ELECTRICAL ENGINEERING, B.S. (CAPITAL)

Begin Campus: Any Penn State Campus
End Campus: Harrisburg

Program Description
The Bachelor of Science degree in Electrical Engineering provides a solid background in electrical engineering sciences. It also provides an opportunity for students to pursue interests in electrical and electronic circuits, including digital circuits and VLSI and its fabrication, microprocessors and their applications, electromagnetics, communications, control systems, and digital image processing and computer vision. Through participation in a senior capstone design, the curriculum emphasizes written as well as verbal communication and teamwork approach among the students to attain a common goal.

This program helps its graduates develop capabilities to analyze and design a variety of electrical and electronic systems found in many industrial and government settings as well as provide a foundation for further graduate studies. A strong background in the fundamentals is built through a broad base core in basic sciences (physics and chemistry) and mathematics as well as engineering sciences.

What is Electrical Engineering?
Electrical engineering is a broad discipline of study that includes circuit design, analog and digital electronics, electromagnetics, electro-optics, control systems, power systems, communications, and signal/image processing. Electrical engineers study and apply physics and mathematics to design electrical and electronic systems and their components for a wide range of applications such as mobile phones, wireless communications, consumer electronics, computers, computer networks, power generation, machine learning, robotics, nanoelectronics, nanophotonics, bioelectronics, autonomous transportation, wearable networks, power generation, machine learning, robotics, nanoelectronics, wireless communications, consumer electronics, computers, computer components for a wide range of applications such as mobile phones, wireless communications, consumer electronics, computers, computer networks, power generation, machine learning, robotics, nanoelectronics, nanophotonics, bioelectronics, autonomous transportation, wearable systems, including digital circuits and VLSI and its fabrication, microprocessors and their applications, electromagnetics, communications, control systems, and digital image processing and computer vision. Through participation in a senior capstone design, the curriculum emphasizes written as well as verbal communication and teamwork approach among the students to attain a common goal.

You Might Like This Program If...
- You enjoy problem-solving and math.
- You prefer to use analysis and the scientific method to understand things.
- You enjoy working on multidisciplinary teams on complex problems.
- You want to pursue a career in electrical engineering or its sub-branches.

Entrance to Major
Entry to the Electrical Engineering major requires that the student earned a minimum cumulative grade-point average (GPA) of 2.00 and has completed with a grade of C or better: MATH 140, MATH 141, PHYS 211, and CHEM 110.

Degree Requirements
For the Bachelor of Science degree in Electrical Engineering a minimum of 134 credits is required:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Education</td>
<td>45</td>
</tr>
<tr>
<td>Requirements for the Major</td>
<td>113-115</td>
</tr>
</tbody>
</table>

24 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 3 credits of GWS courses; 6 credits of GS courses; 9 credits of GN courses; 6 credits of GQ courses.

Requirements for the Major
To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44).

Code | Prescribed Courses                        | Credits |
-----|------------------------------------------|---------|
CHEM 111 | Experimental Chemistry I                  | 1       |
CMPEH 472 | Microprocessors                           | 4       |
EDSGN 100S | Introduction to Engineering Design      | 3       |
EE 311   | Electronic Circuit Design II             | 3       |
EE 330   | Engineering Electromagnetics            | 4       |
EE 341   | Semiconductor Device Principles         | 3       |
EE 405   | Capstone Proposal Preparation            | 1       |
EE 461   | Communications I                         | 4       |
EE 481   | Control Systems                          | 4       |
EE 485   | Energy Systems and Conversion            | 3       |
EMCH 211 | Statics                                  | 3       |
ENGR 320Y | Design for Global Society               | 3       |
MATH 220 | Matrices                                 | 2       |
MATH 230 | Calculus and Vector Analysis             | 4       |
MATH 250 | Ordinary Differential Equations         | 3       |
PHYS 213 | General Physics: Fluids and Thermal Physics | 2     |
PHYS 214 | General Physics: Wave Motion and Quantum Physics | 2 |
SSET 295 | Internship                               | 1       |

