COMPUTER SCIENCE, B.S. (ENGINEERING)

Begin Campus: Any Penn State Campus

End Campus: Beaver, Brandywine, Hazleton, University Park

Program Description

Computer Science is the study of computation, including its principles and foundations, its efficient implementation, its analysis, and its practical use in a wide range of different application areas. Computer Science is far more than just programming and no other science or engineering discipline has had a greater impact in such diverse areas as commerce, communication, entertainment, finance, medicine, the social sciences, the physical sciences and the life sciences. Computer Science impacts our daily lives in a multitude of ways and computer scientists are instrumental in driving these changes. Computer Science transforms the way we look at and live in our world.

The mission of our undergraduate program is to prepare our students fora wide range of careers as computer scientists, software engineers, software developers, and related positions in the field of computing. Our curriculum covers fundamental programming techniques and skills, broad knowledge of computer hardware, operating systems, programming languages, the mathematical foundations of computing, and advanced topics in software design and application development. Recurrent themes in the program include security, algorithmic complexity, cooperating systems, performance evaluation, and software correctness. This curriculum provides students with the skills needed to design, develop, evaluate, and analyze software solutions to a wide spectrum of computational problems and prepares them to be leaders in the rapidly changing field of computing throughout their careers.

What is Computer Science?

Computer science is the study of computational methods, including their principles and foundations, their efficient implementation, their analyses, and their practical application in wide-ranging areas. It includes the foundations of software development, computational problem solving, the principles of system software, and the fundamental principles and limits of computing. It is much more than just programming. It includes the mathematical foundations that support analyzing, evaluating, and proving the correctness of computational solutions. It includes specializations such as artificial intelligence, machine learning, cybersecurity, data mining, high-performance computing, computer networks, computer graphics, computer vision, quantum computing, and others. It is continually evolving with the development of new and faster forms of computation and with the identification of new problems that require computational solutions.

You Might Like This Program If...

- You are interested in creating solutions to challenging problems involving computers
- You want to understand how to build and analyze complex software solutions
- You want to understand how computer hardware and software work and how to make them better
- You want to design software that impacts and improves people's everyday lives

Entrance to Major

University Park (CMPSC_BS)

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 2023, Fall 2023, Spring 2024

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, CMPSC 122 or CMPSC 132, MATH 140, MATH 141, PHYS 211
- earned a minimum cumulative grade-point average (GPA) of 3.20

Students Who Entered Prior to Summer 2023

Students who entered the University from Summer 2018 through Spring 2023 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.

Beaver, Brandywine, Hazleton (CSENG_BS)

In order to be eligible for entrance to this major, students must satisfy the following requirements by the end of the semester during which the admission to major process is carried out:

- 29-55 cumulative credits (excludes transfer and AP credits)
- completed with a grade of C or better: CMPSC 121 or CMPSC 131, CMPSC 122 or CMPSC 132, MATH 140, MATH 141, and PHYS 211
- earned a minimum cumulative grade-point average (GPA) of 2.60

* In the event that the major is under enrollment control, a higher minimum cumulative grade-point average is likely to be needed and students must be enrolled in the College of Engineering or Division of Undergraduate Studies at the time of confirming their major choice.

Degree Requirements

For the Bachelor of Science degree in Computer Science, a minimum of 127 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	106-108

24 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; 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/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44).

