COMPUTER SCIENCE - BACHELOR OF SCIENCE (BSCS)

The goal of the Department of Computer Science is to prepare students for an intriguing and satisfying career in computer science in industry, research, or academia. The huge number of technical jobs and the continuing shortage of people to fill them mean that opportunities are great for today's computer science graduates when seeking career options or to continue on to graduate school.

The BS degree program in computer science emphasizes knowledge and awareness of computing at all levels, from circuits and computer architecture through operating systems and programming languages to large application systems; the theoretical and mathematical aspects of computing; the interdependence of hardware and software; and the challenge of large-scale software production and the engineering principles used to meet that challenge. Students may choose to take classes that touch on a wide variety of computing topics, or may select classes that focus on a particular specialization.

For more information, visit the department's BS Degree (http://www.colorado.edu/cs/current-students/undergraduate-students/bs-degree/) webpage.

Accreditation

The Bachelor of Science degree in computer science is accredited by the Computing Accreditation Commission of ABET (http://www.abet.org).

Program Educational Objectives

Our program educational objectives for students 3–5 years after graduating with a Bachelor of Science degree in computer science are that they will be:

- Broadly Educated and Versatile. Able to draw upon foundational knowledge, learn, adapt and successfully bring to bear analytical and computational approaches on changing societal and technological challenges
- Inspiring and Collaborative. Is a leader and a responsible citizen whose strengths come from an ability to draw on and contribute to diverse teams, expertise and experiences.
- Innovative. Drives scientific and societal advancement through technological innovation and entrepreneurship.
- Engaged. Is and remains engaged with the University of Colorado, the state of Colorado and technical and scientific professional communities.

Requirements

Requirements for the BS degree in computer science include coursework in computer science, mathematics, natural science, and the humanities and social sciences, as well as free elective coursework.

The degree provides considerable freedom in the selection of specific courses to fulfill these requirements, allowing students to tailor the degree to their individual needs and interests.

A student may not earn both a BS degree in computer science and a BA degree in computer science (catalog.colorado.edu/undergraduate/colleges-schools/arts-sciences/programs-study/computer-science/computer-science-bachelor-arts-ba/) from CU Boulder. A student may not earn a bachelor's degree in computer science and a minor in computer science from CU Boulder.

For more information, visit the department's BS Degree (http://www.colorado.edu/cs/current-students/undergraduate-students/bs-degree/) webpage.

Course Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td><strong>Computer Science</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSCI 1000</td>
<td>Computer Science as a Field of Work and Study</td>
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<tr>
<td>or CSCI 2020</td>
<td>Professional Development in Computer Science</td>
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</tr>
<tr>
<td>CSCI 1300</td>
<td>Computer Science 1: Starting Computing</td>
<td>4</td>
</tr>
<tr>
<td>or CSCI 1320</td>
<td>Computer Science 1: Starting Computing-Engineering Applications</td>
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<tr>
<td>or ECEN 1310</td>
<td>C Programming for ECE</td>
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<tr>
<td>CSCI 2270</td>
<td>Computer Science 2: Data Structures</td>
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<tr>
<td>CSCI 2400</td>
<td>Computer Systems</td>
<td>4</td>
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<tr>
<td>CSCI 3104</td>
<td>Algorithms</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 3155</td>
<td>Principles of Programming Languages</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 3308</td>
<td>Software Development Methods and Tools</td>
<td>3</td>
</tr>
<tr>
<td><strong>Computer Science Core</strong></td>
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</tr>
<tr>
<td>Select six courses from approved list below; exact number of credit hours earned may vary based on courses selected.</td>
<td>18-21</td>
<td></td>
</tr>
<tr>
<td>CSCI 3002</td>
<td>Fundamentals of Human Computer Interaction</td>
<td></td>
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<tr>
<td>CSCI 3202</td>
<td>Introduction to Artificial Intelligence</td>
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<tr>
<td>CSCI 3287</td>
<td>Design and Analysis of Database Systems</td>
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<tr>
<td>CSCI 3302</td>
<td>Introduction to Robotics</td>
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<tr>
<td>CSCI 3403</td>
<td>Introduction to CyberSecurity for a Converged World</td>
<td></td>
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<tr>
<td>CSCI 3434</td>
<td>Theory of Computation</td>
<td></td>
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<tr>
<td>CSCI 3656</td>
<td>Numerical Computation</td>
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<tr>
<td>or APPM 46!Intermediate Numerical Analysis 1</td>
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<td></td>
</tr>
<tr>
<td>or MCEN 30:Computational Methods</td>
<td></td>
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<tr>
<td>CSCI 3753</td>
<td>Design and Analysis of Operating Systems</td>
<td></td>
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<tr>
<td>CSCI 4022</td>
<td>Advanced Data Science</td>
<td></td>
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<tr>
<td>CSCI 4273</td>
<td>Network Systems</td>
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</tr>
<tr>
<td>CSCI 4448</td>
<td>Object-Oriented Analysis and Design</td>
<td>5-8</td>
</tr>
</tbody>
</table>

**Computer Science Electives**

Select additional approved coursework to bring total Computer Science credit hours to at least 58. See department website for list of approved courses.

