain and life cycle analysis for wind turbine components.

ENGR 350: Dean's Leadership Seminar

(1-0) Cr. 1. F.S.

Prereq: Selection based on demonstrated commitment to leadership development. Sophomore or higher.

Understanding the complexities of leadership in building an organization, decision-making styles, communication, managing change, building trust, shared responsibility leadership, creating legacy, prioritizing, effective use of authority, conflict, ethics, integrity, transparency, accountability. Offered on a satisfactory-fail basis only. May not apply toward a degree in Engineering

ENGR 396: Summer Internship

Cr. R. Repeatable. SS.

Prereq: Permission of adviser and Engineering Career Services

Professional or interdisciplinary work period in engineering or career-related field of a minimum of 10 weeks during the summer. Offered on a satisfactory-fail basis only.

ENGR 397: Professional Internship

Cr. R. F.S.SS.

Prereq: Permission of adviser and Engineering Career Services

Professional or interdisciplinary work period in engineering or career-related field. Enrollment limited to one semester and/or one summer per academic year. Offered on a satisfactory-fail basis only.

ENGR 466: Multidisciplinary Engineering Design

(Cross-listed with A B E, AER E, B M E, CPR E, E E, I E, M E, MAT E). (1-4)

Cr. 3. Repeatable. F.S.

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.

ENGR 467: Multidisciplinary Engineering Design II

(Cross-listed with AER E, CPR E, E E, I E, M E, MAT E). (1-4) Cr. 3.

Repeatable, maximum of 2 times. Alt. F., offered irregularly. Alt. S., offered irregularly.

Prereq: Student must be within two semesters of graduation or receive permission of instructor.

Build and test of a conceptual design. Detail design, manufacturability, test criteria and procedures. Application of design tools such as CAD and CAM and manufacturing techniques such as rapid prototyping. Development and testing of a full-scale prototype with appropriate documentation in the form of design journals, written reports, oral presentations and computer models and engineering drawings.

ENGR 490E: Entrepreneurship

Cr. 1-3. Repeatable, maximum of 3 credits.

*Prereq: Junior or senior classification in engineering, college approval***ENGR 490L: Independent Study**

Cr. 1-3. Repeatable, maximum of 3 credits. F.S.SS. Leadership.