Code	Title	Credits
Prescribed Courses		
CMPSC 464	Introduction to the Theory of Computation	3
MATH 220	Matrices	2-3
MATH 230	Calculus and Vector Analysis	4
Prescribed Courses: Require a grade of C or better		
CMPEN 331	Computer Organization And Design	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 461	Programming Language Concepts	3
CMPSC 465	Data Structures and Algorithms	3
CMPSC 473	Operating Systems Design & Construction	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		
Select 1 credit of First-Year Seminar		1
Select one of the following:		3
STAT/MATH 318	Elementary Probability	
STAT/MATH 414	Introduction to Probability Theory	
STAT/MATH 418	Introduction to Probability and Stochastic Processes for Engineering	
Select 6 credits from the following:		6
CMPEN 362	Communication Networks	
CMPEN 431	Introduction to Computer Architecture	
CMPEN 454	Fundamentals of Computer Vision	
CMPSC 442	Artificial Intelligence	
CMPSC 443	Introduction to Computer and Network Security	
CMPSC 444	Secure Programming	
CMPSC 450	Concurrent Scientific Programming	
CMPSC 451	Numerical Computations	
CMPSC 455	Introduction to Numerical Analysis I	
CMPSC 456	Introduction to Numerical Analysis II	
CMPSC 458	Fundamentals of Computer Graphics	
CMPSC 467	Factorization and Primality Testing	
CMPSC 471	Introduction to Compiler Construction	
CMPSC 475	Applications Programming	
EE 456	Introduction to Neural Networks	
Select 3 credits from any CMPEN or CMPSC course numbered 400-489		3
CMPSC 431W	Database Management Systems	3
or CMPSC 483W	Software Design Methods	
STAT/MATH 319	Elementary Mathematical Statistics	3
or STAT/MATH 415	Introduction to Mathematical Statistics	
Additional Courses: Require a grade of C or better:		
CMPSC 121	Introduction to Programming Techniques	3
or CMPSC 131	Programming and Computation I: Fundamentals	
CMPSC 122	Intermediate Programming	3
or CMPSC 132	Programming and Computation II: Data Structures	
CMPEN 270	Digital Design: Theory and Practice	4
or CMPEN 271 & CMPEN 275	Introduction to Digital Systems and Digital Design Laboratory	
ENGL 15	Rhetoric and Composition	3
or ENGL 137H	Rhetoric and Civic Life I	
ENGL 138T	Rhetoric and Civic Life II	3
or CAS 100A	Effective Speech	
or CAS 100B	Effective Speech	
Supporting Courses and Related Areas		
Select 2-3 credits from the following:		2-3
PHYS 213	General Physics: Fluids and Thermal Physics	
PHYS 214	General Physics: Wave Motion and Quantum Physics	
3 credits from the approved list of natural sciences courses		
Select 0-4 credits in a foreign language (second-semester proficiency)		0-4
Select 10-14 credits from department list. Students may apply up to 3 credits of ROTC as department list credits and 3 credits of ROTC as GHW credits.		10-14
Select 6 credits in non-CMPEN or CMPSC courses numbered 400-489 in consultation with adviser		6

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 Computer Science and M.I.A. in International Affairs

Requirements for the Integrated B.S. in Computer Science 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

Graduates of our Computer Science degree will be prepared with technical knowledge and professional skills for the practice and future development in their profession along different career paths. We expect them to engage in continuous learning activities, to continue to communicate effectively and work collaboratively with internal and external stakeholders in multidisciplinary and multicultural work environments, and to maintain a strong commitment to ethical practices in their profession. Due to their experience in our program, within few years of their graduation we expect our graduates to have the following career and professional accomplishments:

1. Those employed in industry and focused on technical accomplishments will demonstrate professional advancement by their promotion or other recognition of their technical skills.
2. Those who pursue additional formal education related to their technical skills, either directly or soon after graduation, will have completed or be near completion of a graduate degree or other technical certification.
3. Those who pursue career paths or formal education unrelated or tangential to their degree program will have applied their broad educational skills, including analytical problem solving, communication and independent learning, towards a new discipline.
4. Those employed by government or industry and focused on leadership will demonstrate professional advancement through expanded leadership responsibility based on their acquired technical knowledge and experience.
5. Those employed by government or industry and focused on management will demonstrate professional advancement through expanded management responsibilities based on their acquired management training and experience.

Student Outcomes

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

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

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/)

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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*).