Prescribed Courses: Require a grade of C or better

Code | Title                                            | Credits |
-----|--------------------------------------------------|---------|
CHEM 110 | Chemical Principles I                            | 3       |
CMPEN 271 | Introduction to Digital Systems                  | 3       |
CMPEN 275 | Digital Design Laboratory                        | 1       |
EE 210   | Circuits and Devices                             | 4       |
EE 310   | Electronic Circuit Design I                      | 4       |
EE 317   | Circuits II and Data Acquisition                 | 2       |
EE 352   | Signals and Systems: Continuous and Discrete-Time | 4       |
EE 406W  | Electrical Engineering Capstone Design           | 3       |
ENGL 202C | Effective Writing: Technical Writing             | 3       |
MATH 140 | Calculus With Analytic Geometry I                | 4       |
MATH 141 | Calculus with Analytic Geometry II               | 4       |
PHYS 211 | General Physics: Mechanics                       | 4       |
PHYS 212 | General Physics: Electricity and Magnetism       | 4       |

Additional Courses

Code | Programming for Engineers with C++ or CMPSC 121 Introduction to Programming Techniques | Credits |
-----|-----------------------------------------------------------------------------------------|---------|
CMPS 201 | Programming for Engineers with C++ or CMPSC 121 Introduction to Programming Techniques | 3       |

Select 3 credits from the following: 3
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECON 14</td>
<td>Principles of Economics</td>
</tr>
<tr>
<td>ECON 102</td>
<td>Introductory Microeconomic Analysis and Policy</td>
</tr>
<tr>
<td>ECON 104</td>
<td>Introductory Macroeconomic Analysis and Policy</td>
</tr>
</tbody>
</table>

Select 3-4 credits from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 200</td>
<td>Elementary Statistics (requires a grade of C or better)</td>
</tr>
<tr>
<td>STAT 401</td>
<td>Experimental Methods</td>
</tr>
<tr>
<td>STAT 414</td>
<td>Introduction to Probability Theory</td>
</tr>
<tr>
<td>STAT 418</td>
<td>Introduction to Probability and Stochastic Processes for Engineering</td>
</tr>
</tbody>
</table>

### Supporting Courses and Related Areas

Select 11-12 credits in consultation with an academic adviser and in support of the student's interests:

### General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements ([https://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program/](https://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program/)) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

#### Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)
- Quantification (GQ): 6 credits
- Writing and Speaking (GWS): 9 credits

#### Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)
- Arts (GA): 3 credits
- Health and Wellness (GHW): 3 credits
- Humanities (GH): 3 credits
- Social and Behavioral Sciences (GS): 3 credits
- Natural Sciences (GN): 3 credits

### Integrative Studies
- Inter-Domain Courses (Inter-Domain): 6 credits

### Exploration
- GN, may be completed with Inter-Domain courses: 3 credits
- GA, GH, GN, GS, Inter-Domain courses. This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

### University Degree Requirements

#### First Year Engagement
All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

### Cultures Requirement
6 credits are required and may satisfy other requirements:
- United States Cultures: 3 credits
- International Cultures: 3 credits

### Writing Across the Curriculum
3 credits required from the college of graduation and likely prescribed as part of major requirements.

### Total Minimum Credits
A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

### Quality of Work
Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

### Limitations on Source and Time for Credit Acquisition
The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 [https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80]). For more information, check the Suggested Academic Plan for your intended program.

### Integrated B.S. in Electrical Engineering and M.S. in Electrical Engineering
Requirements for the Integrated B.S. in Electrical Engineering and M.S. in Electrical Engineering can be found in the Graduate Bulletin ([https://bulletins.psu.edu/graduate/programs/majors/electrical-engineering-capital/#integratedundergradgradprogramtext](https://bulletins.psu.edu/graduate/programs/majors/electrical-engineering-capital/#integratedundergradgradprogramtext)).

### Academic Advising
The objectives of the university’s academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee’s unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.
The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an Academic Requirements or What If report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

### Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years’ suggested academic plans, please visit the archive (https://bulletins.psu.edu/undergraduate/archive/) to view the appropriate Undergraduate Bulletin edition.

