Academic Programs and Curriculum Guide

GENERAL ELECTIVES
Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

COORDINATE EDUCATION

UNIVERSITY-WIDE REQUIREMENTS
136 total semester hours required
Minimum 2.000 GPA required

ELECTRICAL AND COMPUTER ENGINEERING

www.ece.neu.edu

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The Department of Electrical and Computer Engineering offers two distinct Bachelor of Science programs: Bachelor of Science in electrical engineering (BSEE) and Bachelor of Science in computer engineering (BSCompE). An integrated dual major is available in electrical and computer engineering for students who complete the requirements of both majors. In addition, a minor in electrical engineering, a minor in computer engineering, and a minor in biomedical engineering are available to qualified students throughout the University, including majors within the department.

Successful engineers need to organize and adapt information to solve problems. They also must work effectively in teams and communicate well. The electrical engineering and computer engineering programs develop these skills and provide the appropriate technical background for a successful career. The objectives of the Bachelor of Science programs are that every student will develop and apply in an engineering context, (1) mathematical, scientific, computational, and experimental knowledge and skills; (2) the technical skills necessary for engineering practice, (3) the communications and interpersonal skills necessary as engineering professionals; (4) a personal and professional ethic appropriate to the practice of engineering; and (5) an awareness of the social, cultural, and historical context of engineering solutions.

The curricula are continuously assessed to ensure that graduates can achieve these goals and go on to succeed as professional electrical or computer engineers. The Bachelor of Science programs allow students sufficient flexibility within the standard eight academic semesters to earn a minor in nearly any department in the University. Typical minors might include electrical engineering, computer engineering, physics, math, computer science, or business, but students might also organize their course of study to earn a minor in economics, English, or music.
The academic program is supported by extensive laboratory facilities for study and experimentation in computing, circuits analysis, electronics, digital systems, microwaves, control systems, semiconductor processing, VLSI design, and digital signal processing. Students have access to state-of-the-art computing facilities, including numerous UNIX-based personal computers, all connected to the Internet. Many courses are taught in one of the four computer-based teaching classrooms, where students work online and practice the theory presented in lecture while still in the classroom.

More than 90 percent of department undergraduates take advantage of the cooperative education program. During the cooperative work phase of the program, the students' levels of responsibility grow as they gain theoretical and technical knowledge through academic work. A sophomore might begin cooperative work experience as an engineering assistant and progress by the senior year to a position with responsibilities similar to those of entry-level engineers.

A senior-year design course caps the education by drawing on everything learned previously. Teams of students propose, design, and build a functioning electrical or computer engineering system—just as they might in actual practice.

Electrical Engineering

The components of the Information Age—global communication systems, computers and computer chips, and the software that runs them, as well as pacemakers, magnetic resonance imaging, and interplanetary space missions—are possible because of the efforts of electrical engineers. Today, electrical engineers are developing concepts and working to translate these ideas into the next generation of products, from computers and safe, energy-efficient vehicles, to radar that can detect unexploded land mines from the air, to microrobots that diagnose disease from inside the body.

Many electrical engineers work in the traditional areas of communications, computation, and control, and components required to realize such systems. They are involved in design and product development, testing and quality control, sales and marketing, and manufacturing. Others use their problem-solving skills in diverse areas such as bioengineering, health care, electronic music, meteorology, and experimental psychology. Some graduates develop on their electrical engineering backgrounds to launch successful careers as physicians, electronic music, meteorology, and experimental psychology. Others use their problem-solving skills in diverse areas such as bioengineering, health care, electronic music, meteorology, and experimental psychology. Some graduates develop

As specified below, the BSEE degree requires a sequence of core courses and advanced study in one or more technical elective areas: electronic circuits and devices; signals and systems; fields, waves, and optics; power engineering; or computer engineering. Electives in historical perspective, social/cultural perspective, and social science/humanities are also required. See pages 267–273 for course descriptions.

BSEE—Bachelor of Science in Electrical Engineering

ENGLISH REQUIREMENT
Complete the following course:
ENG U113 College Writing 4 SH
and one approved Advanced Writing in the Disciplines course for the major. A grade of C or higher is required in both courses.

ENGINEERING CATEGORICAL REQUIREMENT
Students must complete a minimum of semester hours in the categories of math/science and engineering topics. Completing all courses in the prescribed curriculum satisfies these requirements without any additional consideration. However, any student with transfer credits or course substitutions must meet with an academic adviser to plan appropriate course work to ensure that these requirements are fully satisfied.

