

Electrical Engineering B.S.



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Faculty

Associate Professor Hemmelman, Chair; William J. Hoffert Professor Simonson; Steven P. Miller Endowed Chair and Professor Whites; Professors Batchelder and Hasan; Assistant Professors Montoya, Zhang, and Fathelbab; Instructors Hutton and Rausch.

Electrical Engineering

The electrical engineering curriculum is principally oriented toward preparing students for careers by providing them with the engineering and technical education appropriate to meet modern technological challenges. The basic curriculum includes required course work in mathematics, basic sciences, humanities, social sciences, and fundamental engineering topics in circuit analysis, electronics, electrical systems, electromagnetics, energy systems, and properties of materials. Electrical engineering students are required to select three (3) senior elective courses from a wide variety of subject areas to fit their particular interests. Elective subject areas include

communication systems, power systems, control systems, optoelectronics, microwave engineering, and computer systems.

Mission

The mission of the electrical engineering program, in support of the mission of School of Mines, is to provide electrical engineering students with education that is broadly based in the fundamentals of the profession so that graduates will be able to maintain a high degree of adaptability throughout their professional careers. It is also intended that the students will develop a dedication to the profession and an ability to maintain professional competency through a program of lifelong learning.

Objectives

1. Graduates will be able to successfully practice electrical engineering and related fields regionally and nationally.
2. Graduates will be well-educated in the fundamental concepts of electrical engineering and be able to continue their professional development throughout their careers.
3. Graduates will be skilled in clear communications and teamwork and capable of functioning responsibly in diverse environments.

Program Strengths

A two-semester capstone design experience requires electrical engineering students to conduct their own design project in a simulated industrial environment. They are encouraged to work on team projects and often the team projects are multidisciplinary. This foundation provides students with a broad base of understanding that allows them to apply their knowledge of scientific and engineering principles to the practical and innovative solutions of existing and future problems.

Students are required to develop a high level

of written and oral communication skills and to work well as members of a team. They must develop a social and ethical awareness so they understand their responsibility to protect both the occupational and public health and safety and to implement these factors in their professional activities. Students are encouraged to participate in the activities of professional societies, such as the Institute of Electrical and Electronics Engineers and Eta Kappa Nu, to enhance their educational and social life while on campus and to gain professional contacts for their careers. Students have opportunities to participate in cooperative education and summer intern programs whereby they elect to seek employment to experience engineering work before they complete their degree requirements. Students gain insight into future opportunities and are often hired by their intern companies after graduation.

Integration of Design Concepts

One of the key elements of the undergraduate electrical engineering education experience is to integrate design throughout the curriculum. Students experience various design concepts in a variety of settings:

- Hands-on laboratory projects (including team projects);
- Effective integration of computer applications;
- Development of effective communication skills;
- Senior elective courses;
- Senior capstone experience; and
- Participation in competitive team projects such as the Robotics team, the Alternative Fuel Vehicle Team, the Unmanned Aerial Vehicle team, and the Formula SAE Mini-Indy team.

Graduate School Opportunities

Since the undergraduate curriculum is broad based, it is impossible to study areas of interest in very much depth. Qualified students may specialize further by pursuing a graduate program at the School of Mines.

Laboratories

The electrical and computer engineering department houses well-equipped laboratories designed to give students easy access to experimental support for their theoretical studies. Junior and senior laboratory projects are conducted on an open laboratory basis that allows students to schedule experimental work at their own convenience. Laboratory facilities are open to students and are supervised until 10 p.m. on most weeknights.

Four general-purpose laboratories are fully equipped to provide facilities for experiments in such diverse areas as communication systems, control systems, electromechanics, energy conversion, digital circuits, and electronics. These laboratories can also be used to provide hands-on experience under the direct supervision of electrical and computer engineering faculty. In addition, there are special-purpose laboratories serving the fields of power systems, antennas, microwave engineering, analog and digital systems, mechatronics, real-time embedded systems, computer instrumentation, microprocessor development, reconfigurable logic, and parallel processing and cluster computing (in conjunction with the mathematics and computer science department).

Seniors and graduate students have access to facilities to work on senior design and graduate thesis projects. The work area allows them a convenient place in which to work for the duration of their project.

Notes on Electrical Engineering Courses

Classes that are typically offered every semester include EE 220, EE 221, EE 301, EE 351, EE 464, and EE 465.