Computer Science, 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
CMPSC 121 or 131*‡#	3	CMPSC 122 or 132*#	3
MATH 140 (GQ)*‡#†	4	MATH 141 (GQ)*‡#†	4
ENGL 15 (GWS)‡	3	PHYS 211 (GN, PHYSICS 211L & PHYSICS 211R)*#†	4
General Education Course	3	General Education Course	3
General Education Course	3	First Year Seminar	1
	16		**15**

Second Year

Fall	Credits	Spring	Credits
CMPSC 221*	3	CMPSC 360*	3
MATH 230	4	CMPEN 270*	4
MATH 220	2-3	CMPSC 311*	3
PHYS 212 (GN, PHYSICS 212L & PHYSICS 212R)*†	4	Natural Science Elective (GN, See College Note below for options that DO NOT count)	2-3
CAS 100A or 100B (GWS)‡†	3	General Education Course	3
	16-17		**15-16**

Third Year

Fall	Credits	Spring	Credits
CMPSC 465*	3	CMPSC 464	3
CMPEN 331*	3	CMPSC 473*	3
STAT 318	3	STAT 319	3
CMPSC 461*	3	ENGL 202C (GWS)‡†	3
Foreign Language	4	General Education Course	3
	16		**15**

Fourth Year

Fall	Credits	Spring	Credits
CMPSC 483W or 431W	3	CMPSC/CMPEN 400-level[2]	3
CMPSC Elective[1]	3	CMPSC Elective[1]	3
Supporting Course	3	Supporting Course	3
Department List (General Elective)	3	General Education Course	3
Department List (General Elective)	4	Department List (General Elective)	3
General Education Course (GHW)	1.5	General Education Course (GHW)	1.5
	17.5		**16.5**

Total Credits 127-129

* 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] Select from department list. Restrictions may apply. Computer Science 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.

[2] Select 3 credits 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.

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.

College Notes:

- **NATURAL SCIENCES ELECTIVE:** Choose any GN-designated course EXCEPT the following: ASTRO 1, 7N, 10, 11, 120, or 140; all below CHEM 110 (except 3 credits of CHEM 106); all below PHYS 211; PHYS 250 or 251; all BI SC; and GEOSC 20.
- **CMPSC/CMPEN 4XX:** Select any 400-489 CMPSC or CMPEN course offered at University Park.
- **Computer Science Elective:** Select from department list. Restrictions may apply. Computer Science 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.
- **Department List Elective:** Select from department list. Restrictions may apply. Students who complete the ROTC Program may substitute 3 ROTC credits for a Department List Elective. Students who complete the Cooperative Education Program may substitute 3 co-op credits for a Department List Elective.
- **Health and Wellness:** Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Department List Elective.
- **Supporting Course:** Select from department list. Restrictions may apply.

Computer Science, B.S. at Beaver 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
CMPSC 121 or 131*‡#	3	CMPSC 122 or 132*#	3
MATH 140*‡#†	4	MATH 141*‡#†	4
ENGL 15 (GWS)‡†	3	PHYS 211 (GN, PHYSICS 211L & PHYSICS 211R)*#†	4
General Education Course	3	General Education Course	3
First-Year Seminar	1	General Education Course	3
	14		**17**

Second Year

Fall	Credits	Spring	Credits
CMPSC 221*	3	CMPSC 360*	3
MATH 230	4	CMPEN 270*	4
MATH 220	3	CMPSC 311*	3
PHYS 212 (GN, PHYSICS 212L & PHYSICS 212R)*†	4	Natural Science Elective (GN, See College Note below for options that DO NOT count)	3
CAS 100A (GWS)‡†	3	General Education Course	3
	17		**16**

Third Year

Fall	Credits	Spring	Credits
CMPSC 465*	3	CMPSC 464	3
CMPEN 331*	3	CMPSC 473*	3
STAT 318	3	STAT 319	3
CMPSC 461*	3	ENGL 202C (GWS)‡†	3
Foreign Language	4	General Education Course	3
	16		**15**

Fourth Year

Fall	Credits	Spring	Credits
CMPSC 483W or 431W	3	CMPSC Elective[2]	3
CMPSC Elective[1]	3	CMPSC Elective[1]	3
Supporting Course	3	Supporting Course	3
Department List (General Elective)	3	Department List (General Elective)	3
Department List (General Elective)	4	General Education Course (GHW)	1.5
General Education Course (GHW)	1.5	General Education Course	3
	17.5		**16.5**

Total Credits 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] Select from department list. Restrictions may apply. Computer Science 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.