ELECTRICAL ENGINEERING GENERAL EDUCATION

Mathematics and Science

CALCULUS 1 AND 2 FOR SCIENCE/ENGINEERING
Complete the following two courses:
MTH U241 Calculus 1 for Science and Engineering 4 SH
MTH U242 Calculus 2 for Science and Engineering 4 SH

PHYSICS 1 AND 2
Complete the following two courses and corresponding labs:
PHY U151 Physics for Engineering 1 4 SH
with PHY U152 Lab for PHY U151 1 SH
PHY U155 Physics for Engineering 2 4 SH
with PHY U156 Lab for PHY U155 1 SH

CHEMISTRY
Complete the following course (CHM U152 does not become a requirement until fall 2005):
CHM U151 General Chemistry for Engineers 4 SH
with CHM U152 Lab for CHM U151 1 SH

DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA
Complete the following course:
MTH U341 Differential Equations and Linear Algebra 4 SH

CALCULUS 3 FOR SCIENCE AND ENGINEERING
Complete the following course:
MTH U343 Calculus 3 for Science and Engineering 4 SH

ALGORITHMS AND DATA STRUCTURES
Complete the following course and corresponding lab:
CS U215 Algorithms and Data Structures 4 SH

with CS U216 Lab for CS U215 1 SH

Arts and Humanities
Complete two courses from the “College of Engineering Arts and Humanities Requirements” on page 178. Also, choose one additional humanities/social science elective from the following departments: ARC, ART, CJ, ECN, ENG, MUS, PHL, POL, PSY, SOC, or TSE.
Academic Programs and Curriculum Guide

ELECTRICAL ENGINEERING MAJOR REQUIREMENTS

First-Year Engineering
Complete the following two courses:
- GE U110 Engineering Design 4 SH
- GE U111 Engineering Problem Solving 4 SH

General Engineering
Complete the following three courses:
- GE U100 Introduction to the Study of Engineering 1 SH
- ECE U100 Introduction to Engineering Co-op Education 1 SH
- ECE U500 Professional Issues in Engineering 1 SH

Electrical Engineering Lab
Complete the following course:
- ECE U401 Introduction to Electrical and Computer Engineering Lab 1 SH

Linear Circuits
Complete the following course:
- ECE U400 Linear Circuits 4 SH

Electronics
Complete the following course and corresponding lab:
- ECE U402 Electronics 4 SH
  with ECE U403 Lab for ECE U402 1 SH

Digital Logic Design
Complete the following course and corresponding lab:
- ECE U322 Digital Logic Design 4 SH
  with ECE U323 Lab for ECE U322 1 SH

Linear Systems
Complete the following course:
- ECE U464 Linear Systems 4 SH

Electromagnetic Fields and Waves
Complete the following course and corresponding lab:
- ECE U440 Electromagnetic Fields and Waves 4 SH
  with ECE U441 Lab for ECE U440 1 SH

Noise and Stochastic Processes
Complete the following course:
- ECE U468 Noise and Stochastic Processes 4 SH

Communication Systems
Complete the following course:
- ECE U572 Communications Systems 1 4 SH

Electrical Engineering Technical Electives
Complete four 4-SH-equivalent courses from the following list:
- ECE U322 Digital Logic Design 4 SH
- ECE U400 Linear Circuits 4 SH
- ECE U402 Electronics 4 SH
- ECE U403 Lab for ECE U402 1 SH
- ECE U440 Electromagnetic Fields and Waves 4 SH
  with ECE U441 Lab for ECE U440 1 SH

Capstone Design
Complete the following two courses:
- ECE U790 Electrical and Computer Engineering Capstone 1 4 SH
- ECE U792 Electrical and Computer Engineering Capstone 2 4 SH

ELECTRICAL ENGINEERING GENERAL ELECTIVE REQUIREMENTS

Complete four 4-SH-equivalent, nonremedial, nonrepetitive courses from the following list:
- CBA U101 Introduction to Business 4 SH
- or any courses from the following departments: ACC, AFR, ARC, ART, ASL, BIO, CHE, CHM, CIV, CJ, CMN, CS, ECE, ECN, ED, ENG, ENT, ENV, FIN, GEO, HRM, HS, HST, IAF, INB, INT, IS, JRN, LIN, LNA, LNC, LNP, LNG, LNH, LN, LNL, LNM, LNR, LNS, MGT, MME, MMS, MSC, MTH, MUS, PHL, PHY, POL, PSY, SCM, SOA, SOC, or THE.

GPA REQUIREMENT
Minimum 2.000 GPA required in the major

GENERAL ELECTIVES

Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

COOPERATIVE EDUCATION

UNIVERSITY-WIDE REQUIREMENTS

138 total semester hours required
Minimum 2.000 GPA required

Minor in Electrical Engineering

A minor in electrical engineering is open to all students in the University with the prerequisite calculus and physics background. The minor is particularly designed for majors in math, science, computer engineering, or other engineering departments, students who would like a coherent background in the theory and laboratory practice of electrical engineering. The completion of a minor in electrical engineering will be recognized by a notation on the student’s transcript.