Classes that are typically offered every fall

semester include EE 311, EE 320, EE 381, EE 421, EE 431, EE 461, and EE 481.

Classes that are typically offered every spring semester include EE 312, EE 322, EE 330, EE 362, EE 451, EE 382, and EE 483.

Classes that are typically offered in the fall semester of even numbered years, for example fall 2006, include EE 482.

Classes that are typically offered in the fall semester of odd numbered years, for example fall 2007, include EE 432.

Electrical Engineering Curriculum/Checklist

It is the student's responsibility to check with his or her advisor for any program modifications that may occur after the publication of this catalog.

Freshman Year

First Semester

MATH 123	Calculus I	4
CHEM 112	General Chemistry I	3
CHEM 112L	General Chemistry I Lab	1
CENG 244	Intro to Digital Systems	4
Humanities or Social Sciences Elective(s)		3
PE	Physical Education ¹	1
TOTAL		16

Second Semester

ENGL 101	Composition I	3
MATH 125	Calculus II	4
PHYS 211	University Physics I	3
PE	Physical Education I	1
Humanities or Social Sciences Elective(s)		3
TOTAL		14

Sophomore Year

First Semester

EE 220	Circuits I	4
MATH 321	Differential Equations	4
CSC 150	Computer Science I	3
PHYS 213	University Physics II	3
PHYS 213L	University Physics II Lab	1
Humanities or Social Sciences Elective(s)		3
TOTAL		18

Second Semester

ENGL 279	Technical Comm I	3
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EE 221	Circuits	4
MATH 225	Calculus III	4
EE 351	Mechatronics and Measurement Systems	4
Humanities or Social Sciences Elective(s)		3
TOTAL		18

Junior Year

First Semester

ENGL 289	Tech Comm II	3
EE 311	Systems	3.5
EE 320	Electronics I	4
EE 381	Electric and Magnetic Fields	3
EM 216	Statics and Dynamics	4
TOTAL		17.5

Second Semester

EE 312	Signals	3.5
EE 322	Electronics II	4
EE 330	Energy Systems	4
EE 382	Applied Electromagnetics	3
Approved Math Elective ²		3
TOTAL		17.5

Senior Year

First Semester

IENG 301	Basic Engr Economics	2
ME 211 OR PHYS 341	Thermodynamics	3

EE 464	Senior Design I	2
EE	Electrical Engr Elective ³	4
EE	Electrical Engr Elective ³	4
Free Elective ⁴		3
TOTAL		18

Second Semester

EE 362	Electric and Magnetic Properties of Materials	3
EE 465	Electrical Engr Design II	2
EE	Electrical Engr Elective ³	3
Technical Elective ⁵		3
Humanities or Social Sciences Elective(s)		4
TOTAL		15

136 credits required for graduation

Curriculum Notes

¹ Music Ensemble courses, (MUEN 101, 121)

or 122) may be substituted for Physical Education courses. Any other substitutions must be approved in advance by the physical education department chair.

² MATH 315, 373, 381, and 441/442 are approved electives.

³ Eleven (11) electrical engineering elective credits required.

EE Electives

EE 421	Communications Systems	4
EE 431	Power Systems	4
EE 432	Power Electronics	4
EE 451	Control Systems	4
EE 461	VLSI Technology	4
EE 481	Microwave Engineering	4
EE 482	Laser and Opto-Electronic Systems	4
EE 483	Antennas for Wireless Communications	4
CENG 342	Digital Systems	4
CENG 420	Design of Digital Signal Processing Systems	4
CENG 440	VLSI Design	4
CENG 442	Microprocessor Design	4
CENG 444	Computer Networks	4
(credit for only one of CENG 444 or CSC 463 may be used)		
CENG 446	Advanced Computer Architectures	4
(credit for only one of CENG 446 or CSC 440 may be used)		
CENG 447	Embedded and Real-Time Computer Systems	4

⁴ A free elective is any college level course 100 level or above that is acceptable toward an engineering or science degree. Military science courses, 100 level and above, apply as free electives only; substitution for departmental, technical, humanities, or social science electives is not permitted.

⁵ A technical elective is any science or engineering course 200 level or above that does not duplicate the content of any other course required for graduation. Co-op credits may be used for technical elective credit. A maximum of six (6) co-op credits may be used for the EE degree.

Electrical engineering students are required to take the FE (Fundamentals of Engineering) exam

prior to graduation.