[2] Select 3 credits 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.

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.

Program Notes:

- **NATURAL SCIENCES ELECTIVE**: Choose any GN-designated course EXCEPT the following: ASTRO 1, 7N, 10, 11, 120, or 140; all below CHEM 110 (except 3 credits of CHEM 106); all below PHYS 211; PHYS 250 or 251; all BI SC; and GEOSC 20.
- **CMPSC/CMPEN 4XX**: Select any 400-489 CMPSC or CMPEN course offered at University Park.
- **Computer Science Elective**: Select from department list. Restrictions may apply. Computer Science 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.
- **Department List Elective**: Select from department list. Restrictions may apply. Students who complete the ROTC Program may substitute 3 ROTC credits for a Department List Elective. Students who complete the Cooperative Education Program may substitute 3 co-op credits for a Department List Elective.
- **Health and Wellness**: Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Department List Elective.
- **Supporting Course**: Select from department list. Restrictions may apply.

Computer Science, B.S. at Brandywine 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
CMPSC 121 or 131*‡#	3	CMPSC 122 or 132*#	3
MATH 140 (GQ)*‡#†	4	MATH 141 (GQ)*‡#†	4
ENGL 15 (GWS)‡	3	PHYS 211 (GN, PHYSICS 211L & PHYSICS 211R)*#†	4
General Education Course	3	General Education Course	3
General Education Course	3	First Year Seminar	1
	16		**15**

Second Year

Fall	Credits	Spring	Credits
CMPSC 221*	3	CMPSC 360*	3
MATH 230	4	CMPEN 270*	4
MATH 220	2-3	CMPSC 311*	3
PHYS 212 (GN, PHYSICS 212L & PHYSICS 212R)*†	4	Natural Science Elective (GN, See College Note below for options that DO NOT count)	2-3
CAS 100A or 100B (GWS)‡†	3	General Education Course	3
	16-17		**15-16**

Third Year

Fall	Credits	Spring	Credits
CMPSC 465*	3	CMPSC 464	3
CMPEN 331*	3	CMPSC 473*	3
STAT 318	3	STAT 319	3
CMPSC 461*	3	ENGL 202C (GWS)‡†	3
Foreign Language	4	General Education Course	3
	16		**15**

Fourth Year

Fall	Credits	Spring	Credits
CMPSC 483W or 431W	3	CMPSC/CMPEN 400-level[2]	3
CMPSC Elective[1]	3	CMPSC Elective[1]	3
Supporting Course	3	Supporting Course	3
Department List (General Elective)	3	General Education Course	3
Department List (General Elective)	4	Department List (General Elective)	3
General Education Course (GHW)	1.5	General Education Course (GHW)	1.5
	17.5		**16.5**

Total Credits 127-129

* 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] Select from department list. Restrictions may apply. Computer Science 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.

[2] Select 3 credits 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.

University Requirements and General Education Notes:

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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.

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College Notes:

- **NATURAL SCIENCES ELECTIVE:** Choose any GN-designated course EXCEPT the following: ASTRO 1, 7N, 10, 11, 120, or 140; all below CHEM 110 (except 3 credits of CHEM 106); all below PHYS 211; PHYS 250 or 251; all BI SC; and GEOSC 20.
- **CMPSC/CMPEN 4XX:** Select any 400-489 CMPSC or CMPEN course offered at University Park.
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- **Department List Elective:** Select from department list. Restrictions may apply. Students who complete the ROTC Program may substitute 3 ROTC credits for a Department List Elective. Students who complete the Cooperative Education Program may substitute 3 co-op credits for a Department List Elective.
- **Health and Wellness:** Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Department List Elective.
- **Supporting Course:** Select from department list. Restrictions may apply.

