COMPUTER SCIENCE, B.S. (CAPITAL)

Begin Campus: Any Penn State Campus

End Campus: Harrisburg

Degree Requirements

For the Bachelor of Science degree in Computer Science, a minimum of 120 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	88

13 of the 45 credits for General Education are included in Requirements for the Major. This includes: 3 credits of GWS courses, 6 credits of GQ courses, and 4 credits of GN courses.

First-Year Seminar: Incoming first-year students are required to complete a course with the suffix S, T, or X, or the PSU abbreviation.

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).

Common Requirements for the Major (All Options)

Code	Title	Credits
Prescribed Courses		
CMPSC 312	Computer Organization and Architecture [1]	3
CMPSC 430	Database Design [1]	3
CMPSC 460	Principles of Programming Languages [1]	3
CMPSC 462	Data Structures [1]	3
CMPSC 463	Design and Analysis of Algorithms [1]	3
CMPSC 469	Formal Languages with Applications [1]	3
CMPSC 472	Operating System Concepts [1]	3
CMPSC 487W	Software Engineering and Design [1]	3
CMPSC 488	Computer Science Project [1]	3
MATH 220	Matrices	2
PHYS 211	General Physics: Mechanics	4
Prescribed Courses: Require a grade of C or better		
CMPSC 330	Advanced Programming in C++	3
CMPSC 360	Discrete Mathematics for Computer Science [1]	3
ENGL 202C	Effective Writing: Technical Writing	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
Additional Courses		
STAT/MATH 318	Elementary Probability	3
or STAT/MATH 414	Introduction to Probability Theory	
Requirements for the Option		
Select an option		35

[1] Students must earn a 2.5 or higher grade point average in the following courses:

- For the General Option: CMPSC 221, CMPSC 312, CMPSC 360, CMPSC 430, CMPSC 460, CMPSC 462, CMPSC 463, CMPSC 469, CMPSC 470, CMPSC 472, CMPSC 487W, and CMPSC 488
- For the Data Science Option: DS 220, CMPSC 312, CMPSC 360, CMPSC 430, CMPSC 445, CMPSC 446, CMPSC 460, CMPSC 462, CMPSC 463, CMPSC 469, CMPSC 472, CMPSC 487W, and CMPSC 488

Requirements for the Option

Data Science Option (35 credits)

Available at the following campuses: Abington, Harrisburg

Code	Title	Credits
Prescribed Courses		
CMPSC 441	Artificial Intelligence	3
CMPSC 445	Applied Machine Learning in Data Science [1]	3
CMPSC 446	Data Mining [1]	3
DS 220	Data Management for Data Sciences [1]	3
STAT 401	Experimental Methods	3
STAT 462	Applied Regression Analysis	3
Prescribed Courses: Require a grade of C or better		
CMPSC 131	Programming and Computation I: Fundamentals	3
CMPSC 132	Programming and Computation II: Data Structures	3
Additional Courses		
Select at least 6 credits from the following:		6
CMPSC 313	Assembly Language Programming	
CMPSC 412	Data Structures Lab	
CMPSC 413	Algorithms Lab	
CMPSC 414	Contest Programming	
CMPSC 421	Net-centric Computing	
CMPSC 438	Computer Network Architecture and Programming	
CMPSC 444	Secure Programming	
CMPSC/MATH 455	Introduction to Numerical Analysis I	
CMPSC 457	Computer Graphics Algorithms	
CMPSC 470	Compiler Construction	
CMPSC 475	Applications Programming	
CMPSC 496	Independent Studies	
CMPSC 497	Special Topics	
MATH 401	Introduction to Analysis I	
MATH 410	Complex Analysis for Mathematics and Engineering	
MATH 411	Ordinary Differential Equations	
MATH 412	Fourier Series and Partial Differential Equations	
MATH 425	Introduction to Operations Research	
MATH 430	Linear Algebra and Discrete Models I	
MATH 435	Basic Abstract Algebra	
MATH 448	Mathematics of Finance	
MATH 465	Number Theory	
MATH 468	Mathematical Coding Theory	
MATH 485	Graph Theory	

