COMPUTER SCIENCE - BACHELOR OF SCIENCE

The Bachelor of Science in Computer Science is the traditional undergraduate degree in Computer Science. It is rigorously focused on educating the student in the fundamental disciplines of Computer Science. It prepares the student for any technological field in industry, and also provides the preparation for graduate studies in Computer Science. It is the main undergraduate degree in the Computer Science department, and should be the choice of a single-major Computer Science student. This degree is accredited by the ABET Computing Accreditation Commission (CAC) under the General and Computer Science Program Criteria (through 9/30/2022).

General Requirements Exception
A grade of at least C- must be earned in each of the courses taken to satisfy the departmental and non-departmental requirements. No course may be counted as satisfying both a departmental and a non-departmental requirement. No course taken to satisfy either a departmental or a non-departmental requirement may be taken S/U.

Requirements
Students must complete all University degree requirements, which include: General Education requirements, Viewing a Wider World requirements, and elective credits to total at least 120 credits with 48 credits in courses numbered 300 or above. Developmental coursework will not count towards the degree requirements and/or elective credits, but may be needed in order to take the necessary English and Mathematics coursework.

Prefix Title Credits
General Education Requirement
Area I: Communications
English Composition - Level 1 2
English Composition - Level 2
Choose one from the following: 3
ENGL 218G Technical and Scientific Communication
ENGL 311G Advanced Composition
ENGL 318G Advanced Technical and Professional Communication
Oral Communication
Choose one from the following: 3
COMM 253G Public Speaking
COMM 265G Principles of Human Communication
HON 265G Principles of Human Communication Honors
Area II: Mathematics
MATH 191G Calculus and Analytic Geometry I 3
Area III/IV: Laboratory Sciences and Social/Behavioral Sciences 11
Area III: Laboratory Sciences
Choose two different courses from the following:
ASTR 110G Introduction to Astronomy
BIOL 111G Natural History of Life
& 111GL and Natural History of Life Laboratory
BIOL 211G Cellular and Organismal Biology
& 211GL and Cellular and Organismal Biology Laboratory
CHEM 111G General Chemistry I
CHEM 112G General Chemistry II
GEOG 111G Geography of the Natural Environment
GEOL 111G Introductory Geology
HON 219G Earth, Time, and Life
PHYS 211G General Physics I
& 211GL and General Physics I Laboratory
PHYS 212G General Physics II
& 212GL and General Physics II Laboratory
PHYS 215G Engineering Physics I
& 215GL and Engineering Physics I Laboratory
PHYS 216G Engineering Physics II
& 216GL and Engineering Physics II Laboratory
Area IV: Social/Behavioral Sciences (3 credits) 2
Area V: Humanities 2
Area VI: Creative and Fine Arts 2
General Education Elective
MATH 192G Calculus and Analytic Geometry II 3
Viewing a Wider World 4
Departmental/College Requirements
C S 172 Computer Science I
C S 271 Object Oriented Programming
C S 272 Introduction to Data Structures
C S 273 Machine Programming and Organization
C S 278 Discrete Mathematics for Computer Science
C S 370 Compilers and Automata Theory
C S 371 Software Development
C S 372 Data Structures and Algorithms
C S 419 Computing Ethics and Social Implications of Computing
C S 448 Senior Project
or C S 449 Senior Thesis
C S 471 Programming Language Structure I
C S 474 Operating Systems I
C S 482 Database Management Systems I
Select 6 credits from the following: 5
C S 473 Architectural Concepts I
C S 475 Artificial Intelligence I
C S 476 Computer Graphics I
C S 477 Digital Game Design
C S 478 Computer Security
C S 479 Special Topics 6
C S 480 Linux System Administration
C S 481 Visual Programming
C S 483 Introduction to Robotics
C S 484 Computer Networks I
C S 485 User Interface Design
C S 486 Bioinformatics
C S 487 Applied Machine Learning I
C S 488  Introduction to Data Mining
C S 489  Bioinformatics Programming
C S 491  Parallel Programming
C S 494  Introduction to Smart Grids
C S 496  Cloud and Edge Computing

Non-Departmental Requirements (in addition to Gen.Ed./VWW)

MATH 280  Introduction to Linear Algebra  3
or MATH 480  Matrix Theory and Applied Linear Algebra

Select one from the following:  3
MATH 331  Introduction to Modern Algebra
MATH 332  Introduction to Analysis
MATH 377  Introduction to Numerical Methods
MATH 392  Introduction to Ordinary Differential Equations
MATH 454  Logic and Set Theory
MATH 455  Elementary Number Theory

