COMPUTER ENGINEERING, B.S. (ENGINEERING)

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Description

The mission of the faculty of the undergraduate computer engineering program at Penn State is to provide students with the knowledge and experience needed to pursue a productive lifelong career in industry or to engage in further study at the graduate level. Students participate in a balanced program of instruction covering the basic principles of the design and application of computer systems. The program includes coverage in breadth and depth of basic science, engineering, and abstract concepts of information handling. Students specialize in and are prepared for careers in the design, analysis and use of hardware, software and systems. The program is structured to ensure that graduates have a clear understanding of the design and the applications of computers, as well as the ability to apply this knowledge throughout their professional careers.

What is Computer Engineering?

Computer engineering is the study of the design, analysis, and implementation of computer systems including processors, memory, embedded devices, and data communication systems for a wide range of application domains. It includes the study of digital systems, computer architecture, and computer networks. It encompasses many design activities spanning from designing individual logic components to designing complete computer systems composed of hardware, software, and hardware-software co-design. Computer engineering drives the development of new computing systems that enable the latest technologies impacting our everyday lives.

You Might Like This Program If...

- You excel in math and physics and have an interest in designing and constructing computer hardware
- You want to build and analyze physical computing devices that go beyond traditional computers
- You want to understand how current computer hardware and software work and how to design the next generation hardware and its supporting software
- You want to design computing systems that impact and improve everyday lives

Entrance to Major

This program currently has administrative enrollment controls. Administrative Enrollment Controls are initiated when limitations of space, faculty, or other resources in a major prevent accommodating all students who request them. Students must follow the administrative enrollment controls that are in effect for the semester that they enter the university.

First-Year Students Entering Summer 2025, Fall 2025, Spring 2026

In order to be eligible for entrance to this major, students must satisfy the following requirements:

- be enrolled in the College of Engineering or the Division of Undergraduate Studies
- 29-55 graded Penn State credits (excludes transfer and AP credits)
- completed with a grade of C or better: CMPSC 121 or CMPSC 131, CHEM 110, MATH 140, MATH 141, PHYS 211
- earned a minimum cumulative grade-point average (GPA) of 3.20

Students Who Entered Prior to Summer 2025

Students who entered the University from Summer 2018 through Spring 2025 should view the administrative enrollment controls in the appropriate Undergraduate Bulletin archive (https://bulletins.psu.edu/undergraduate/archive/). Students who entered the University prior to the summer 2018 semester should consult with their academic adviser about the administrative enrollment controls in effect for the semester they entered the university.

Degree Requirements

For the Bachelor of Science degree in Computer Engineering, a minimum of 128 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	110

27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS 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/students/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/).

Code	Title	Credits
Prescribed Courses		
CMPEN 362	Communication Networks	3
CMPEN 482W	Computer Engineering Project Design	3
CMPSC 473	Operating Systems Design & Construction	3
MATH 220	Matrices	2-3
MATH 231	Calculus of Several Variables	2
PHYS 214	General Physics: Wave Motion and Quantum Physics	2
STAT/MATH 418	Introduction to Probability and Stochastic Processes for Engineering	3
Prescribed Courses: Require a grade of C or better		
CHEM 110	Chemical Principles I	3
CMPEN 331	Computer Organization And Design	3
CMPEN 431	Introduction to Computer Architecture	3
CMPSC 221	Object Oriented Programming with Web-Based Applications	3
CMPSC 311	Introduction to Systems Programming	3
CMPSC 360	Discrete Mathematics for Computer Science	3
CMPSC 465	Data Structures and Algorithms	3
EE 210	Circuits and Devices	4
EE 310	Electronic Circuit Design I	4

