

# ELECTRICAL ENGINEERING MAJOR: BIOMEDICAL ENGINEERING OPTION (B.S.)

<https://ceps.unh.edu/electrical-computer-engineering/program/bs/electrical-engineering-biomedical-engineering-option>

## Description

The Biomedical Engineering (BME) Option is intended to provide the core of knowledge expected of a computer and/or electrical engineer to provide engineering services in the biomedical field. Electrical and/or computer engineers with this option in biomedical engineering combine engineering principles with medical and biological sciences to design and create equipment, devices, computer systems, and software used in healthcare. The BME option is embedded in both the Electrical Engineering (EE) program and the Computer Engineering (CE) program.

The Electrical Engineering (B Sci in Electrical Engineering) program is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the General Criteria and the Program Criteria for Electrical, Computer, Communications, Telecommunication(s) and Similarly Named Engineering Programs.

## Requirements

### Degree Requirements

**Minimum Credit Requirement:** 129 credits

**Minimum Residency Requirement:** 32 credits must be taken at UNH

**Minimum GPA:** 2.0 required for conferral\*

**Core Curriculum Required:** Discovery & Writing Program Requirements

**Foreign Language Requirement:** No

All Major, Option and Elective Requirements as indicated.

\*Major GPA requirements as indicated.

### Major Requirements

In addition to Discovery Program requirements, the department has a number of grade-point average and course requirements.

- Any electrical engineering major whose cumulative grade-point average in ECE courses is less than 2.0 during any three semesters will not be allowed to continue as an electrical engineering major.
- Electrical engineering majors must achieve a 2.0 grade-point average in all ECE and CS courses as a requirement for graduation.

To make an exception to any of these departmental requirements based on extenuating circumstances, students must petition the department's undergraduate committee. Mindful of these rules, students, with their advisor's assistance, should plan their programs based on the distribution of courses found in the Degree Plan tab.

Code	Title	Credits
<b>Required Courses</b>		
BMS 508	Human Anatomy and Physiology II	4

CS 410C	Introduction to Scientific Programming/C	4
CS 419	Computer Science for Engineers and Scientists	4
ECE 401	Perspectives in Electrical and Computer Engineering	4
ECE 541	Electric Circuits	4
ECE 543	Introduction to Digital Systems	4
ECE 548	Electronic Design I	4
ECE 562	Computer Organization	4
ECE 602	Engineering Analysis	3
ECE 603	Electromagnetic Fields and Waves I	3
ECE 633	Signals and Systems I	3
ECE 634	Signals and Systems II	3
ECE 647	Random Processes and Signals in Engineering	3
ECE 652	Electronic Design II	6
ECE 653	Electronic Design III	6
ECON 402	Principles of Economics (Micro)	4
or NR 411	Environmental and Resource Economics Perspectives	
MATH 425	Calculus I	4
MATH 426	Calculus II	4
MATH 527	Differential Equations with Linear Algebra	4
MATH 645	Linear Algebra for Applications	4
PHYS 407	General Physics I	4
PHYS 408	General Physics II	4
<b>Capstone</b>		
ECE 791	Senior Project I	3
ECE 792	Senior Project II	3
<b>Professional Electives</b>		
Choose one professional elective course <sup>1</sup>		4
<b>Biomedical Engineering Option Required Courses</b>		
ECE 717	Introduction to Digital Image Processing	4
ECE 784	Biomedical Instrumentation	4
CHBE 762	Biomedical Engineering	4
or CHBE 766	Biomaterials	
<b>Other Courses</b>		
Discovery requirements not already covered by required courses <sup>2</sup>		20
<b>Total Credits</b>		<b>129</b>

<sup>1</sup> Professional electives must be selected as follows:

- Choose one ECE 700-level courses
- Students are allowed to take only one ECE 795 Electrical and Computer Engineering Projects or ECE 796 Special Topics

<sup>2</sup> Fulfilling the EE Program curriculum taking ECE 401 Perspectives in Electrical and Computer Engineering, ECE 791 Senior Project I, and ECE 792 Senior Project II curriculum will automatically meet Discovery Category, "Environment, Technology and Society."

## Degree Plan

### Sample Degree Plan

*This sample degree plan serves as a general guide; students collaborate with their academic advisor to develop a personalized degree plan to meet their academic goals and program requirements.*

#### First Year

Fall		Credits
ECE 401	Perspectives in Electrical and Computer Engineering	4
CS 410C	Introduction to Scientific Programming/C	4
MATH 425	Calculus I	4
ENGL 401	First-Year Writing	4

#### Credits

**16**

**Spring**

PHYS 407	General Physics I	4
MATH 426	Calculus II	4
BMS 508	Human Anatomy and Physiology II	4
CS 419	Computer Science for Engineers and Scientists	4

**Credits** 16

**Second Year****Fall**

ECE 541	Electric Circuits	4
ECE 543	Introduction to Digital Systems	4
MATH 527	Differential Equations with Linear Algebra	4
PHYS 408	General Physics II	4

**Credits** 16

**Spring**

ECE 548	Electronic Design I	4
ECE 562	Computer Organization	4
MATH 645	Linear Algebra for Applications	4
ECON 402 or NR 411	Principles of Economics (Micro) <sup>1</sup> or Environmental and Resource Economics Perspectives	4

**Credits** 16

**Third Year****Fall**

ECE 602	Engineering Analysis	3
ECE 633	Signals and Systems I	3
ECE 652	Electronic Design II	6
Discovery Program Category		4

**Credits** 16

**Spring**

ECE 603	Electromagnetic Fields and Waves I	3
ECE 634	Signals and Systems II	3
ECE 647	Random Processes and Signals in Engineering	3
ECE 653	Electronic Design III	6
Discovery Program Category		4

**Credits** 19

**Fourth Year****Fall**

ECE 791	Senior Project I	3
CHBE 762 or CHBE 766	Biomedical Engineering or Biomaterials	4
Professional Elective <sup>2</sup>		4
Discovery Program Category		4

**Credits** 15

**Spring**

ECE 792	Senior Project II	3
ECE 784	Biomedical Instrumentation	4
ECE 717	Introduction to Digital Image Processing	4
Discovery Program Category		4

**Credits** 15

**Total Credits** 129

<sup>1</sup> Students are required to take either ECON 402 Principles of Economics (Micro) or NR 411 Environmental and Resource Economics Perspectives to fulfill the Social Science Category of the Discovery Program.

<sup>2</sup> One professional elective must be selected as follows:

- Choose any one ECE 7XX courses.

ECE 791 Senior Project I and ECE 792 Senior Project II fulfill Discovery Program Capstone Experience.

Fulfilling the EE Program Biomedical Option curriculum taking ECE 401 Perspectives in Electrical and Computer Engineering, ECE 791 Senior Project I, and ECE 792 Senior Project II will automatically meet Discovery Category, "Environment, Technology and Society."

## Student Learning Outcomes

The Department of Electrical and Computer Engineering has adopted a set of student outcomes that consists of statements describing what students are expected to know and be able to do by the time of graduation, the achievement of which indicates that the student is equipped to achieve the program objectives. The current student outcomes are:

## Program Learning Outcomes

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- 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.
- An ability to communicate effectively with a range of audiences.
- 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.
- 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.
- An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.