Select one from the following:  3
A ST 311  Statistical Applications
STAT 371  Statistics for Engineers and Scientists I
STAT 470  Probability: Theory and Applications

Lab Science Courses

Select one from the following:  5
BIOL 111G  Natural History of Life
& 111GL  and Natural History of Life Laboratory
BIOL 211G  Cellular and Organismal Biology
& 211GL  and Cellular and Organismal Biology Laboratory
CHEM 111G  General Chemistry I
CHEM 112G  General Chemistry II
PHYS 211G  General Physics I
& 211GL  and General Physics I Laboratory
PHYS 212G  General Physics II
& 212GL  and General Physics II Laboratory
PHYS 213  Mechanics
& 213 L  and Experimental Mechanics
PHYS 214  Electricity and Magnetism
& 214 L  and Electricity and Magnetism Laboratory
PHYS 215G  Engineering Physics I
& 215GL  and Engineering Physics I Laboratory
PHYS 216G  Engineering Physics II
& 216GL  and Engineering Physics II Laboratory

Second Language Requirements: (not required)

Electives, to bring the total credits to 120  7

Students who plan to seek employment at the bachelor level are advised to use their elective credits to complete one of the concentration areas below

| Total Credits | 120 |

1  Students with Area I transfer credits may sometimes complete this requirement with 9 credits
2  See the General Education section of the catalog for a full list of courses

Concentrations

Students who plan to seek employment at the bachelor level are advised to take one of the concentration area curricula in addition to the general and departmental requirements. An elective course cannot be used for more than two focuses. A course that is required for one concentration cannot be used as an elective course of another one. Below are the list of possible concentrations.

Concentration: Algorithm Theory

Prefix  Title  Credits
Select 3-4 credits from the following:  3-4
C S 472  Data Structures and Algorithms
C S 434  Algorithm Design & Implementation
Select 9 credits from the following:  9
C S 475  Artificial Intelligence I
C S 476  Computer Graphics I
C S 487  Applied Machine Learning I
C S 488  Introduction to Data Mining
Total Credits  12-13

Concentration: Artificial Intelligence

Prefix  Title  Credits
Select 3-4 credits from the following:  3-4
C S 372  Data Structures and Algorithms
C S 434  Algorithm Design & Implementation
Select 9 credits from the following:  9
C S 475  Artificial Intelligence I
C S 483  Introduction to Robotics
C S 487  Applied Machine Learning I
C S 488  Introduction to Data Mining
Total Credits  12-13

Concentration: Big Data and Data Science

Prefix  Title  Credits
Required course:  7
C S 371  Software Development
C S 482  Database Management Systems I
Select 6 credits from the following:  6
C S 487  Applied Machine Learning I
C S 488 Introduction to Data Mining

Total Credits 13

Concentration: Computer Networking
Prefix Title Credits
Required courses:
C S 473 Architectural Concepts I 6
C S 484 Computer Networks I
Select 6 credits from the following:
C S 478 Computer Security
C S 480 Linux System Administration
C S 496 Cloud and Edge Computing

Total Credits 12

Concentration: Cybersecurity
Prefix Title Credits
Required courses:
C S 473 Architectural Concepts I 6
C S 478 Computer Security
Select 6 credits from the following:
C S 479 Special Topics Topics in Cryptography
C S 484 Computer Networks I

Total Credits 12

Concentration: Human Computer Interaction
Prefix Title Credits
Required courses:
C S 371 Software Development 7
C S 485 User Interface Design
Select 6 credits from the following:
C S 476 Computer Graphics I
C S 477 Digital Game Design
C S 481 Visual Programming

Total Credits 13

Concentration: Software Development
Prefix Title Credits
Required course:
C S 371 Software Development 10
C S 471 Programming Language Structure I
C S 485 User Interface Design
Select 6 credits from the following:
C S 476 Computer Graphics I
C S 482 Database Management Systems I
C S 484 Computer Networks I
C S 491 Parallel Programming

Total Credits 16

Second Language Requirement
For the Bachelor of Science with a major in Computer Science (including all Concentration Areas), there is no second language requirement for the degree.

