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 continuing 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 (https://www.colorado.edu/engineering-advising/get-your-degree/graduation-requirements/) webpage.

Western Colorado University/University of Colorado Boulder Partnership Program (Computer Science)

Western Colorado University (Western) and CU Boulder have created a partnership to deliver specific engineering and computer science baccalaureate programs in their entirety in Gunnison, Colorado. The first two years of coursework are taught by Western faculty and the second two years of coursework are taught by CU Boulder faculty located in Gunnison. Students completing the programs will be awarded a Bachelor of Science from CU Boulder.

Degrees are offered in mechanical engineering and computer science, with additional details on the Computer Science (https://western.edu/program/computer-science-university-colorado-partnership/) and Mechanical Engineering (https://western.edu/program/mechanical-engineering-university-colorado-partnership/) partnership program websites.

Coursework requirements and plans of study specific to this partnership can be found on the Western Colorado University computer science partnership website (https://western.edu/program/computer-science-university-colorado-partnership/). Learn more about this program on the CU Boulder partnership website (https://www.colorado.edu/academics/western-cu-boulder-bs-computer-science/).

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. Students must meet the graduation requirements of earning the BS degree as laid out by the College of Engineering and Applied Science (https://www.colorado.edu/eng...
CSCI 3434  Theory of Computation
CSCI 3656  Numerical Computation
or APPM 4600  Numerical Methods and Scientific Computing
or MCEN 3030  Computational Methods
CSCI 3753  Design and Analysis of Operating Systems
CSCI 4022  Advanced Data Science
CSCI 4273  Network Systems
CSCI 4448  Object-Oriented Analysis and Design

Computer Science Electives  7-12
Select additional approved coursework to bring total Computer Science credit hours to at least 58. 1

Senior Capstone
CSCI 4308  Software Engineering Project 1  8
& CSCI 4318  and Software Engineering Project 2
or CSCI 4348  Startup Essentials: Entrepreneurial Projects in
& CSCI 4358  and Entrepreneurial Projects II
or CSCI 4950  Senior Thesis
& CSCI 3100  and Software and Society
or CSCI 4368  Multidisciplinary Design Project 1
& CSCI 4378  and Multidisciplinary Design Project 2

Mathematics
APPM 1350  Calculus 1 for Engineers  4
or MATH 1300  Calculus 1
or MATH 1310  Calculus for Life Sciences
or APPM 1345  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
or MATH 2001  Introduction to Discrete 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  Introduction to Linear Algebra
or MATH 3135  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 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 1160  Introduction to Medical Ethics
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 ENLP 2000  Leadership, Fame and Failure
or EHON 1151  Critical Encounters
or HONR 2250  Ethics of Ambition

Humanities/Social Sciences/Writing  2  18

Natural Science
PHYS 1110  General Physics 1  4
or PHYS 1115  General Physics 1 for Majors
PHYS 1120  General Physics 2
& PHYS 1140  and Experimental Physics 1
or PHYS 1125  General Physics 2 for Majors
& 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 EIO 1210  General Biology 1
& EIO 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 1
or MCDB 1150  Introduction to Cellular and Molecular Biology
& MCDB 1171  and Antibiotics 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  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  128-137

1  For list of approved courses, see department website (https://www.colorado.edu/cs/academics/undergraduate-programs/bachelor-science/bachelor-science-degree-requirements/#Electives).
2  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

## First Year

**Fall Semester**
- **APPM 1350**: Calculus 1 for Engineers 4
- **CSCI 1000**: Computer Science as a Field of Work and Study 1
- **CSCI 1300**: Computer Science 1: Starting Computing 4
- **Natural Science Elective**: 3
- **COEN 1830**: Special Topics (Engineering First Year Seminar) 1
- **Humanities and social sciences elective** 1

**Credit Hours**: 15

**Spring Semester**
- **APPM 1360**: Calculus 2 for Engineers 4
- **CSCI 2270**: Computer Science 2: Data Structures 4
- **PHYS 1110**: General Physics 1 4
- **Logic**: 3

**Credit Hours**: 15

## Second Year

**Fall Semester**
- **CSCI 2400**: Computer Systems 4
- **CSCI 2824**: Discrete Structures (or other approved course) 3
- **CSCI 3308**: Software Development Methods and Tools 3
- **Natural science elective**: 3
- **Ethics**: 3

**Credit Hours**: 15

**Spring Semester**
- **CSCI 3104**: Algorithms 4
- **CS core course from approved core list (1 of 5)** 3
- **CSCI 2820**: Linear Algebra with Computer Science Applications (or other approved course) 3
- **Natural science elective**: 3
- **Humanities and social sciences elective** 1

**Credit Hours**: 16

## Third Year

**Fall Semester**
- **CSCI 3155**: Principles of Programming Languages 4
- **CS core course from approved core list (2 of 5)** 3
- **CS core course from approved core list (3 of 5)** 3
- **CSCI 3022**: Introduction to Data Science with Probability and Statistics (or other approved course) 3
- **College-approved writing course** 2

**Credit Hours**: 16

**Spring Semester**
- **CS core course from approved core list (4 of 5)** 4
- **CS core course from approved core list (5 of 5)** 3
- **Natural science sequence option**: 5
- **Humanities and social sciences elective** 1

**Credit Hours**: 16

## Fourth Year

**Fall Semester**
- **CSCI Senior Capstone I**: 4
- **Computer Science elective** 3
- **Computer Science elective**: 3
- **Humanities and social sciences elective** 1
- **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
- **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/).