MATH 496	Independent Studies	
MATH 497	Special Topics	
STAT/MATH 415	Introduction to Mathematical Statistics	
STAT 463	Applied Time Series Analysis	
Supporting Courses and Related Areas		
Select 5 credits of unrestricted electives at 100-400 level		5

[1] Students must earn a 2.5 or higher grade point average in the following courses:

- For the General Option: CMPSC 221, CMPSC 312, CMPSC 360, CMPSC 430, CMPSC 460, CMPSC 462, CMPSC 463, CMPSC 469, CMPSC 470, CMPSC 472, CMPSC 487W, and CMPSC 488
- For the Data Science Option: DS 220, CMPSC 312, CMPSC 360, CMPSC 430, CMPSC 445, CMPSC 446, CMPSC 460, CMPSC 462, CMPSC 463, CMPSC 469, CMPSC 472, CMPSC 487W, and CMPSC 488

General Option (35 credits)
Available at the following campuses: Abington, Harrisburg

Code	Title	Credits
Prescribed Courses		
CMPSC 221	Object Oriented Programming with Web-Based Applications [1]	3
CMPSC 470	Compiler Construction [1]	3
Additional Courses		
Select 9 credits from the following:		9
CMPSC 313	Assembly Language Programming	
CMPSC 412	Data Structures Lab	
CMPSC 413	Algorithms Lab	
CMPSC 414	Contest Programming	
CMPSC 421	Net-centric Computing	
CMPSC 438	Computer Network Architecture and Programming	
CMPSC 441	Artificial Intelligence	
CMPSC 444	Secure Programming	
CMPSC 445	Applied Machine Learning in Data Science	
CMPSC 446	Data Mining	
CMPSC/MATH 455	Introduction to Numerical Analysis I	
CMPSC 457	Computer Graphics Algorithms	
CMPSC 475	Applications Programming	
CMPSC 496	Independent Studies	
CMPSC 497	Special Topics	
MATH 425	Introduction to Operations Research	
MATH 485	Graph Theory	
Select 6 credits from the following:		6
CMPSC 313	Assembly Language Programming	
CMPSC 412	Data Structures Lab	
CMPSC 413	Algorithms Lab	
CMPSC 414	Contest Programming	
CMPSC 421	Net-centric Computing	
CMPSC 438	Computer Network Architecture and Programming	
CMPSC 441	Artificial Intelligence	
CMPSC 444	Secure Programming	
CMPSC 445	Applied Machine Learning in Data Science	
CMPSC 446	Data Mining	
CMPSC/MATH 455	Introduction to Numerical Analysis I	
CMPSC 457	Computer Graphics Algorithms	
CMPSC 475	Applications Programming	
CMPSC 496	Independent Studies	
CMPSC 497	Special Topics	
MATH 401	Introduction to Analysis I	
MATH 410	Complex Analysis for Mathematics and Engineering	
MATH 411	Ordinary Differential Equations	
MATH 412	Fourier Series and Partial Differential Equations	
MATH 425	Introduction to Operations Research	
MATH 430	Linear Algebra and Discrete Models I	
MATH 435	Basic Abstract Algebra	
MATH 448	Mathematics of Finance	
MATH 465	Number Theory	
MATH 468	Mathematical Coding Theory	
MATH 485	Graph Theory	
MATH 496	Independent Studies	
MATH 497	Special Topics	
STAT 401	Experimental Methods	
STAT/MATH 415	Introduction to Mathematical Statistics	
STAT 462	Applied Regression Analysis	
STAT 463	Applied Time Series Analysis	
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	
Supporting Courses and Related Areas		
Select 3 credits of unrestricted electives at 300-400 level		3
Select 5 credits of unrestricted electives at 100-400 level		5

[1] Students must earn a 2.5 or higher grade point average in the following courses:

- For the General Option: CMPSC 221, CMPSC 312, CMPSC 360, CMPSC 430, CMPSC 460, CMPSC 462, CMPSC 463, CMPSC 469, CMPSC 470, CMPSC 472, CMPSC 487W, and CMPSC 488
- For the Data Science Option: DS 220, CMPSC 312, CMPSC 360, CMPSC 430, CMPSC 445, CMPSC 446, CMPSC 460, CMPSC 462, CMPSC 463, CMPSC 469, CMPSC 472, CMPSC 487W, and CMPSC 488

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.