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COLLEGE OF ENGINEERING AND ENGINEERING TECHNOLOGY

Department of Electrical Engineering

BOT Other Catalog Change Pages 158-160, 2017-18 Undergraduate Catalog
IBHE

Department of Electrical Engineering (ELE)

The Department of Electrical Engineering offers two undergraduate degrees: a B.S. in ~~Electrical-electrical Engineering-engineering~~ and a B.S. in ~~Biomedical-biomedical Engineering-engineering~~. The B.S. in ~~Electrical-electrical Engineering-engineering~~ offers five areas: —microelectronics, power/controls, signal processing & and communications, electromagnetics, and computer engineering, which The B.S. in ~~Electrical-electrical Engineering-engineering~~ will equip students with the basic competence and job skills needed to design, develop, and operate systems which generate and use electronic signals. These technologies include machinery, electronics, communications and computers. The B.S. in ~~Biomedical-biomedical Engineering-engineering~~ offers two tracks: —~~b~~Biomechanics and ~~b~~Biomaterials in Track 1, and ~~b~~Biomedical ~~i~~nstrumentation, ~~s~~Sensors and ~~s~~Signal ~~p~~rocessing in Track 2. Both tracks in ~~Biomedical-biomedical Engineering-engineering~~ will equip students with the basic competence and job skills needed to design, develop, and operate biomedical systems and devices.

As a profession, both electrical and biomedical engineering demands the individual to work with others in supporting disciplines to achieve common goals. Design is central to the both professions and is integrated throughout the ~~curriculum~~ curricula for both programs. The design experience in each program is supported by concepts related to reliability, maintainability, and product value. The student is encouraged to approach central technical issues with increased awareness of logistical, ethical, and social implications. Respect for the safety of persons and property is integral to both the electrical engineering and the biomedical engineering ~~curriculum~~ curricula.



Electrical Engineering Program Educational Objectives

As individuals or as members of teams, our graduates will have:

- A solid background in mathematics, science, and engineering fundamentals that make it possible to acquire and use contemporary knowledge and tools to practice electrical engineering, in a professional and ethical way, as well as to succeed in graduate education.
- The ability to develop problem-solving skills to design and build systems and to communicate, orally and in writing, with others from inside and outside the profession.

Biomedical Engineering Program Educational Objectives

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A B.S. in Biomedical Engineering will equip the students with ~~cross-cross~~-disciplinary knowledge and training in life sciences and medicine, training them to apply core engineering principles to analyzing and solving complex problems in the biomedical related fields. Graduates of this program are expected to have a solid background in mathematics, sciences, and engineering fundamentals as well as core biological sciences. Successful completion of this program should enable the graduates with the ability to seamlessly transition between fields in identifying and solving problems pertinent to life sciences and medicine. The program curriculum will involve engaged teaching and learning as well as design experience through establishing a synergy between classroom and hands-on laboratory activities. This curriculum has an emphasis on creating, transmitting, expanding, and applying knowledge in the practice of biomedical engineering in a professional and ethical way, while preparing our graduates to succeed in the industry as well as preparing them for graduate education.

Program Learning Outcomes

The electrical engineering program is designed to provide our graduates with the:

- A. Ability to apply their knowledge of mathematics, science, and engineering.
- B. Ability to design and conduct experiments, as well as to analyze and interpret data.
- C. Ability to design a system, component, or process to meet desired needs.
- D. Ability to function on multidisciplinary teams.
- E. Ability to identify, formulate, and solve engineering problems.
- F. Understanding of professional and ethical responsibility.
- G. Ability to communicate effectively.
- H. Broad education necessary to understand the impact of engineering solutions in a global and societal context.
- I. Recognition of the need for, and an ability to engage in lifelong learning.
- J. Knowledge of contemporary issues.
- K. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Learning Outcomes

The Electrical Engineering and Biomedical Engineering programs are designed to provide our graduates with:

- 1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- 2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
- 3) An ability to communicate effectively with a range of audiences.
- 4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

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- 5) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- 6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- 7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Department Requirements

All **E**lectrical **e**ngineering students and **b**iomedical **e**ngineering students must have their schedule reviewed, approved, and signed by their faculty adviser each semester. Any deviation from an approved course schedule may delay graduation.

Major in Biomedical Engineering (B.S.)

Course Requirements

Students entering the BME program complete the required course work within the department and outside of the department and complete three required courses and three electives from the list of pre-approved courses, based on the track they choose.

