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:

<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>88</td>
</tr>
</tbody>
</table>

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/students/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/).

Common Requirements for the Major (All Options)

**Prescribed Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMPSC 312</td>
<td>Computer Organization and Architecture 1</td>
<td>3</td>
</tr>
<tr>
<td>CMPSC 430</td>
<td>Database Design 1</td>
<td>3</td>
</tr>
<tr>
<td>CMPSC 460</td>
<td>Principles of Programming Languages 1</td>
<td>3</td>
</tr>
<tr>
<td>CMPSC 462</td>
<td>Data Structures 1</td>
<td>3</td>
</tr>
<tr>
<td>CMPSC 463</td>
<td>Design and Analysis of Algorithms 1</td>
<td>3</td>
</tr>
<tr>
<td>CMPSC 469</td>
<td>Formal Languages with Applications 1</td>
<td>3</td>
</tr>
<tr>
<td>CMPSC 472</td>
<td>Operating System Concepts 1</td>
<td>3</td>
</tr>
<tr>
<td>CMPSC 487W</td>
<td>Software Engineering and Design 1</td>
<td>3</td>
</tr>
<tr>
<td>CMPSC 488</td>
<td>Computer Science Project 1</td>
<td>3</td>
</tr>
<tr>
<td>MATH 220</td>
<td>Matrices</td>
<td>2</td>
</tr>
<tr>
<td>PHYS 211</td>
<td>General Physics: Mechanics</td>
<td>4</td>
</tr>
</tbody>
</table>

*Prescribed Courses: Require a grade of C or better*

**Additional Courses**

Select at least 6 credits from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMPS 330</td>
<td>Advanced Programming in C++</td>
<td>3</td>
</tr>
<tr>
<td>CMPS 360</td>
<td>Discrete Mathematics for Computer Science 1</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>
</tbody>
</table>

Requirements for the Option
Data Science Option (35 credits)

**Prescribed Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMPS 441</td>
<td>Artificial Intelligence</td>
<td>3</td>
</tr>
<tr>
<td>CMPS 445</td>
<td>Applied Machine Learning in Data Science 1</td>
<td>3</td>
</tr>
<tr>
<td>CMPS 446</td>
<td>Data Mining 1</td>
<td>3</td>
</tr>
<tr>
<td>DS 220</td>
<td>Data Management for Data Sciences 1</td>
<td>3</td>
</tr>
<tr>
<td>STAT 401</td>
<td>Experimental Methods</td>
<td>3</td>
</tr>
<tr>
<td>STAT 462</td>
<td>Applied Regression Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

*Prescribed Courses: Require a grade of C or better*

**Additional Courses**

Select at least 6 credits from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMPS 313</td>
<td>Assembly Language Programming</td>
<td></td>
</tr>
<tr>
<td>CMPS 412</td>
<td>Data Structures Lab</td>
<td></td>
</tr>
<tr>
<td>CMPS 413</td>
<td>Algorithms Lab</td>
<td></td>
</tr>
<tr>
<td>CMPS 414</td>
<td>Contest Programming</td>
<td></td>
</tr>
<tr>
<td>CMPS 421</td>
<td>Net-centric Computing</td>
<td></td>
</tr>
<tr>
<td>CMPS 438</td>
<td>Computer Network Architecture and Programming</td>
<td></td>
</tr>
<tr>
<td>CMPS 444</td>
<td>Secure Programming</td>
<td></td>
</tr>
<tr>
<td>CMPS/ MATHREQUIRE</td>
<td>Introduction to Numerical Analysis I</td>
<td></td>
</tr>
</tbody>
</table>

or STAT/ MATH REQUIREMENTS FOR THE MAJOR 414

Requirements for the Option
Select an option 35

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
### 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 REQUIREMENTS FOR THE MAJOR 415**

- **MATH 401**  Introduction to Analysis I
- **MATH 410**  Complex Analysis for Mathematics and Engineering
- **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

**Additional Courses: Require a grade of C or better**

- **CMPSC 121**  Introduction to Programming Techniques  
- **CMPSC 131**  Programming and Computation I: Fundamentals  
- **CMPSC 413**  Algorithms Lab
- **CMPSC 421**  Net-centric Computing
- **CMPSC 441**  Artificial Intelligence
- **CMPSC 444**  Secure Programming
- **CMPSC 445**  Applied Machine Learning in Data Science
- **CMPSC 446**  Data Mining

**Additional Courses:** Select 6 credits from the following:

- **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

**MATH 455**  Introduction to Numerical Analysis I

**Supporting Courses and Related Areas**

Select 3 credits of unrestricted electives at 300-400 level

Select 5 credits of unrestricted electives at 100-400 level

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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.