Electrical Engineering-Bachelor of Science in Engineering

For information, contact the Department of Electrical and Computer Engineering, 260 Garland Hall, 513-529-0740.

This program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

Electrical engineering is the process of applying electric and magnetic phenomena in an innovative way to create useful products and services. Progress in electrical engineering led society from the electricity age through communication and computer ages to the current information age. The profession encompasses a broad range of concentration areas such as electronic circuits, instrumentation and control, integrated circuits, electromagnetics, power and energy, communications, computers and networks, and signal processing. Products and services like electricity, broadcasting, computers, cellular phones, navigation equipment, and the internet affect and influence every aspect of modern civilization. The widespread utilization of electrical means of measurement and control, computers, and communications has resulted in the need for electrical engineers in all types of industries. Excellent employment opportunities exist for well-prepared graduates.

Miami’s electrical engineering curriculum provides students with a sound foundation in basic science, mathematics, the humanities, communication skills, and technical subjects. Design, project management, and teamwork, as well as ethics and professionalism, are emphasized throughout the curriculum.

Program Educational Objectives

Program educational objectives describe the career and professional accomplishments that the program prepares graduates to attain within a few years of graduation. The objectives of the electrical engineering program are for graduates to achieve:

• Success in being employed in an area related to electrical engineering or enrolled in an advanced program.
• Advancement in professional skills and knowledge with an understanding of the impact on societal, economic, global, and environmental issues.
• Progression in responsibilities by exercising effective communication, leadership, and teamwork skills.
• Commitment to professionalism, ethical, inclusive and equitable practices, continuous improvement, and lifelong learning.

Student Outcomes

These student outcomes prepare our graduates to attain the program educational objectives listed above.

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.
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.

Credit/No Credit Policy

All courses in chemistry, physics, biology, mathematics, statistics and those in the College of Engineering and Computing (CPB, CSE, ECE, EGM, MME, CEC) that are used to fulfill requirements of the major, must be taken for a grade.

Divisional Policy

DOUBLE MAJORS: Students with two majors in the College of Engineering and Computing must take a minimum of 15 different/additional credit hours in their second major beyond the requirements of their first major.

Program Requirements

(104 semester hours minimum)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHM 141</td>
<td>College Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>ECO 201</td>
<td>Principles of Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ECE 345</td>
<td>Introduction to Probability, Statistics, and Random Processes</td>
<td>3</td>
</tr>
<tr>
<td>ENG 313</td>
<td>Technical Writing</td>
<td>3</td>
</tr>
<tr>
<td>MTH 151</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MTH 251</td>
<td>Calculus II</td>
<td>4-5</td>
</tr>
<tr>
<td>or MTH 249</td>
<td>Calculus II</td>
<td></td>
</tr>
<tr>
<td>MTH 246</td>
<td>Linear Algebra and Differential Equations for Engineers</td>
<td>4</td>
</tr>
<tr>
<td>MTH 252</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>PHY 191</td>
<td>General Physics with Laboratory I</td>
<td>5</td>
</tr>
<tr>
<td>PHY 192</td>
<td>General Physics with Laboratory II</td>
<td>5</td>
</tr>
<tr>
<td>CSE 174</td>
<td>Fundamentals of Programming and Problem Solving</td>
<td>3</td>
</tr>
<tr>
<td>CEC 111</td>
<td>Imagination, Ingenuity and Impact I</td>
<td>2</td>
</tr>
<tr>
<td>CEC 112</td>
<td>Imagination, Ingenuity, and Impact II</td>
<td>2</td>
</tr>
<tr>
<td>ECE 448</td>
<td>Senior Design Project</td>
<td>2</td>
</tr>
<tr>
<td>ECE 449</td>
<td>Senior Design Project</td>
<td>2</td>
</tr>
</tbody>
</table>

Required Electrical and Computer Engineering

ECE 205 Electric Circuit Analysis I 4
ECE 287 | Digital Systems Design | 4
ECE 301 | Advanced Circuits and Fundamentals of Renewable Energy | 3
ECE/MME 303 | Computer-Aided Experimentation or ECE 314 | Elements of Robotics | 3
ECE 304 | Electronics | 3
ECE 306 | Signals and Systems | 3
ECE 325 | Applied Electromagnetics | 3
ECE 425 | Digital Signal Processing | 3
ECE/MME 436 | Control of Dynamic Systems | 3
ECE 484 | Embedded Systems Design | 3

**Professional EE Electives**
Select 12 hours of the following: 12

- ECE 388 | Introduction to Smartphone Technologies
- ECE 411 | Sensors and Data Fusion with Robotics Applications
- ECE 414 | Design and Modeling of Robotic Systems
- ECE 426 | Biomedical Signal Analysis and Machine Learning
- ECE 427 | Radar Signal Processing
- ECE 429 | Digital Image Processing
- ECE 430 | Electromagnetics in Wireless Sensing and Communications
- ECE 453 | Communication Systems
- ECE 461 | Network Performance Analysis
- ECE 487 | Computer Aided Design Tools for Computer Engineering
- ECE 491 | Power Systems Engineering
- ECE 493 | Power Electronics
- ECE 497 | Electric Vehicle Technology

**General Technical Electives**
Select 11 hours of the following: 11

- Additional courses from the Professional EE Elective list

- ECE 289 | Computer Organization
- ECE 291 | Energy Systems Engineering
- ECE 302 | MATLAB and its engineering applications
- ECE 317 | Industrial Robotics
- ECE 395 | Undergraduate Research Immersion Project
- MTH 231 | Elements of Discrete Mathematics
- MTH 331 | Proof: Introduction to Higher Mathematics
- MTH 432 | Optimization
- MTH 438 | Theory and Applications of Graphs
- MTH 441 | Real Analysis
- MTH 451 | Introduction to Complex Variables
- MTH 453 | Numerical Analysis
- PHY 281 | Contemporary Physics I: Foundations
- PHY 282 | Contemporary Physics II: Frontiers
- CPB 219 | Statics and Mechanics of Materials

**Total Credit Hours** 104-105

1 General Technical Electives are subject to the following rules:
   - At least 3 credits of General Technical Electives must be 300-level or above.
   - At least 6 credits must be from ECE.
   - Courses cannot be double-counted as both Professional EE Electives and General Technical Electives.
   - CHM 141/CHM 144 may be used if they are not double-counted for Miami Plan requirement.