A Suggested Plan of Study for Students
This roadmap assumes student placement in MATH 191G Intermediate Algebra and ENGL 111G Rhetoric and Composition. The contents and order of this roadmap may vary depending on initial student placement in mathematics and English. It is only a suggested plan of study for students and is not intended as a contract. Course availability may vary from fall to spring semester and may be subject to modification or change.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C S 172</td>
<td>Computer Science I</td>
<td>4</td>
</tr>
<tr>
<td>C S 271</td>
<td>Object Oriented Programming</td>
<td>4</td>
</tr>
<tr>
<td>C S 273</td>
<td>Machine Programming and Organization</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 111G</td>
<td>Rhetoric and Composition</td>
<td>4</td>
</tr>
<tr>
<td>MATH 191G</td>
<td>Calculus and Analytic Geometry I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 192G</td>
<td>Calculus and Analytic Geometry II</td>
<td>4</td>
</tr>
<tr>
<td>Area IV: Social/Behavioral Sciences Course</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Area V: Humanities Course</td>
<td></td>
<td>3</td>
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</table>

| Credits | 30 |

Sophomore
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>C S 272</td>
<td>Introduction to Data Structures</td>
<td>4</td>
</tr>
<tr>
<td>C S 278</td>
<td>Discrete Mathematics for Computer Science</td>
<td>4</td>
</tr>
<tr>
<td>C S 370</td>
<td>Compilers and Automata Theory</td>
<td>4</td>
</tr>
<tr>
<td>C S 372</td>
<td>Data Structures and Algorithms</td>
<td>4</td>
</tr>
<tr>
<td>COMM 265G</td>
<td>Principles of Human Communication</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 218G</td>
<td>Technical and Scientific Communication</td>
<td>3</td>
</tr>
<tr>
<td>MATH 280 or MATH 480</td>
<td>Introduction to Linear Algebra or Matrix Theory and Applied Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>Area VI: Creative and Fine Arts</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Select one from the following:</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>A ST 311</td>
<td>Statistical Applications</td>
<td></td>
</tr>
<tr>
<td>STAT 371</td>
<td>Statistics for Engineers and Scientists</td>
<td></td>
</tr>
<tr>
<td>STAT 470</td>
<td>Probability, Theory and Applications</td>
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</tr>
<tr>
<td>Elective credits if needed for financial aid requirements</td>
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<td>3+</td>
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| Credits | 31-34 |

Junior
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>C S 371</td>
<td>Software Development</td>
<td>4</td>
</tr>
<tr>
<td>C S 471</td>
<td>Programming Language Structure I</td>
<td>3</td>
</tr>
<tr>
<td>C S 482</td>
<td>Database Management Systems I</td>
<td>3</td>
</tr>
<tr>
<td>Computer Science 400-level Elective</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>MATH elective (upper division)</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Lab Science Elective</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Lab Science Elective</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Viewing a Wider World</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Viewing a Wider World</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Elective credits if needed for financial aid requirements</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

| Credits | 33 |

Senior
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>C S 448 or C S 449</td>
<td>Senior Project or Senior Thesis</td>
<td>4</td>
</tr>
</tbody>
</table>

| Credits | 33 |
Computer Science - Bachelor of Science

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>C S 419</td>
<td>Computing Ethics and Social Implications of Computing</td>
<td>1</td>
</tr>
<tr>
<td>C S 474</td>
<td>Operating Systems I</td>
<td>3</td>
</tr>
<tr>
<td>Lab Science Elective</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Computer Science 400-level Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Upper division electives to bring total upper division to 48</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Electives as needed to meet minimum credit requirements</td>
<td></td>
<td>7</td>
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</table>

Credits                  | Total Credits       |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>26</td>
</tr>
</tbody>
</table>

1 MATH 191G Calculus and Analytic Geometry I is required for the degree but students may need to take any prerequisites needed to enter MATH 191G first.

2 See the General Education section of the catalog for a full list of courses.

3 Students who plan to seek employment at the bachelor level are advised to use their elective credits to complete one of the concentration areas below:

   Elective credit may vary based on prerequisites, dual credit, AP credit, double majors, and/or minor coursework. The amount indicated in the requirements list is the amount needed to bring the total to 120 credits and may appear in variable form based on the degree. However students may end up needing to complete more or less on a case-by-case basis and students should discuss elective requirements with their advisor.

4 See list of Computer Science electives in Degree Requirement Section.

5 Math Electives:
   - MATH 331 Introduction to Modern Algebra
   - MATH 332 Introduction to Analysis
   - MATH 377 Introduction to Numerical Methods
   - MATH 392 Introduction to Ordinary Differential Equations
   - MATH 454 Logic and Set Theory
   - MATH 455 Elementary Number Theory

6 See list of Lab Science courses in the Degree Requirement Section.

7 See the Viewing a Wider World section of the catalog for a full list of courses.

Students planning to undertake graduate work in computer science are encouraged to consult with their advisor regarding the possibility of taking other computer science electives to satisfy their departmental requirements.