Minor in Electrical Engineering

REQUIRED COURSE
Complete one of the following courses with corresponding lab:
- ECE U210 Electrical Engineering 4 SH
  with ECE U211 Lab for ECE U210 1 SH
- ECE U400 Linear Circuits 4 SH
  with ECE U401 Introduction to Electrical and Computer Engineering Lab

ELECTIVE COURSES
Complete two of the following courses with corresponding labs:
- ECE U322 Digital Logic Design 4 SH
  with ECE U323 Lab for ECE U322 1 SH
- ECE U400 Linear Circuits 4 SH
  with ECE U401 Lab for ECE U402 1 SH
- ECE U440 Electromagnetic Fields and Waves 4 SH
  with ECE U441 Lab for ECE U440 1 SH

TECHNICAL ELECTIVES
Complete 5 semester hours of electrical engineering technical electives.

GPA REQUIREMENT
2.000 GPA required in the minor
Computer Engineering
The use of computer technology is exploding, driven by applications in wireless communications, multimedia, portable devices, and Internet computing. At the core of these technological advances are computer engineers who research, design, and develop hardware and software. With a degree in computer engineering you might develop an e-business Web site, design the next-generation microprocessor, write an embedded real-time operating system, or start your own software company.

The computer engineering major acquires a strong foundation in engineering principles and the physical sciences in addition to a powerful mix of theory and practice in hardware and software design. The core of the computer engineering curriculum comprises courses in computer organization and architecture, operating systems, computer-aided design, programming languages, optimization theory, and software design.

As specified below, the BSCompE degree requires a sequence of core courses, technical electives, general (free) electives, and electives in historical perspective, social/cultural perspective, and social science/humanities. See pages 267–273 for course descriptions.

BSCompE—Bachelor of Science in Computer Engineering

ENGLISH REQUIREMENT
Complete the following course:
ENG U111 College Writing 4 SH
and one approved Advanced Writing in the Disciplines course for the major. A grade of C or higher is required in both courses.

ENGINEERING CATEGORICAL REQUIREMENT
Students must complete a minimum of semester hours in the categories of math/science and engineering topics. Completing all courses in the prescribed curriculum satisfies these requirements without any additional consideration. However, any student with transfer credits or course substitutions must meet with an academic adviser to plan appropriate course work to ensure that these requirements are fully satisfied.

COMPUTER ENGINEERING GENERAL EDUCATION
Mathematics and Science

PHYSICS 1 AND 2
Complete the following two courses and corresponding labs:
PHY U151 Physics for Engineering 1 4 SH
with PHY U152 Lab for PHY U151 1 SH
PHY U155 Physics for Engineering 2 4 SH
with PHY U156 Lab for PHY U155 1 SH

CHEMISTRY
Complete the following course (CHM U152 does not become a requirement until fall 2005):
CHM U151 General Chemistry for Engineers 4 SH
with CHM U152 Lab for CHM U151 1 SH

CALCULUS 1 AND 2 FOR SCIENCE AND ENGINEERING
Complete the following two courses:
MTH U241 Calculus 1 for Science and Engineering 4 SH
MTH U242 Calculus 2 for Science and Engineering 4 SH

DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA
Complete the following course:
MTH U343 Differential Equations and Linear Algebra for Engineering 4 SH

DISCRETE MATHEMATICS
Complete the following course:
MTH U230 Discrete Mathematics 4 SH

PROBABILITY AND STATISTICS
Complete the following course:
MTH U481 Probability and Statistics 4 SH

ALGORITHMS AND DATA STRUCTURES
Complete the following course and corresponding lab:
CS U215 Algorithms and Data Structures 4 SH
with CS U216 Lab for CS U215 1 SH

Arts and Humanities
Complete two courses from the “College of Engineering Arts and Humanities Requirements” on page 178. Also, choose one additional humanities/social science elective from the following departments: ARC, ART, CJ, ECN, ENG, MUS, PHL, POL, PSY, SOC, or THE.

COMPUTER ENGINEERING MAJOR REQUIREMENTS

First-Year Engineering
Complete the following two courses:
GE U110 Engineering Design 4 SH
GE U111 Engineering Problem Solving and Computation 4 SH

General Engineering
Complete the following three courses:
GE U100 Introduction to the Study of Engineering 1 SH
ECE U300 Introduction to Engineering Co-op Education 1 SH
ECE U500 Professional Issues in Engineering 1 SH

Electrical Engineering Lab
Complete the following course:
ECE U401 Introduction to Electrical and Computer Engineering Lab 1 SH

Linear Circuits
Complete the following course:
ECE U400 Linear Circuits 4 SH

Electronics
Complete the following course and corresponding lab:
ECE U402 Electronics 4 SH
with ECE U403 Lab for ECE U402 1 SH

Digital Logic Design
Complete the following course and corresponding lab:
ECE U322 Digital Logic Design 4 SH
with ECE U323 Lab for ECE U322 1 SH

Northeastern University
Computer Architecture/Organization
Complete the following course:

ECE U324 Computer Architecture and Organization 4 SH

Optimization Methods
Complete the following course:

ECE U326 Optimization Methods 4 SH

Computer Networks
Complete the following course and corresponding lab:

ECE U628 Computer and Telecommunication Networks 4 SH
ECE U629 Internetworking Design Lab 1 SH

