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 electronics, and metamaterials.

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:

Requirement	Credits
General Education	45
Requirements for the Major	113-115

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	Title	Credits
Prescribed Courses		
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		
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		
CMPSC 201	Programming for Engineers with C++	3
or CMPSC 121	Introduction to Programming Techniques	
Select 3 credits from the following:		3

ECON 14	Principles of Economics	
ECON 102	Introductory Microeconomic Analysis and Policy	
ECON 104	Introductory Macroeconomic Analysis and Policy	
Select 3-4 credits from the following:		3-4
STAT 200	Elementary Statistics (requires a grade of C or better)	
STAT 401	Experimental Methods	
STAT 414	Introduction to Probability Theory	
STAT 418	Introduction to Probability and Stochastic Processes for Engineering	
Supporting Courses and Related Areas		
Select 11-12 credits in consultation with an academic adviser and in support of the student's interests		11-12

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/) 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/#integratedundergradgradprogramstext).

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.

READ SENATE POLICY 32-00: ADVISING POLICY (https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/)

Harrisburg

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Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2023-24 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 (*Note: the archive only contains suggested academic plans beginning with the 2018-19 edition of the Undergraduate Bulletin*).

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 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.

First Year

Fall	Credits	Spring	Credits
CHEM 110*#†	3	CAS 100A or 100S‡[1]	3
CHEM 111†	1	EDSGN 100 or 100S[1]	3
ENGL 15, 15S, 30T, or ESL 15‡[1]	3	MATH 141*#†	4
MATH 140*#†	4	PHYS 211*#†	4
General Education Course (Inter-Domain)[2]	3	General Education Course (Inter-Domain)[2]	3
General Education Course (GHW)[2]	1.5		
General Education Course (GHW)[2]	1.5		
	17		**17**

Second Year

Fall	Credits	Spring	Credits
CMPEN 271*	3	CMPSC 121, 131, or 201[3]	3
CMPEN 275*	1	ECON 102, 104, or 14†	3
EMCH 211	3	ENGL 202C‡†	3
MATH 220	2	MATH 250	3
MATH 230	4	PHYS 213	2
PHYS 212*†	4	PHYS 214	2
		SSET 295 (see footnotes)[4]	1
	17		**17**

Third Year

Fall	Credits	Spring	Credits
EE 210*	4	EE 310*	4
EE 341[5]	3	EE 317*	2
CMPEH 472	4	EE 330[7]	4
STAT 200, 401, 414, or 418[6]	3-4	EE 352*	4
General Education Course (GH)[2]	3	EE 485[7]	3
	17-18		**17**

Fourth Year

Fall	Credits	Spring	Credits
EE 311	3	EE 406W*†	3
EE 405	1	Technical Elective II	3
EE 461[5]	4	Technical Elective III	3
EE 481	4	Technical Elective IV	2-3
Technical Elective I	3	ENGR 320Y†	3
General Education Course (GA)[2]	3		
	18		**14-15**

Total Credits 134-136

* Course requires a grade of C or better for the major
‡ Course requires a grade of C or better for General Education
# Course is an Entrance to Major requirement
† Course satisfies General Education and degree requirement

1. First-year students at Penn State Harrisburg must take 1 to 3 credits of a First-Year Seminar course, as indicated by the "S" designation at the end of the course number. The program recommends students complete this during their first semester with one of the following courses: ENGL 15S, EDSGN 100S, or CAS 100S.
2. One of the General Education courses must satisfy the US or IL requirement (ENGR 320Y satisfies the other). The knowledge domains that must be satisfied are indicated in parentheses, but these courses may be taken in any order.
3. CMPSC 131 recommended.
4. Most students complete their SSET 295 credit during a summer semester while working at a paid internship with an engineering company.
5. EE 341 and EE 461 are only offered during Fall semesters.
6. STAT 200 requires a grade of C or better.
7. EE 330 and EE 485 are only offered during Spring semesters.

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/)

Accreditation

The Bachelor of Science in Electrical Engineering at Penn State Harrisburg is accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org, under the General Criteria and the Electrical and Electronics Engineering Program Criteria.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (https://www.psu.edu/state-licensure-disclosures/) interactive map.

Contact

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