**Electrical Engineering, B.S. at Harrisburg Campus**

The course series listed below provides only one of the many possible ways to move through this curriculum. The University may change policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an Academic Requirements or What If report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

#### First Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Spring</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 110†**</td>
<td>3</td>
<td>CAS 100A or 100S††</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 111†</td>
<td>1</td>
<td>EDSGN 100 or 100S†</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 15, 15S, 30T, or ESL 15††</td>
<td>3</td>
<td>MATH 141†**</td>
<td>4</td>
</tr>
<tr>
<td>MATH 140†**</td>
<td>4</td>
<td>PHYS 211†**</td>
<td>4</td>
</tr>
<tr>
<td>General Education Course (Inter-Domain)²</td>
<td>3</td>
<td>General Education Course (Inter-Domain)²</td>
<td>3</td>
</tr>
<tr>
<td>General Education Course (GHW)²</td>
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<td></td>
<td></td>
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<tr>
<td>General Education Course (GHW)²</td>
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<tr>
<td><strong>Total Credits</strong></td>
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#### Second Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Spring</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CMPEN 271*</td>
<td>3</td>
<td>CMPSC 121, 131, or 201³</td>
<td>3</td>
</tr>
<tr>
<td>CMPEN 275†</td>
<td>1</td>
<td>ECON 102, 104, or 14††</td>
<td>3</td>
</tr>
<tr>
<td>EMCH 211†</td>
<td>3</td>
<td>ENGL 202C††</td>
<td>3</td>
</tr>
<tr>
<td>MATH 220</td>
<td>2</td>
<td>MATH 250</td>
<td>3</td>
</tr>
<tr>
<td>MATH 230</td>
<td>4</td>
<td>PHYS 213</td>
<td>2</td>
</tr>
<tr>
<td>PHYS 212††</td>
<td>4</td>
<td>PHYS 214</td>
<td>2</td>
</tr>
<tr>
<td>SSET 295 (see footnotes)⁴</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td>17</td>
<td></td>
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#### Third Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Spring</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 210*</td>
<td>4</td>
<td>EE 310*</td>
<td>4</td>
</tr>
<tr>
<td>EE 341††</td>
<td>3</td>
<td>EE 317†</td>
<td>2</td>
</tr>
<tr>
<td>CMPEH 472</td>
<td>4</td>
<td>EE 330†</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td>17</td>
<td></td>
<td>17</td>
</tr>
</tbody>
</table>

#### Fourth Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Spring</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 311</td>
<td>3</td>
<td>EE 406W††</td>
<td>3</td>
</tr>
<tr>
<td>EE 405</td>
<td>1</td>
<td>Technical Elective II</td>
<td>3</td>
</tr>
<tr>
<td>EE 461†</td>
<td>4</td>
<td>Technical Elective III</td>
<td>3</td>
</tr>
<tr>
<td>EE 481</td>
<td>4</td>
<td>Technical Elective IV</td>
<td>2-3</td>
</tr>
<tr>
<td>Technical Elective I</td>
<td>3</td>
<td>ENGR 320Y†</td>
<td>3</td>
</tr>
<tr>
<td>General Education Course (GA)²</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td>18</td>
<td></td>
<td>14-15</td>
</tr>
</tbody>
</table>

### University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

### Career Paths

According to the U.S. Bureau of Labor Statistics, employment of electrical engineers is projected to grow 7 percent from 2016 to 2026, about as fast as the average for all occupations. The rapid pace of technological...
innovation will likely drive demand for electrical and electronics engineers in research and development, an area in which engineering expertise will be needed to design distribution systems related to new technologies. These engineers will play key roles in new developments with solar arrays, semiconductors, and communications technologies.

**Careers**

Graduates of the program have gained positions in a number of specialty areas including digital circuits and VSLI and its fabrication, microprocessors and their applications, electromagnetics, communications, control systems, digital image processing, and computer engineering. Career opportunities for these specialties are available in a multitude of industries including computers, automobile, power, communications, manufacturing, pure and applied research, and biomedical and environmental fields.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE ELECTRICAL ENGINEERING PROGRAM (https://harrisburg.psu.edu/science-engineering-technology/electrical-engineering-bs/career-opportunities/)

**Opportunities for Graduate Studies**

The Bachelor of Science degree in Electrical Engineering is designed to provide a solid background for students who plan to pursue graduate studies, including Penn State's Master of Engineering (https://harrisburg.psu.edu/science-engineering-technology/electrical-engineering-meng/) and Master of Science (https://harrisburg.psu.edu/science-engineering-technology/electrical-engineering-ms/) in Electrical Engineering programs.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (https://harrisburg.psu.edu/science-engineering-technology/)