Senior Capstone

CSCI 4308 & CSCI 4318 Software Engineering Project 1
or CSCI 4348 & CSCI 4358 Startup Essentials: Entrepreneurial Projects in Computing and Entrepreneurial Projects II
or CSCI 4950 & CSCI 3100 Senior Thesis and Software and Society
Mathematics

APPM 1350  Calculus 1 for Engineers  4
or MATH 1300  Calculus 1
or APPM 1340  Calculus 1 with Algebra, Part A
& APPM 1345  and Calculus 1 with Algebra, Part B
APPM 1360  Calculus 2 for Engineers  4
or MATH 2300  Calculus 2
CSCI 2824  Discrete Structures  3
or ECEN 2703  Discrete Mathematics for Computer Engineers
or APPM 3170  Discrete Applied Mathematics

CSCI 2820  Linear Algebra with Computer Science Applications  3
or MATH 2130  Introduction to Linear Algebra for Non-Mathematics Majors
or MATH 2135  Introduction to Linear Algebra for Mathematics Majors
or MATH 3130  Honors Introduction to Linear Algebra
or APPM 3310  Matrix Methods and Applications

CSCI 3022  Introduction to Data Science with Probability and Statistics  3
or APPM 3570  Applied Probability
or APPM 4570  Statistical Methods
or CHEN 3010  Applied Data Analysis
or CVEN 3227  Probability, Statistics and Decision
or ECEN 3810  Introduction to Probability Theory
or ECON 3818  Introduction to Statistics with Computer Applications
or MATH 3510  Introduction to Probability and Statistics
or MATH 4510  Introduction to Probability Theory
or STAT 3100  Applied Probability
or STAT 4000  Statistical Methods and Application I

Logic & Ethics

Logic
PHIL 1440  Critical Thinking  3
or PHIL 2440  Symbolic Logic

Ethics
PHIL 1100  Ethics  3
or PHIL 1200  Contemporary Social Problems
or PHIL 2160  Ethics and Information Technology
or CSCI 2750  Computing, Ethics and Society
or INFO 4601  Ethical and Policy Dimensions of Information and Technology
or EHON 1151  Critical Encounters

Humanities/Social Sciences/Writing 1

Natural Science
PHYS 1110  General Physics 1  4
PHYS 1120  General Physics 2  4-5
& PHYS 1140  and Experimental Physics 1
or CHEN 1201  General Chemistry for Engineers 1
& CHEM 1114  and Laboratory in General Chemistry 1
or CHEN 1211  Accelerated Chemistry for Engineers
& CHEM 1221  and Engineering General Chemistry Lab
or CHEM 1113  General Chemistry 1
& CHEM 1114  and Laboratory in General Chemistry 1
or EBIO 1210  General Biology 1
& EBIO 1230  and General Biology Laboratory 1
or MCDB 1150  Introduction to Cellular and Molecular Biology
& MCDB 1161  and From Dirt to DNA: Phage Genomics Laboratory I
or MCDB 1150  Introduction to Cellular and Molecular Biology
& MCDB 1171  and Drug Discovery Through Hands-on Screens I

Natural Science Electives  8-9

Additional natural science electives to reach 17 credits, number of credits needed may vary based on natural science sequence completed. See department website for list of approved courses.

Free Electives  8-16

Additional coursework to bring cumulative total credit hours to at least 128, number of credits needed may vary based on options selected to complete other requirements.

Total Credit Hours  128

1  Complete the College’s Humanities, Social Sciences and Writing (https://www.colorado.edu/engineering-advising/get-your-degree/degree-requirements/humanities-social-sciences-and-writing-requirements/) requirements (18 credits total) as specified.

Recommended Four-Year Plan of Study

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Year</td>
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<tr>
<td>Fall Semester</td>
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<tr>
<td>APPM 1350</td>
<td>Calculus 1 for Engineers</td>
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<tr>
<td>CSCI 1000</td>
<td>Computer Science as a Field of Work and Study</td>
<td>1</td>
</tr>
<tr>
<td>CSCI 1300</td>
<td>Computer Science 1: Starting Computing</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 1110</td>
<td>General Physics 1</td>
<td>4</td>
</tr>
<tr>
<td>Humanities and social sciences elective 1</td>
<td>3</td>
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<tr>
<td></td>
<td>Credit Hours</td>
<td>16</td>
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<tr>
<td>Spring Semester</td>
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<tr>
<td>APPM 1360</td>
<td>Calculus 2 for Engineers</td>
<td>4</td>
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<tr>
<td>CSCI 2270</td>
<td>Computer Science 2: Data Structures</td>
<td>4</td>
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<tr>
<td></td>
<td>Natural science sequence option</td>
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<td></td>
<td>Logic</td>
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<td></td>
<td>Credit Hours</td>
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<td>Second Year</td>
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<td>Fall Semester</td>
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<td>CSCI 2400</td>
<td>Computer Systems</td>
<td>4</td>
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<tr>
<td>CSCI 2824</td>
<td>Discrete Structures (or other approved course)</td>
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<tr>
<td>CSCI 3308</td>
<td>Software Development Methods and Tools</td>
<td>3</td>
</tr>
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<td></td>
<td>Natural science elective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Ethics</td>
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<tr>
<td></td>
<td>Credit Hours</td>
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<tr>
<td>Spring Semester</td>
<td></td>
<td></td>
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<tr>
<td>CSCI 3104</td>
<td>Algorithms</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>CS core course from approved core list (1 of 6)</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 2820</td>
<td>Linear Algebra with Computer Science Applications (or other approved course)</td>
<td>3</td>
</tr>
</tbody>
</table>
Natural science elective 3
Humanities and social sciences elective 1 3
Credit Hours 16