EE 353	Signals and Systems: Continuous and Discrete-Time	3
ENGL 202C	Effective Writing: Technical Writing	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
MATH 250	Ordinary Differential Equations	3
PHYS 211	General Physics: Mechanics	4
PHYS 212	General Physics: Electricity and Magnetism	4
Additional Courses		
Select 1 credit of First-Year Seminar		1
Select 3 credits of the following:		3
ECON 14	Principles of Economics	
ECON 102	Introductory Microeconomic Analysis and Policy	
ECON 104	Introductory Macroeconomic Analysis and Policy	
Select 6 credits from the following:		6
CMPEN 411	VLSI Digital Circuits	
CMPEN 416	Digital Integrated Circuits	
CMPEN 417	Digital Design Using Field Programmable Devices	
CMPEN 454	Fundamentals of Computer Vision	
CMPEN 455	An Introduction to Digital Image Processing	
CMPEN 471		
CMPEN 472	Microprocessors and Embedded Systems	
CMPEN 473	Microcomputer Laboratory	
CMPEN 475	Functional Verification	
EE 453	Fundamentals of Digital Signal Processing	
EE 456	Introduction to Neural Networks	
Select 6 credits from any 400-level CMPEN or CMPSC course		6
Additional Courses: Require a grade of C or better		
CAS 100A	Effective Speech	3
or CAS 100B	Effective Speech	
CMPSC 121	Introduction to Programming Techniques	3
or CMPSC 131	Programming and Computation I: Fundamentals	
CMPSC 122	Intermediate Programming [1]	3
or CMPSC 132	Programming and Computation II: Data Structures	
ENGL 15	Rhetoric and Composition	3
or ENGL 30H	Honors Rhetoric and Composition	
Select 4 credits from the following:		4
CMPEN 270	Digital Design: Theory and Practice	
CMPEN 271 & CMPEN 275	Introduction to Digital Systems and Digital Design Laboratory [2]	
Supporting Courses and Related Areas		
Select 6 credits from department list [3]		6

1 CMPSC 122 does not require a grade of C or better.
2 CMPEN 275 does not require a grade of C or better.
3 Students may apply up to 3 credits of Co-op. Students who complete ROTC may apply up to 3 credits of ROTC as department list credits and 3 credits of ROTC as GHW credits.

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/students/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/)). For more information, check the Suggested Academic Plan for your intended program.

Integrated B.S. in Computer Engineering and M.I.A. in International Affairs

Undergraduate degree available at the following campuses: University Park

Graduate degree available at the following campuses: University Park

Requirements for the Integrated B.S. in Computer Engineering and M.I.A. in International Affairs can be found in the Graduate Bulletin (https://bulletins.psu.edu/graduate/programs/majors/international-affairs/#integratedundergradgradprogramstext).

Program Educational Objectives

In particular, within a few years after graduation, graduates in computer engineering should be able to:

1. Work in industry or government producing or evaluating components of computer hardware and/or software systems.
2. Work in teams to design, implement, and/or maintain components of computer hardware and/or software systems.
3. Stay current through professional conferences, certificate programs, post-baccalaureate degree programs, or other professional educational activities.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Computer Engineering program is designed to enable students to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. 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. Communicate effectively with a range of audiences
4. 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. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

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/students/policies-and-rules-for-undergraduate-students/32-00-advising-policy/)

University Park

CSE Advising
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cseadvising@engr.psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2025-26 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.

Computer Engineering, B.S. at University Park 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.

If you are starting at a campus other than the one this plan is ending at, please refer to: https://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx

First Year

Fall	Credits	Spring	Credits
MATH 140 (GQ)[*‡#†]	4	CMPSC 121 or 131 (GQ)[*#]	3
PHYS 211 (GN, PHYSICS 211L & PHYSICS 211R)[*‡#†]	4	MATH 141 (GQ)[*‡#†]	4
CHEM 110 (GN)[*#†]	3	PHYS 212 (GN, PHYSICS 212L & PHYSICS 212R)[*†]	4
General Education Course	3	ENGL 15 (GWS)[*‡]	3
First Year Seminar	1	General Education Course	3
	15		**17**