Tracks in Biomedical Engineering program: There are two tracks in the BME program:

- Biomechanics and Biomaterials
- Biomedical Instrumentation, Sensors and Signal Processing

Requirements in Department (26)

BME 201 - Introduction to Biomedical Engineering (3)
BME 320 - Introduction to Biomedical Measurements (4)
BME 330 - Biomechanics (3)
BME 336 - Biomaterials (3)
BME 495 - Biomedical Engineering Senior Design I (3)
BME 496 - Biomedical Engineering Senior Design II (3)
ELE 210 - Engineering Circuit Analysis (3)
ELE 210U - Engineering Circuit Laboratory Project (1)
ELE 315 - Signals and Systems (3)

Requirements outside Department (5651-52)

BIOS 208 - Fundamentals of **C**ellular Biology I (3)
BIOS 210 - Fundamentals of **C**ellular Biology I Laboratory (1)
BIOS 311 - Functional Human Anatomy (4)
or-OR BIOS 357 - Human Anatomy and Physiology (5)
CHEM 210 - General Chemistry I (3)
CHEM 212 - General Chemistry Laboratory I (1)
CHEM 230 - Introduction to Organic Chemistry (3)

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CHEM 231 - Introduction to Organic Chemistry Laboratory (1)
CSCI 240 - Computer Programming in C++ (4)
ISYE 335 - Probability and Statistics for Engineers (3)
~~OR~~ STAT 350 - Introduction to Probability and Statistics (3)
MATH 229 - Calculus I (4)
MATH 230 - Calculus II (4)
MATH 232 - Calculus III (4)
MATH 336 - Ordinary Differential Equations (3)
MEE 209 - Engineering Mechanics:— Statics and Dynamics (4)
PHYS 253 - Fundamentals of Physics I: —Mechanics (4)
PHYS 273 - Fundamentals of Physics II: —Electromagnetismes (4)
UEET 101 - Introduction to Engineering (1)

The list of pre-approved elective courses (i.e., selective electives) beyond the required core BME courses for each of the BME tracks are as follows:

Track 1: Biomechanics and Biomaterials (18-20)

Required Courses (9)

MEE 340 - Fluid Mechanics (3)
BME 435 - Biotransport (3)
BME 436 - Advanced Biomaterials and Manufacturing (3)

Elective Courses (9-11)

Choose at least 9 credit hours from the following:

BME 420 - Biomedical Instrumentation Design (4)
BME 421 - Biomedical Sensor Engineering (3)
BME 425 - Biomedical Signal Processing (3)
BME 437 - Biomaterials Characterization (3)
BME 497 - Independent Study (1-3)
BME 498 - Special Topics (1-3)
BME 499 - Honors Undergraduate Research (1-3)
ELE 380 - Control Systems I (4)
MEE 427 - PLC-based ~~Design~~ Robotics in Automated ~~systems~~ Systems (3)

Track 2: Biomedical Instrumentation, Sensors and Signal Processing (19-22)

Required Courses (10):

BME 420 - Biomedical Instrumentation Design (4)
BME 421 - Biomedical Sensor Engineering (3)
BME 425 - Biomedical Signal Processing (3)

Elective courses (9-12)

Choose at least 9 credit hours from the following:

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BME 435 - Biotransport (3)
BME 436 - Advanced Biomaterials and Manufacturing (3)
BME 437 - Biomaterials Characterization (3)
BME 497 - Independent Study (1-3)
BME 498 - Special Topics (1-3)
BME 499 - Honors Undergraduate Research (1-3)
ELE 250 - Computer Engineering I (3)
ELE 250U - Computer Engineering I Laboratory (1)
ELE 330 - Electronics Circuits (4)
ELE 356 - Computer Engineering II (4)
ELE 360 - Communication Systems (3)
ELE 370 - Engineering Electromagnetics (3)
ELE 380 - Control Systems I (4)
ELE 430 - Design with Field Programmable Logic Devices (3)
ELE 437 - Hybrid Circuit Design (3)
ELE 438 - Thin Film Engineering (3)
ELE 454 - Introduction to Digital Image Processing (3)
MEE 340 - Fluid Mechanics (3)
Total Hours for a Major in Biomedical Engineering: 97-102

BOT 3/8/18; IBHE 5/1/18; BC 12/7/18 Sec. B

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Major in Electrical Engineering (B.S.)

~~**Emphasis 1. Electrical and Computer Engineering**~~

Requirements in Department (4143)

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ELE 380 - Control Systems I (4)
~~ELE 491 - Electrical Engineering Design Proposal (1)~~
~~ELE 492 - Electrical Engineering Design Project (3);~~
~~OR ELE 429 - Biomedical Engineering Design Project (3)~~
ELE 495 - Electrical Engineering Design I (3)
ELE 496 - Electrical Engineering Design II (3)

Requirements Outside Department (45-47)

↓

Electives (1816)

Electives may be any ELE course numbered 400 or higher with the exception of ~~ELE 429, ELE 491, ELE 492,~~ ELE 495, ELE 496, and ELE 497. With the approval of ... the following five areas.

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Total Hours for a Major in Electrical Engineering: 104-106

~~Emphasis 2, Biomedical Engineering~~

~~↓Total Hours for Emphasis 2, Biomedical Engineering: 108-113~~

BOT 6/18/18, effective with the new BS in Biomedical Engineering, approved by the IBHE 5/1/18, BC 12/7/17
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