Computer Engineering Technical Electives
Complete four 4-SH-equivalent courses from the following list.
Only one course may be from computer science:

ECE U3370 Object-Oriented Design 4 SH
CS U390 Theory of Computation 4 SH
CS U520 Artificial Intelligence 4 SH
CS U540 Computer Graphics 4 SH
CS U660 Programming Languages 4 SH
CS U665 Compilers 4 SH
CS U680 Topics in Operating Systems 4 SH

Capstone Design
Complete the following two courses:

ECE U790 Electrical and Computer Engineering Capstone 1 4 SH
ECE U792 Electrical and Computer Engineering Capstone 2 4 SH

COMPUTER ENGINEERING GENERAL ELECTIVE REQUIREMENTS
Complete four 4-SH-equivalent, nonremedial, nonrepetitive courses from the following list:

CBA U101 Introduction to Business 4 SH
or any courses from the following departments: ACC, AFR, ARC, ART, ASL, BIO, CHE, CHM, CIN, CIV, CJ, CMN, C5, ECE, ECN, ED, ENG, ENT, ENV, FIN, GEO, HRM, HS, HST, IAF, INB, INT, IS, JBN, LIN, LNA, LNC, LNF, LNG, LNH, LNI, LNJ, LIN, LNM, LNR, LNS, MCT, MIM, MXK, MMS, MSC, MTH, MUS, PHL, PHY, POL, PSY, SCM, SOA, SOC, or THE.

GPA REQUIREMENT
Minimum 2.000 GPA required in the major

GENERAL ELECTIVES
Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

COORDINATE EDUCATION

UNIVERSITY-WIDE REQUIREMENTS
137 total semester hours required
Minimum 2.000 GPA required

Academic Programs

Minor in Computer Engineering
The minor in computer engineering is open to all students in the University. The minor is designed for students who would like a coherent background in the theory and laboratory practice of computer engineering. The completion of a minor in computer engineering will be recognized by a notation on the student’s transcript.

REQUIRED COURSES
Complete the following three courses with two corresponding labs:

CS U215 Algorithms and Data Structures for Engineering 4 SH
ECE U322 Digital Logic Design 4 SH
ECE U324 Computer Architecture and Organization 4 SH

ELECTIVES
Complete 4 semester hours of computer engineering technical electives.

GPA REQUIREMENT
2.000 GPA required in the minor

Minor in Biomedical Engineering
Medical imaging and biomedical electronics are important areas of biomedical engineering that are within the province of electrical engineering. The minor in biomedical engineering is open to all students in the University with the prerequisite calculus and physics background. The minor is particularly designed for majors in electrical or computer engineering, biology, health science fields, or other engineering departments who would like a background in relevant aspects of biology and electrical engineering, with the opportunity to complete an interdisciplinary biomedical engineering (capstone) design project. Course work in anatomy and physiology and other health science topics is combined with technical engineering courses related to biomedical imaging and instrumentation. Specific curriculum information about the biomedical engineering minor may be obtained from the Department of Electrical and Computer Engineering office, 411 Dana, from the department Web site, or by calling 617.373.2165.

Minor in Biomedical Engineering

REQUIRED ECE COURSES
Complete the following three courses:

ECE U401 Introduction to Electrical and Computer Engineering Lab 1 SH
ECE U790 Electrical and Computer Engineering Capstone 1 4 SH
ECE U792 Electrical and Computer Engineering Capstone 2 4 SH

Minor in Biomedical Engineering
BIOMEDICAL ECE COURSE
Complete one course from the following list:
ECE U512 Biomedical Electronics 4 SH
or ECE U664 Biomedical Signal Processing and Medical Imaging 4 SH

TECHNICAL ELECTIVE
Complete one technical elective from the following list:
ECE U520 Software Engineering 1 4 SH
ECE U522 Software Engineering 2 4 SH
ECE U524 VLSI Design 4 SH
with ECE U525 Lab for ECE U524 1 SH
ECE U528 CAD for Design and Test 4 SH
ECE U530 Hardware Description Languages and Synthesis 4 SH
ECE U534 Microprocessor-Based Design 4 SH
with ECE U535 Lab for ECE U534 1 SH
ECE U574 Wireless Communication Circuits 4 SH
ECE U576 Wireless Personal Communications Systems 4 SH
ECE U580 Control Systems 4 SH
with ECE U581 Lab for ECE U580 1 SH
ECE U600 Electronic Design 4 SH
with ECE U607 Lab for ECE U600 1 SH
ECE U604 Semiconductor Device Theory 4 SH
ECE U606 Integrated Circuit Fabrication 4 SH
ECE U622 Parallel and Distributed Processing 4 SH
ECE U626 Image Processing and Pattern Recognition 4 SH
ECE U628 Computer and Telecommunication Networks 4 SH
with ECE U629 Internetworking Design Lab 1 SH
ECE U630 Robotics 4 SH
ECE U638 Special Topics in Computer Engineering 4 SH
ECE U642 Antennas 4 SH
ECE U644 Microwave Networks 4 SH
ECE U646 Optics 4 SH
ECE U666 Digital Signal Processing 4 SH
with ECE U667 Lab for ECE U666 1 SH
ECE U672 Communication Systems 2 4 SH
ECE U680 Electric Drives 4 SH
with ECE U681 Power Systems Lab 1 SH
ECE U684 Power Electronics 4 SH
ECE U686 Electrical Machines 4 SH
ECE U692 Subsurface Sensing and Imaging 4 SH
ECE U694 Numerical Methods and Computer Applications 4 SH

