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

https://ceps.unh.edu/electrical-computer-engineering/program/bsee/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.

Requirements

Degree Requirements

Minimum Credit Requirement: 128 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.

1. 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.

2. 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 adviser's assistance, should plan their programs based on the distribution of courses found in the Degree Plan tab.

Required Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMS 508</td>
<td>Human Anatomy and Physiology II</td>
<td>4</td>
</tr>
<tr>
<td>CS 410C</td>
<td>Introduction to Scientific Programming/C</td>
<td>4</td>
</tr>
<tr>
<td>CS 419</td>
<td>Computer Science for Engineers and Scientists</td>
<td>4</td>
</tr>
<tr>
<td>ECE 401</td>
<td>Perspectives in Electrical and Computer Engineering</td>
<td>4</td>
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<tr>
<td>ECE 541</td>
<td>Electric Circuits</td>
<td>4</td>
</tr>
<tr>
<td>ECE 543</td>
<td>Introduction to Digital Systems</td>
<td>4</td>
</tr>
<tr>
<td>ECE 548</td>
<td>Electronic Design I</td>
<td>4</td>
</tr>
<tr>
<td>ECE 562</td>
<td>Computer Organization</td>
<td>4</td>
</tr>
<tr>
<td>ECE 602</td>
<td>Engineering Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ECE 603</td>
<td>Electromagnetic Fields and Waves I</td>
<td>3</td>
</tr>
<tr>
<td>ECE 633</td>
<td>Signals and Systems I</td>
<td>3</td>
</tr>
<tr>
<td>ECE 634</td>
<td>Signals and Systems II</td>
<td>3</td>
</tr>
<tr>
<td>ECE 647</td>
<td>Random Processes and Signals in Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ECE 652</td>
<td>Electronic Design II</td>
<td>6</td>
</tr>
<tr>
<td>ECE 653</td>
<td>Electronic Design III</td>
<td>6</td>
</tr>
<tr>
<td>ECON 402</td>
<td>Principles of Economics (Micro)</td>
<td>4</td>
</tr>
<tr>
<td>or EREC 411</td>
<td>Environmental and Resource Economics Perspectives</td>
<td>4</td>
</tr>
<tr>
<td>MATH 425</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 426</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 527</td>
<td>Differential Equations with Linear Algebra</td>
<td>4</td>
</tr>
<tr>
<td>MATH 545</td>
<td>Linear Algebra for Applications</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 407</td>
<td>General Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 408</td>
<td>General Physics II</td>
<td>4</td>
</tr>
</tbody>
</table>

Capstone

ECE 791 Senior Project I | 3
ECE 792 Senior Project II | 3

Professional Electives

Choose one professional elective course¹

Biomedical Engineering Option Required Courses

ECE 717 Introduction to Digital Image Processing | 4
ECE 784 Biomedical Instrumentation | 4
CHBE 762 Biomedical Engineering | 4
or CHBE 766 Biomaterials | 4

Other Courses

Discovery requirements not already covered by required courses² | 20

Total Credits | 129

¹ Professional electives must be selected as follows:
- Choose one ECE 700-level course
- Students are allowed to take only one ECE 795 Electrical and Computer Engineering Projects or ECE 796 Special Topics

² Fulfiling 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

Course | Title                                      | Credits |
--------|--------------------------------------------|---------|
**First Year**

**Fall**

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 **Principles of Economics (Micro)**
  or EREC 411 **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 **Biomedical Engineering**
  or CHBE 766 **Biomaterials** 4
- Professional Elective 2 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

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

2. 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 Program Educational Objectives for the Electrical Engineering Program are as follows:

• 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.