Electrical Engineering B.S.

Contact Information

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Faculty

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Electrical Engineering

The electrical engineering curriculum prepares students for life-long 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 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, microwave engineering, antenna engineering, and computer systems.

The bachelor of science program in electrical engineering is accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 – telephone (410) 347-7700.

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, nationally, and globally.

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 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:

• Laboratory projects (including team projects);
• Effective integration of computer applications;
• 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, Lunar Regolith Mining, and the Formula SAE Mini-Indy Team.

Graduate School Opportunities

The undergraduate curriculum is broadly based to give graduates flexibility in their career paths. Qualified students may study areas of interest in more depth and 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 practical 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.

Electrical Engineering Curriculum/Checklist

Students are responsible for checking with their advisors 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
- **TOTAL**  16

**Second Semester**
- ENGL 101 Composition I  3
- MATH 125 Calculus II  4
- PHYS 211 University Physics I  3
- PE Physical Education  1
- Humanities or Social Sciences Elective(s)  3
- CSC 150 Computer Science I  3
- **TOTAL**  17

### Second Semester

**First Semester**
- EE 220 Circuits I  4
- MATH 321 Differential Equations  4
- ENGL 279 Technical Comm 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**
- EM 216 Statics and Dynamics  4
- EE 221 Circuits II  4
- MATH 225 Calculus III  4
- EE 351 Mechatronics and Measurement Systems  4
- EE 264 Sophomore Design  3
- **TOTAL**  18

### Sophomore 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
- EE 362 Electric and Magnetic Properties of Materials  3
- **TOTAL**  16.5

**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  3
- **TOTAL**  17.5

### Senior Year

**First Semester**
- IENG 301 Basic Engr. Economics  2
- ME 211 Thermodynamics  3
- EE 464 Senior Design I  2
- EE Electrical Engr. Elective  3
- Free Elective  3
- **TOTAL**  18

**Second Semester**
- EE 465 Electrical Engr. Design II  2
- EE Electrical Engr. Elective  3
- Technical Elective  3
- Humanities or Social Sciences Elective(s)  3
- Upper-level Humanities or Social Elective  3
- Free Elective  1
- **TOTAL**  15

### Junior Year

**First Semester**
- ENGL 289 Tech Comm. II  3
- EE Electives
  - EE 421 Communications Systems  4
  - EE 431 Power Systems  4
  - EE 432 Power Electronics  4
  - EE 451 Control Systems  4
  - EE 481 Microwave Engineering  4
  - EE 483 Antennas for Wireless Communications  4
  - EE 552 Robotic Control Systems  3
  - CENG 342 Digital Systems  4
- **TOTAL**  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 head.

2 MATH 381 and 441 are approved electives.

3 Eleven electrical engineering elective credits required.
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 6 co-op credits may be used for the EE degree.

Electrical engineering students are required to take the Fundamentals of Engineering exam prior to graduation.