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

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

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 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>CS 410C</td>
<td>Introduction to Scientific Programming/C</td>
<td>4</td>
</tr>
<tr>
<td>ECE 401</td>
<td>Perspectives in Electrical and Computer Engineering</td>
<td>4</td>
</tr>
<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>
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<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>
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<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></td>
</tr>
<tr>
<td>MATH 425</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 426</td>
<td>Calculus II</td>
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<tr>
<td>MATH 527</td>
<td>Differential Equations with Linear Algebra</td>
<td>4</td>
</tr>
<tr>
<td>MATH 645</td>
<td>Linear Algebra for Applications</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 407</td>
<td>General Physics I</td>
<td>4</td>
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<tr>
<td>PHYS 408</td>
<td>General Physics II</td>
<td>4</td>
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Capstone

<table>
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<tr>
<th>Code</th>
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<tbody>
<tr>
<td>ECE 791</td>
<td>Senior Project I</td>
<td>3</td>
</tr>
<tr>
<td>ECE 792</td>
<td>Senior Project II</td>
<td>3</td>
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Mathematics or Science Elective

Select one from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>CHEM 405</td>
<td>Chemical Principles for Engineers</td>
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<td>MATH 644</td>
<td>Statistics for Engineers and Scientists</td>
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<td>MS 762</td>
<td>Electronic Materials Science</td>
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<tr>
<td>PHYS 605</td>
<td>Experimental Physics I</td>
<td></td>
</tr>
<tr>
<td>PHYS 615</td>
<td>Classical Mechanics and Mathematical Physics I</td>
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Professional Electives

Choose two professional elective courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>BENG 762</td>
<td>Biomedical Engineering</td>
<td>4</td>
</tr>
<tr>
<td>or BENG 766</td>
<td>Biomaterials</td>
<td></td>
</tr>
<tr>
<td>or CHE 714</td>
<td>Chemical Sensors</td>
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Other Courses

Discovery requirements not already covered by required courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ENGL 401</td>
<td>First-Year Writing</td>
<td>4</td>
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</tbody>
</table>

| Total Credits | 129 |

1 Three professional electives must be selected as follows:

- Select one course from: BEN 762 Biomedical Engineering, BENG 766 Biomaterials, CHE 714 Chemical Sensors
- Choose any two ECE 700-level courses
- Students are allowed to take only one ECE 795 Electrical and Computer Engineering Projects or ECE 796 Special Topics
- Honors students who complete ECE 791H Senior Honors Project I and ECE 792H Senior Honors Project II will satisfy one professional elective requirement as well as the requirements for ECE 791 Senior Project I and ECE 792 Senior Project II.

2 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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>First Year</td>
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<tr>
<td>Fall</td>
<td>ECE 401 Perspectives in Electrical and Computer Engineering</td>
<td>4</td>
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<tr>
<td></td>
<td>CS 410C Introduction to Scientific Programming/C</td>
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<td></td>
<td>MATH 425 Calculus I</td>
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<td>ENGL 401 First-Year Writing</td>
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<td>Credits</td>
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<td>Spring</td>
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<td>PHYS 407 General Physics I</td>
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<td>MATH 426 Calculus II</td>
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<td>BMS 508 Human Anatomy and Physiology II</td>
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<td>Second Year</td>
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<td>Fall</td>
<td>ECE 541 Electric Circuits</td>
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<td>ECE 543 Introduction to Digital Systems</td>
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<td>Engineering Analysis</td>
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<td>ECE 784</td>
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<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td><strong>129</strong></td>
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</tbody>
</table>

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 Math/Science Elective approved courses: CHEM 405 Chemical Principles for Engineers, MATH 644 Statistics for Engineers and Scientists, MATH 647 Complex Analysis for Applications, PHYS 605 Experimental Physics I, PHYS 615 Classical Mechanics and Mathematical Physics I, MS 762 Electronic Materials Science

3 Three professional electives must be selected as follows:
   - Choose any two ECE 7XX courses
   - Students are allowed to take only one ECE 795 Electrical and Computer Engineering Projects or ECE 796 Special Topics

- Select one course from: BENG 762 Biomedical Engineering, BENG 766 Biomaterials, CHE 714 Chemical Sensors
- Honors students who complete ECE 791H Senior Honors Project I and ECE 792H Senior Honors Project II will satisfy one professional elective requirement as well as the requirements for ECE 791 Senior Project I and ECE 792 Senior Project II.

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.