Third Year

Fall Semester
CSCI 3155 Principles of Programming Languages 4
CS core course from approved core list (2 of 6) 3
CS core course from approved core list (3 of 6) 3
CSCI 3022 Introduction to Data Science with Probability and Statistics (or other approved course) 3
College-approved writing course 2 3
Credit Hours 16

Spring Semester
CS core course from approved core list (4 of 6) 4
CS core course from approved core list (5 of 6) 3
Natural science elective 3
Humanities and social sciences elective 1 3
Free elective 3
Credit Hours 16

Fourth Year

Fall Semester
CSCI Senior Capstone I 4
CS core course from approved core list (6 of 6) 3
Computer science elective 3
Humanities and social sciences elective 1 3
Free elective 3
Credit Hours 16

Spring Semester
CSCI Senior Capstone II 4
Computer science elective 3
Computer science elective 3
Humanities and social sciences elective 1 3
Free elective 3
Credit Hours 16
Total Credit Hours 128

1 Students may choose courses from the list of college-approved humanities and social sciences (HSS) electives (https://www.colorado.edu/engineering-advising/get-your-degree/degree-requirements/humanities-social-sciences-and-writing-requirements/).

2 Students may choose a course from the list of college-approved writing courses (https://www.colorado.edu/engineering-advising/get-your-degree/degree-requirements/humanities-social-sciences-and-writing-requirements/).

Learning Outcomes

Upon graduation, students are expected to be able to:

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

Bachelor’s–Accelerated Master’s Degree Program(s)

The Bachelor’s–Accelerated Master’s (BAM) degree program options offer currently enrolled CU Boulder undergraduate students the opportunity to receive a bachelor's and master's degree in a shorter period of time. Students receive the bachelor's degree first, but begin taking graduate coursework as undergraduates (typically in their senior year). Because some courses are allowed to double count for both the bachelor's and the master's degrees, students receive a master's degree in less time and at a lower cost than if they were to enroll in a stand-alone master's degree program after completion of their baccalaureate degree. In addition, staying at CU Boulder to pursue a bachelor's–accelerated master's program enables students to continue working with their established faculty mentors.

The following BAM programs are available with the BS in Computer Science:

• BS and MS in Computer Science
• BS in Computer Science, MS in Technology, Cybersecurity and Policy

Admissions Requirements

BS and MS in Computer Science

In order to gain admission to the BAM program named above, a student must meet the following criteria:

• Have a cumulative GPA of 3.50 or higher
• Have a major GPA of 3.70 or higher
• Have at least junior class standing
• Have two strong letters of recommendation from Computer Science faculty
• Have completed the following five prerequisite courses with grades of B or better:
  • CSCI 1300
  • CSCI 2270
  • CSCI 2400
  • CSCI 3104 or CSCI 3434
  • CSCI 3155 or CSCI 3753

Students may submit their intent to apply during the term they are completing their final class from the list above.

BS in Computer Science, MS in Technology, Cybersecurity and Policy

In order to gain admission to the BAM program named above, a student must meet the following criteria:

• Have a cumulative GPA of 3.250 or higher
• Have a major GPA of 3.70 or higher
• Have at least junior class standing

• Have completed the following five prerequisite courses with grades of B or better:
  • CSCI 1300
  • CSCI 2270
  • CSCI 2400
  • CSCI 3104 or CSCI 3434
  • CSCI 3155 or CSCI 3753

Students may submit their intent to apply during the term they are completing their final class from the list above.
Program Requirements (for both programs above)

Students may take up to and including 12 hours while in the undergraduate program which can later be used toward the master’s degree. However, only 6 credits may be double counted toward the bachelor’s degree and the master’s degree. Students must apply to graduate with the bachelor’s degree, and apply to continue with the master’s degree, early in the semester in which the undergraduate requirements will be completed.

Please see the Computer Science/Computer Science BAM degree program (https://www.colorado.edu/cs/current-students/undergraduate-students/bachelors-accelerated-masters-degree/) or Computer Science/Technology, Cybersecurity and Policy BAM degree program (https://www.colorado.edu/program/tcp/current-students/bachelors-accelerated-masters/) for more information.