Computer Science, B.S. at Hazleton 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
ENGL 15 or 30H[‡†]	3	CAS 100[‡†]	3
CMPSC 131[*#]	3	MATH 141[*#†]	4
MATH 140[*#†]	4	PHYS 211[*#†]	4
PSU 8[†]	1	General Education Course[†]	3
General Education Course[†]	3	General Education Course[†]	3
General Education Course (GN)[†]	3		
	17		**17**

Second Year

Fall	Credits	Spring	Credits
CMPSC 132[*#]	3	CMPSC 221[*]	3
CMPEN 271[*]	3	CMPEN 275[*]	1
MATH 220	3	CMPSC 360[*]	3
PHYS 212[*†]	4	MATH 230	4
Foreign Language	4	ENGL 202C[‡†]	3
		General Education Course (GHW)[†]	1.5
	17		**15.5**

Third Year

Fall	Credits	Spring	Credits
CMPEN 331[*]	3	CMPSC 473[*]	3
CMPSC 465[*]	3	CMPSC Elective	3
Supporting Course	3	Department List Elective	3
CMPSC 311[*]	3	General Education Course[†]	3
General Education Course (GHW)[†]	1.5	General Education Course[†]	3
Department List Elective	3		
	16.5		**15**

Fourth Year

Fall	Credits	Spring	Credits
CMPSC 431W or 483W	3	CMPSC 461[*]	3
CMPSC 464	3	CMPEN/CMPSC 4XX	3
STAT 318	3	CMPSC Elective	3
Department List Elective	4	STAT 319	3
General Education Course[†]	3	Supporting Course	3
	16		**15**

Total Credits 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

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.

Program Notes:

- **NATURAL SCIENCES ELECTIVE:** Choose any GN-designated course EXCEPT the following- ASTRO 1, 7N, 10, 11, 120, or 140; all below CHEM 110 (except 3 credits of CHEM 106); all below PHYS 211; PHYS 250 or 251; all BI SC; and GEOSC 20.
- **CMPSC/CMPEN 4XX:** Select any 400-489 CMPSC or CMPEN course.
- **Computer Science Elective:** Select from department list. Restrictions may apply. Computer Science 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.
- **Department List Elective:** Select from department list. Restrictions may apply. Students who complete the ROTC Program may substitute 3 ROTC credits for a Department List Elective. Students who complete the Cooperative Education Program may substitute 3 co-op credits for a Department List Elective.
- **Health and Wellness:** Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Department List Elective.
- **Supporting Course:** Select from department list. Restrictions may apply.

Career Paths

Computer science has had major impacts in such diverse areas as commerce, communication, engineering, entertainment, finance, health sciences, social sciences, physical sciences, and life sciences. Computer scientists do far more than just construct software. They apply their skills and knowledge to solve challenging problems using sound computational methods. They work collaboratively in teams to build complex systems with many integrated parts. They research, study, and develop new technologies, new applications of computing, and new ways to compute.

Careers

Computer science graduates typically find positions as software engineers and software developers in major companies like Google, Apple, Microsoft, IBM, Facebook, and Intel. Graduates are also highly

recruited by major companies in the areas of finance, health care, aerospace, and defense. Most graduates will find themselves a part of a team of software developers and after a few years possibly leading a software 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 SCIENCE PROGRAM (https://career.engr.psu.edu)

Opportunities for Graduate Studies

Graduates of this program can pursue graduate studies in computer science and related disciplines, concentrating in specialized areas such as computer security, artificial intelligence, machine learning, data sciences, computer networks, computer vision, bioinformatics, and high-performance computing. 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 Science at University Park, Penn State Beaver, Penn State Brandywine, and Penn State Hazleton is accredited by the Computing Accreditation Commission of ABET, https://www.abet.org, under the General Criteria and the Computer Science Program Criteria.

Contact

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https://www.brandywine.psu.edu/academics/bachelors-degrees/computer-science (https://www.brandywine.psu.edu/academics/bachelors-degrees/computer-science/)

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