3. See department website (https://www.colorado.edu/cs/academics/undergraduate-programs/bachelor-science/bachelor-science-degree-requirements/#Electives) for Computer Science Electives

## 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.

## Program Educational Objectives

Within 3–5 years after graduating with a Bachelor of Science degree in computer science, our graduates 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.** Are leaders and responsible citizens whose strengths come from an ability to draw on and contribute to diverse teams, expertise and experiences.

• **Innovative.** Drive scientific and societal advancement through technological innovation and entrepreneurship.

• **Engaged.** Are engaged with the University of Colorado, the state of Colorado and technical and scientific professional communities.

### 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 degree 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 Computational Linguistics, Analytics, Search and Informatics
- BS in Computer Science, MS in Data Science
- BS in Computer Science, MS in Network Engineering

### 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 completed all prerequisite courses with grades of B or better.

<table>
<thead>
<tr>
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<td>CSCI 2270</td>
<td>Computer Science 2: Data Structures</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 2400</td>
<td>Computer Systems</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 3104</td>
<td>Algorithms</td>
<td>4</td>
</tr>
<tr>
<td>or CSCI 3434</td>
<td>Theory of Computation</td>
<td></td>
</tr>
<tr>
<td>CSCI 3155</td>
<td>Principles of Programming Languages</td>
<td>4</td>
</tr>
<tr>
<td>or CSCI 3753</td>
<td>Design and Analysis of Operating Systems</td>
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- Students who do not meet the first two criteria, must have one letter of reference from a faculty member or their undergraduate academic advisor outlining why they should be considered. The letter-writer should send their letter directly to gradadms@cs.colorado.edu.
- Have at least junior status within the bachelor's degree program.

#### BS in Computer Science, MS in Computational Linguistics, Analytics, Search and Informatics

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 completed all prerequisites with grades of B or better.

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<tr>
<td>LING 2000</td>
<td>Introduction to Linguistics</td>
<td>3</td>
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<tr>
<td>LING 3832/5832</td>
<td>Natural Language Processing</td>
<td>3</td>
</tr>
<tr>
<td>or CSCI 3202/4622</td>
<td>Introduction to Artificial Intelligence</td>
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One of the following during the semester the student applies:

- LING 5430 | Semantics and Pragmatics               |
- LING 5420 | Morphology and Syntax                  |
- LING 5030 | Linguistic Phonetics                    |

- Have at least junior status within the bachelor's degree program.
- Provide two letters of reference, one from the instructor of the LING 5XXX course they are taking during the semester they apply, the other from an instructor from an upper-division course in Computer Science. Letters should be sent directly to the CLASIC Program Coordinator.

#### BS in Computer Science, MS in Data Science

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

- Have a cumulative GPA of 3.250 or higher.
- Have completed all prerequisite courses with grades of B or better.

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<td>4</td>
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<td>4</td>
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<td>CSCI 3022</td>
<td>Introduction to Data Science with Probability and Statistics</td>
<td></td>
</tr>
<tr>
<td>CSCI 3308</td>
<td>Software Development Methods and Tools</td>
<td>3</td>
</tr>
</tbody>
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- Have at least junior status within the bachelor's degree program.
- Students may submit their intent to apply during the term they are completing their final class from the list of prerequisites.

#### BS in Computer Science, MS in Network Engineering

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

- Have a cumulative GPA of 3.300 or higher
- Have completed the following prerequisite courses with a B or better.
  (If a student has transfer credit for one of the following courses, or has taken a commonly accepted course substitution for one of the
above courses, their grade in that alternate course can be used to
determine their eligibility for this BAM program.)

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</tr>
<tr>
<td>CSCI 2400</td>
<td>Computer Systems</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 3403</td>
<td>Introduction to CyberSecurity for a Converged World</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 3753</td>
<td>Design and Analysis of Operating Systems</td>
<td>4</td>
</tr>
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</table>

• Have at least junior status within the bachelor’s degree program.
• Students may submit their intent to apply during the term they are completing their final class from the list of prerequisites.
• If a student not have at least a 3.3 cumulative GPA or required prerequisite courses, they must have one letter of reference from a faculty member or their academic advisor outlining why they should be considered. The letter-writer should send their letter directly to nteng@colorado.edu.

**Program Requirements**

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 maintain a 3.000 GPA while in the BAM program.

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 accelerated master’s webpage (https://www.colorado.edu/cs/academics/undergraduate-programs/accelerated-masters-programs/computer-science-accelerated-masters/) for more information.