REQUIRED BIOLOGY
Take one of the following groups of courses:
Anatomy and Physiology
BIO U117 Integrated Anatomy and Physiology 1 4 SH
with BIO U118 Lab for BIO U117 1 SH
BIO U119 Integrated Anatomy and Physiology 2 4 SH
with BIO U120 Lab for BIO U119 1 SH

Animal Physiology
BIO U551 Principles of Animal Physiology 4 SH
with BIO U552 Lab for BIO U551 1 SH

GPA REQUIREMENT
2.000 GPA required in the minor

Integrated Dual Major in Electrical and Computer Engineering
Students may choose to major in both electrical and computer engineering by following the integrated dual-major program. Students take the required courses for both majors along with technical electives distributed among the areas of computer engineering; fields, waves, and optics; signals and systems; power engineering; and electronic circuits and devices.

BSEE Bachelor of Science in Electrical/Computer Engineering

ENGLISH REQUIREMENT
Complete the following course:
ENG U111 College Writing 4 SH
and one approved Advanced Writing in the Disciplines course for the major. A grade of C or higher is required in both courses.

ENGINEERING CATEGORICAL REQUIREMENT
Students must complete a minimum of semester hours in the categories of math/science and engineering topics. Completing all courses in the prescribed curriculum satisfies these requirements without any additional consideration. However, any student with transfer credits or course substitutions must meet with an academic adviser to plan appropriate course work to ensure that these requirements are fully satisfied.

DUAL ELECTRICAL/COMPUTER ENGINEERING

Mathematics and Science
PHYSICS 1 AND 2
Complete the following two courses and corresponding labs:
PHY U151 Physics for Engineering 1 4 SH
with PHY U152 Lab for PHY U151 1 SH
PHY U155 Physics for Engineering 2 4 SH
with PHY U156 Lab for PHY U155 1 SH

CHEMISTRY
Complete the following course (CHM U152 does not become a requirement until fall 2005):
CHM U151 General Chemistry for Engineers 4 SH
with CHM U152 Lab for CHM U151 1 SH

CALCULUS 1 AND 2 FOR SCIENCE AND ENGINEERING
Complete the following two courses:
MTH U241 Calculus 1 for Science and Engineering 4 SH
MTH U242 Calculus 2 for Science and Engineering 4 SH

DISCRETE MATHEMATICS
Complete the following course:
MTH U230 Discrete Mathematics 4 SH
DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA
Complete the following course:
MTH U343 Differential Equations and Linear Algebra 4 SH
for Engineering

CALCULUS 3 FOR SCIENCE AND ENGINEERING
Complete the following course:
MTH U341 Calculus 3 for Science and Engineering 4 SH

ALGORITHMS AND DATA STRUCTURES
Complete the following course and corresponding lab:
CS U215 Algorithms and Data Structures 4 SH
for Engineering
with CS U216 Lab for CS U215 1 SH

Arts and Humanities
Complete two courses from the “College of Engineering Arts and Humanities Requirements” on page 178. Also, choose one additional humanities/social science elective from the following departments: ARC, ART, CJ, ECA, ENG, MUS, PHL, POL, PSY, SOC, or THE.

ELECTRICAL/COMPUTER ENGINEERING MAJOR REQUIREMENTS

First-Year Engineering
Complete the following two courses:
GE U110 Engineering Design 4 SH
GE U111 Engineering Problem Solving 4 SH
and Computation

General Engineering
Complete the following three courses:
GE U100 Introduction to the Study of Engineering 1 SH
ECE U100 Introduction to Engineering Co-op Education 1 SH
ECE U190 Professional Issues in Engineering 1 SH

Electrical Engineering Lab
Complete the following course:
ECE U401 Introduction to Electrical and Computer Engineering Lab 1 SH

Linear Circuits
Complete the following course:
ECE U400 Linear Circuits 4 SH

Electronics
Complete the following course and corresponding lab:
ECE U402 Electronics 4 SH
with ECE U403 Lab for ECE U402 1 SH

Digital Logic Design
Complete the following course and corresponding lab:
ECE U322 Digital Logic Design 4 SH
with ECE U323 Lab for ECE U322 1 SH

Linear Systems
Complete the following course:
ECE U464 Linear Systems 4 SH

Electromagnetic Fields and Waves
Complete the following course and corresponding lab:
ECE U440 Electromagnetic Fields and Waves 4 SH
with ECE U441 Lab for ECE U440 1 SH

