COMPUTER SCIENCE, B.S. (ENGINEERING)

Begin Campus: Any Penn State Campus
End Campus: Beaver, Brandywine, Hazleton, University Park

Degree Requirements
For the Bachelor of Science degree in Computer Science, a minimum of 127 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>106-108</td>
</tr>
</tbody>
</table>

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).

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMPSC 464</td>
<td>Introduction to the Theory of Computation</td>
<td>3</td>
</tr>
<tr>
<td>MATH 220</td>
<td>Matrices</td>
<td>2-3</td>
</tr>
<tr>
<td>MATH 230</td>
<td>Calculus and Vector Analysis</td>
<td>4</td>
</tr>
<tr>
<td>CMPEN 331</td>
<td>Computer Organization And Design</td>
<td>3</td>
</tr>
<tr>
<td>CMPSC 221</td>
<td>Object Oriented Programming with Web-Based Applications</td>
<td>3</td>
</tr>
<tr>
<td>CMPSC 311</td>
<td>Introduction to Systems Programming</td>
<td>3</td>
</tr>
<tr>
<td>CMPSC 360</td>
<td>Discrete Mathematics for Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>CMPSC 461</td>
<td>Programming Language Concepts</td>
<td>3</td>
</tr>
<tr>
<td>CMPSC 465</td>
<td>Data Structures and Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CMPSC 473</td>
<td>Operating Systems Design &amp; Construction</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 202C</td>
<td>Effective Writing: Technical Writing</td>
<td>3</td>
</tr>
<tr>
<td>MATH 140</td>
<td>Calculus With Analytic Geometry I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 141</td>
<td>Calculus with Analytic Geometry II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 211</td>
<td>General Physics: Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212</td>
<td>General Physics: Electricity and Magnetism</td>
<td>4</td>
</tr>
</tbody>
</table>

Additional Courses
Select 1 credit of First-Year Seminar
Select one of the following:

- 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:
- 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 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

- CMPEN 431W: Database Management Systems
- CMPSC 483W: Software Design Methods

Select 3 credits from any STAT/MATH course numbered 319-415

- STAT/MATH 319: Elementary Mathematical Statistics
- STAT/MATH 414: Introduction to Probability Theory

Additional Courses: Require a grade of C or better:
- CMPSC 121: Introduction to Programming Techniques
- CMPSC 131: Programming and Computation I: Fundamentals
- CMPSC 122: Intermediate Programming
- CMPSC 132: Programming and Computation II: Data Structures
- CMPEN 270: Digital Design: Theory and Practice
- CMPEN 271: Introduction to Digital Systems
- CMPEN 275: Digital Design Laboratory
- ENGL 15: Rhetoric and Composition
- ENGL 137H: Rhetoric and Civic Life I
- ENGL 138T: Rhetoric and Civic Life II
- or CAS 100A: Effective Speech
- or CAS 100B: Effective Speech

Supporting Courses and Related Areas
Select 2-3 credits from the following:
- 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)

Select 10-14 credits from department list. Students may apply up to 10-14 credits of ROTC as department list credits and 3 credits of ROTC as GHW credits.

Select 6 credits in non-CMPEN or CMPSC courses numbered 400-489 in consultation with adviser

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.