Second Year

Fall	Credits	Spring	Credits
CMPEN 270*[1]	4	CMPEN 331*	3
CMPSC 122 or 132*	3	CMPSC 221*	3
MATH 250*	3	EE 210*	4
MATH 220	2-3	MATH 231	2
PHYS 214	2	ECON 102 or 104 (GS)†	3
General Education Course	3		
	17-18		**15**

Third Year

Fall	Credits	Spring	Credits
CMPEN 431*	3	CMPEN 362	3
CMPSC 311*	3	CMPSC 465*	3
EE 310*	4	CMPSC 473	3
STAT 418	3	EE 353*[2]	3
CMPSC 360*	3	ENGL 202C (GWS)*‡†	3
	16		**15**

Fourth Year

Fall	Credits	Spring	Credits
CMPEN 482W (Capstone Design)	3	CMPEN Elective[4]	3
CMPEN Elective[4]	3	CMPSC/CMPEN Elective[3]	3
CAS 100A or 100B*‡†	3	CMPSC/CMPEN Elective[3]	3
Department List (General Elective)	3	Department List (General Elective)	3
General Education Course	3	General Education Course	3
General Education Course (GHW)	1.5	General Education Course (GHW)	1.5
	16.5		**16.5**

Total Credits 128-129

* 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 This course is the equivalent of the combination of CMPEN 271 and CMPEN 275.
2 EE 353 is only offered in the spring semester.
3 Select from any 400-489 CMPSC or CMPEN course that does not duplicate material already taken or required. No CMPSC/CMPEN 494H or CMPSC/CMPEN 496 may be substituted. CMPSC/CMPEN 497 must be petitioned prior to taking the course.
4 Select from department list. Restrictions may apply. Computer Engineering Electives are NOT offered every semester or even every year. Contact the department for information on which classes are scheduled to be offered during a given semester.

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.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

Career Paths

Computer engineering graduates understand all aspects of computing hardware, are well-studied in the use of modern tools used to design and analyze hardware, are able to think at multiple levels of abstraction when working with system-level design, and have a solid foundation in software development. This background prepares graduates for a wide range of exciting careers in the technology industry and almost all other industry sectors as computer/hardware/embedded system designers. It also prepares them for pursuing academic careers. Computer engineers apply their skills and knowledge to solve challenging problems related to computer hardware. They work collaboratively in teams to design and build complex systems with many integrated parts. They research, study, and develop the new technologies that drive the advances in computing that impact our everyday lives.

Careers

Computer engineering graduates typically find positions as computer/hardware/embedded system designers in major technology companies like IBM, Intel, Cisco, and Qualcomm. Graduates are also highly recruited by major companies in areas such as aerospace, communication, transportation, and defense. Most graduates will find themselves a part of a team of engineers and after a few years possibly leading a design team. With the rapid changes and advances in the field of computing, graduates must continually keep up with the latest technology as their careers adapt and evolve to meet the new opportunities and challenges of computing.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE COMPUTER ENGINEERING PROGRAM (https://career.engr.psu.edu)

Opportunities for Graduate Studies

Graduates of this program can pursue graduate studies in computer engineering, computer science, and related disciplines, concentrating in specialized areas such as multicore architectures, low-power architectures, application-specific hardware architectures, and computer networking. A master's degree allows one to specialize beyond the broad foundations offered by a bachelor's degree. A doctoral degree prepares one for a career in research and academia.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (https://www.eecs.psu.edu/students/graduate/EECS-Graduate-Prospective.aspx)

Professional Resources

- ACM (https://acm.psu.edu)
- Association of Women in Computing (https://awc.cse.psu.edu)
- IEEE (https://sites.psu.edu/psuieee/)

Accreditation

The Bachelor of Science in Computer Engineering at University Park is accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org, under the commission's General Criteria and Program Criteria for Electrical, Computer, Communications, Telecommunication(s), and Similarly Named Engineering Programs the Computer 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://opair.psu.edu/plc/dashboard/) interactive map.

Contact

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