Computer Architecture/Organization
Complete the following course:
ECE U324 Computer Architecture and Organization 4 SH

Optimization Methods
Complete the following course:
ECE U326 Optimization Methods 4 SH

Computer Networks
Complete the following course:
ECE U468 Computer and Telecommunication Networks 4 SH
with ECE U469 Internetworking Design Lab 1 SH

Noise and Stochastic Processes
Complete the following course:
ECE U468 Noise and Stochastic Processes 4 SH

Communication Systems
Complete the following course:
ECE U573 Communications Systems 1 4 SH

Dual Electrical/Computer Engineering Technical Electives
Complete four 4-SH-equivalent courses from the following list. Only one course may be from computer science:
ECE U370 Object-Oriented Design 4 SH
CS U370 Object-Oriented Design 4 SH
CS U390 Theory of Computation 4 SH
CS U430 Database Design 4 SH
CS U480 Systems and Networks 4 SH
CS U520 Artificial Intelligence 4 SH
CS U540 Computer Graphics 4 SH
CS U660 Programming Languages 4 SH
CS U665 Compilers 4 SH
CS U680 Topics in Operating Systems 4 SH

Capstone Design
Complete the following two courses:
ECE U790 Electrical and Computer Engineering Capstone 1 4 SH
ECE U792 Electrical and Computer Engineering Capstone 2 4 SH

GPA REQUIREMENT
Minimum 2.000 GPA required in the major

GENERAL ELECTIVES
Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

COOPERATIVE EDUCATION

UNIVERSITY-WIDE REQUIREMENTS
139 total semester hours required
Minimum 2.000 GPA required
The Department of Mechanical and Industrial Engineering offers two accredited programs leading to a Bachelor of Science in industrial engineering or a Bachelor of Science in mechanical engineering.

The overarching mission of the department is to organize the faculty, staff, curricula, facilities, and research programs to provide the highest-quality education for our students. At the undergraduate level, our goal is to provide rigorous, theoretically based but practice-oriented programs that effectively integrate classroom and laboratory instruction with the cooperative work experience. The educational objectives for both of our undergraduate degree programs are to: (1) educate students through a broad, theoretically based mechanical or industrial engineering curriculum; (2) support students in developing practical work skills involving current technology and technical tools, as well as an awareness of manufacturing, management and economic issues, and commonly accepted norms for professional conduct; (3) integrate academic learning with practice-oriented experience to promote professional development and career planning; (4) provide students with learning experiences that instill a passion for lifelong learning; (5) involve students in leadership and contributing roles in interactive team environments; (6) instruct students to be effective communicators with good interpersonal skills; and (7) integrate students’ engineering course work with industrial, ethical, cultural, historical, and societal perspectives, leading to an appreciation of the broad educational objectives (as specified in the University’s Academic Common Experience [ACE] goals).

Mechanical engineers will achieve the ability to work professionally in both thermal and mechanical systems areas, including the design and realization of such systems. Industrial engineers will demonstrate the ability to design, analyze, improve, and optimize integrated systems that include people, materials, information, equipment, and energy.

Industrial Engineering

Industrial engineering involves the design and analysis of systems that include people, equipment, and materials and their interactions and performance in the workplace. The industrial engineer collects this information and evaluates alternatives to make decisions that best advance the goals of the enterprise. The program in industrial engineering offers students a base of traditional engineering courses such as production systems, work design, probability, statistics, and engineering economy, while emphasizing such contemporary areas as simulation, material handling, computer software, quality control, and operations research.

To gain the skills they need to make informed managerial and professional decisions, students take courses in management, economics, and technical subjects, as well as in the humanities and social sciences.

Industrial engineers work in manufacturing firms, hospitals, banks, public utilities, government agencies, insurance companies, and construction firms. Among the projects they undertake are design and implementation of a computer-integrated manufacturing system, design of a robotics system in a manufacturing environment, long-range corporate planning, development and implementation of a quality-control system, design of workstations to enhance worker safety and productivity, and development of computer systems for information control.
Co-op jobs generally increase in level of responsibility as students gain theoretical and technical knowledge through their academic work. A sophomore might begin as a computer analyst evaluating the performance of a manufacturing system and progress to designing manufacturing workstations by the senior year. See pages 346–351 for course descriptions.

BSIE—Bachelor of Science in Industrial Engineering

ENGLISH REQUIREMENT

Complete the following course:
ENG U111 College Writing 4 SH
and one approved Advanced Writing in the Disciplines course for the major. A grade of C or higher is required in both courses.

ENGINEERING CATEGORICAL REQUIREMENT

Students must complete a minimum of semester hours in the categories of math/science and engineering topics. Completing all courses in the prescribed curriculum satisfies these requirements without any additional consideration. However, any student with transfer credits or course substitutions must meet with an academic adviser to plan appropriate course work to ensure that these requirements are fully satisfied.

INDUSTRIAL ENGINEERING GENERAL EDUCATION

Mathematics and Science

PHYSICS
Complete the following two courses and corresponding labs:
PHY U151 Physics for Engineering 1 4 SH
with PHY U152 Lab for PHY U151 1 SH
PHY U155 Physics for Engineering 2 4 SH
with PHY U156 Lab for PHY U155 1 SH

CHEMISTRY
Complete the following course (CHM U152 does not become a requirement until fall 2005):
CHM U151 General Chemistry for Engineers 4 SH
with CHM U152 Lab for CHM U151 1 SH
CALCULUS 1 AND 2 FOR SCIENCE AND ENGINEERING
Complete the following two courses:
MTH U241 Calculus 1 for Science and Engineering 4 SH
MTH U242 Calculus 2 for Science and Engineering 4 SH
Differential Equations and Linear Algebra
Complete the following course:
MTH U343 Differential Equations and Linear Algebra 4 SH
for Engineering
CALCULUS 3 FOR SCIENCE AND ENGINEERING
Complete the following course:
MTH U341 Calculus 3 for Science and Engineering 4 SH

Arts and Humanities

Complete two courses in the “College of Engineering Arts and Humanities Requirements” on page 178.

INDUSTRIAL ENGINEERING MAJOR REQUIREMENTS

First-Year Engineering
Complete the following two courses:
GE U110 Engineering Design 4 SH
GE U111 Engineering Problem Solving and Computation 4 SH

General Engineering
Complete the following three courses:
GE U100 Introduction to the Study of Engineering 1 SH
MIM U300 Introduction to Engineering Co-op Education 1 SH
or GE U300 Introduction to Engineering Co-op Education 1 SH
MIM U500 Professional Issues in Engineering 1 SH
or GE U500 Professional Issues in Engineering 1 SH

Industrial Engineering Fundamentals
Complete the following two courses:
MIM U310 Introduction to Industrial Engineering 4 SH
MIM U412 Engineering Probability and Statistics 4 SH

Information and Technology
Complete the following two courses:
MIM U420 Computers and Information Systems 4 SH
MIM U425 Engineering Database Systems 4 SH

Advanced Industrial Engineering
Complete the following eight courses with corresponding labs:
MIM U310 Digital Simulation Techniques 4 SH
MIM U312 Engineering Economy 4 SH
MIM U315 Operations Research 4 SH
MIM U316 Quality Assurance 4 SH
MIM U320 Stochastic Modeling 4 SH
MIM U322 Human Machine Systems 4 SH
with MIM U323 Lab for MIM U322 1 SH
MIM U325 Logistics and Supply Chain Management 4 SH
MIM U330 Manufacturing Systems and Techniques 4 SH
with MIM U331 Lab for MIM U330 1 SH

Engineering Science/Design Electives
Complete two science/design engineering courses. See adviser for an approved list.

Capstone
Complete the following two courses:
MIM U701 Capstone Design 1 1 SH
MIM U702 Capstone Design 2 5 SH

INDUSTRIAL ENGINEERING GENERAL ELECTIVE REQUIREMENTS

Complete four 4-SH-equivalent, nonremedial, nonrepetitive courses from the following list:
CBA U101 Introduction to Business 4 SH
or any courses from the following departments: ACC, AFR, ARC, ART, ASL, BIO, CHE, CHM, CIN, CRT, CJ, CMN, C5, ECE, ECN, ED, ENG, ENT, ENV, FIN, GEO, HBM, HS, HST, IAE, INB, INT, IS, JRN, LIN, LMA, LNC, LNF, LNG, LNH, LNI, LNJ, LIN, LNM, LNR, LNS, MGT, MIM, MKT, MMS, MSC, MTH, MUS, PHL, PHY, POL, PSI, SCM, SOA, SOC, or THE.
The curriculum in mechanical engineering focuses on three areas: applied mechanics, thermofluids engineering, and materials science. Applied mechanics is the study of the motion and deformation of structural elements acted on by forces in devices that range from rotating industrial dynamos to dentists’ drills. Thermofluids engineering deals with the motion of fluids and the transfer of energy, as in the cooling of electronic components or the design of gas turbine engines. Materials science is concerned with the relationship between the structure and properties of materials and with the control of structure, through processing, to achieve the desired properties. Practical applications are in the development of composite materials and in metallurgical process industries.

Courses in each area form the foundation for advanced analytical and creative design courses that culminate in a two-semester capstone design project. Faculty encourage students throughout the curriculum to use computer-aided design tools and high-performance computer workstations.

Cooperative education assignments increase in responsibility and technical challenge as students progress through the program. Initial positions may involve computer-intensive CAD/CAM assignments or programming tasks, while more advanced jobs will place students in charge of quality-control systems and performance testing of equipment. See pages 346–351 for course descriptions.

BSME—Bachelor of Science in Mechanical Engineering

ENGLISH REQUIREMENT
Complete the following course:
ENG U111 College Writing 4 SH
and one approved Advanced Writing in the Disciplines course for the major. A grade of C or higher is required in both courses.

ENGINEERING CATEGORICAL REQUIREMENT
Students must complete a minimum of semester hours in the categories of math/science and engineering topics. Completing all courses in the prescribed curriculum satisfies these requirements without any additional consideration. However, any student with transfer credits or course substitutions must meet with an academic adviser to plan appropriate course work to ensure that these requirements are fully satisfied.

MECHANICAL ENGINEERING GENERAL EDUCATION

Mathematics and Science

PHYSICS
Complete the following two courses and corresponding labs:
PHY U351 Physics for Engineering 1 4 SH
with PHY U352 Lab for PHY U351 1 SH
PHY U355 Physics for Engineering 2 4 SH
with PHY U356 Lab for PHY U355 1 SH

CHEMISTRY
Complete the following course (CHM U152 does not become a requirement until fall 2005):
CHM U311 General Chemistry for Engineers 4 SH
with CHM U312 Lab for CHM U311 1 SH
CALCULUS 1 AND 2 FOR SCIENCE AND ENGINEERING
Complete the following two courses:
MTH U241 Calculus 1 for Science and Engineering 4 SH
MTH U242 Calculus 2 for Science and Engineering 4 SH

DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA
Complete the following course:
MTH U343 Differential Equations and Linear Algebra 4 SH for Engineering

CALCULUS 3 FOR SCIENCE AND ENGINEERING
Complete the following course:
MTH U341 Calculus 3 for Science and Engineering 4 SH

Arts and Humanities
Complete two courses from the “College of Engineering Arts and Humanities Requirements” on page 178.

MECHANICAL ENGINEERING MAJOR REQUIREMENTS

First-Year Engineering
Complete the following two courses:
GE U110 Engineering Design 4 SH
GE U111 Engineering Problem Solving and Computation 4 SH

General Engineering
Complete the following three courses:
GE U100 Introduction to the Study of Engineering 1 SH
MIM U300 Introduction to Engineering Co-op Education 1 SH
or GE U100 Introduction to Engineering Co-op Education 1 SH
MIM U500 Professional Issues in Engineering 1 SH
or GE U500 Professional Issues in Engineering 1 SH

Electrical Engineering
Complete the following course and corresponding lab:
ECE U210 Electrical Engineering 4 SH
with ECE U211 Lab for ECE U210 1 SH

Mechanical Engineering Fundamentals
Complete the following five courses and corresponding labs:
MIM U315 Statistical and Econometric Analyses in Engineering 4 SH
MIM U340 Introduction to Material Science 4 SH
with MIM U341 Lab for MIM U340 1 SH
MIM U350 Engineering Mechanics and Design 4 SH
MIM U355 Mechanics of Materials 4 SH
with MIM U356 Lab for MIM U355 1 SH
MIM U380 Thermodynamics 4 SH

Advanced Mechanical Engineering
Complete the following seven courses and corresponding labs:
MIM U455 Dynamics and Vibrations 4 SH
with MIM U456 Lab for MIM U455 1 SH
MIM U475 Fluid Mechanics 4 SH
MIM U505 Measurement and Analysis with Thermal Science Application 4 SH
with MIM U506 Lab for MIM U505 1 SH
MIM U508 Mechanical Engineering Computation and Design 4 SH
MIM U550 Mechanical Engineering Design 4 SH
MIM U555 System Analysis and Control 4 SH
MIM U570 Thermal Systems Analysis and Design 4 SH

Information Technology
Complete one course from the following list:
MIM U420 Computers and Information Systems 4 SH
MIM U425 Engineering Database Systems 4 SH
MIM U410 Object-Oriented Engineering Applications 4 SH
MIM U660 Computer-Aided Design 4 SH

Capstone
Complete the following two courses:
MIM U701 Capstone Design 1 1 SH
MIM U702 Capstone Design 2 5 SH

MECHANICAL ENGINEERING GENERAL ELECTIVE REQUIREMENTS
Complete four 4-SH-equivalent, nonremedial, nonrepetitive courses from the following list:
CBA U101 Introduction to Business 4 SH
or any courses from the following departments: ACC, AFR, ARC, ART, ASI, BIO, CHE, CHM, CIV, CJ, CMN, CS, ECE, EFN, ED, ENG, ENV, ENY, FIN, GEO, HBM, HS, HST, IAF, JNB, INT, IS, JRN, LIN, LNA, LNC, LNF, LNG, LNH, LNI, LNJ, LNL, LNM, LNR, LNS, MGT, MIM, MKT, MMS, MSC, MTH, MUS, PHL, PHY, POL, PSY, SCM, SDA, SOC, or THE.

GPA REQUIREMENT
Minimum 2.000 GPA required in the major

GENERAL ELECTIVES
Additional courses taken beyond college and major course requirements to satisfy graduation credit requirements.

COOPERATIVE EDUCATION

UNIVERSITY-WIDE REQUIREMENTS
140 total semester hours required
Minimum 2.000 GPA required