**COMPUTER SCIENCE, BA**

**Degree:** Bachelor of Arts (BA)
**Major:** Computer Science

**Program Overview**

This program provides students with a strong background in the fundamentals of mathematics and science. Students can use their technical and open electives to pursue concentrations in software engineering, algorithms, artificial intelligence, databases, data mining, bioinformatics, security, computer systems, and computer networks. In addition to an excellent technical education, all students in the department are exposed to societal issues, ethics, professionalism, and have the opportunity to develop leadership and creativity skills.

The Bachelor of Arts degree program in computer science is a combination of a liberal arts program and a computing major. It is a professional program in the sense that graduates can be employed as computer professionals, but it is less technical than the Bachelor of Science degree program in computer science. This degree is particularly suitable for students with a wide range of interests. For example, students can major in another discipline in addition to computer science and routinely complete all of the requirements for the double major in a 4 year period. This is possible because over a third of the courses in the program are open electives. Furthermore, if a student is majoring in computer science and a second technical field such as mathematics or physics many of the technical electives will be accepted for both majors. Another example of the utility of this program is that it routinely allows students to major in computer science and take all of the pre-med courses in a four-year period.

**Mission**

The mission of the Bachelor of Arts degree program in computer science is to graduate students who have fundamental technical knowledge of their profession and the requisite technical breadth and communications skills to become leaders in creating the new techniques and technologies which will advance the field of computer science and its application to other disciplines.

**Program Educational Objectives**

a. To educate and train students in the fundamentals of computer science and mathematics
b. To educate students with an understanding of real-world computing needs
c. To train students to work effectively, professionally and ethically in computing-related professions

**Learning Outcomes**

As preparation for achieving the above educational objectives, the Bachelor of Arts degree program in computer science is designed so that students attain the ability 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.

Core and breadth courses provide our students with the flexibility to work across many disciplines and prepare them for a variety of professions. Our curriculum is designed to teach fundamental skills and knowledge needed by all CS graduates while providing the greatest flexibility in selecting topics.

**Undergraduate Policies**

For undergraduate policies and procedures, please review the Office of Undergraduate Studies section of the General Bulletin.

**Accelerated Master’s Programs**

Undergraduate students may participate in accelerated programs toward graduate or professional degrees. For more information and details of the policies and procedures related to accelerated studies, please visit the Office of Undergraduate Studies section of the General Bulletin.

**Program Requirements**

Students seeking to complete this major and degree program must meet the general requirements for bachelor’s degrees and the general requirements of the College of Arts and Sciences. Students completing this program as a secondary major while completing another undergraduate degree program do not need to satisfy the latter set of requirements.

Students are required to complete a total of 13 computer science and computer science related courses, totaling at least 42 credits. The 13 courses for a total of 42 credits must include all 6 core courses and at least 3 computer science breadth courses. The remaining 4 courses may be any CS Course, defined below, plus at most 3 courses from either the group 1 or the group 3 list of approved technical electives. There is no depth requirement for the Computer Science BA degree.

**Required Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mathematics Requirement</strong></td>
<td></td>
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<tr>
<td>BA students must complete two of the following calculus courses:</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>MATH 121</td>
<td>Calculus for Science and Engineering I</td>
<td></td>
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<tr>
<td>or MATH 123</td>
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<td></td>
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<tr>
<td>or MATH 125</td>
<td>Math and Calculus Applications for Life, Managerial, and Social Sci I</td>
<td></td>
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<tr>
<td>MATH 122</td>
<td>Calculus for Science and Engineering II</td>
<td></td>
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<tr>
<td>or MATH 122</td>
<td>Calculus II</td>
<td></td>
</tr>
<tr>
<td>or MATH 122</td>
<td>Math and Calculus Applications for Life, Managerial, and Social Sci II</td>
<td></td>
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<tr>
<td><strong>Core Requirement</strong></td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>CSDS 132</td>
<td>Programming in Java</td>
<td></td>
</tr>
<tr>
<td>CSDS 233</td>
<td>Introduction to Data Structures</td>
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</tr>
</tbody>
</table>
CSDS 281 Logic Design and Computer Organization
CSDS 302 Discrete Mathematics
CSDS 310 Algorithms
CSDS 395 Senior Project in Computer Science

**Breadth Requirement**

BA students must complete at least 3 of the 7 following courses: 9-10

- CSDS 314 Computer Architecture
- CSDS 325 Computer Networks I
- CSDS 338 Intro to Operating Systems and Concurrent Programming
- CSDS 341 Introduction to Database Systems
- CSDS 345 Computer Networks I
- CSDS 395 Senior Project in Computer Science
- CSDS 396 Artificial Intelligence: Statistical Natural Language Processing

**Computer Science Courses**

BA students must complete at least one additional CS Course for a total of 10. The remaining 3 courses to complete the major may come from the CS Courses or Technical Elective lists below.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Any computer science core course (see above)</td>
<td></td>
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<tr>
<td></td>
<td>Any computer science breadth course (see above)</td>
<td></td>
</tr>
<tr>
<td>CSDS 234</td>
<td>Structured and Unstructured Data</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 293</td>
<td>Software Craftsmanship</td>
<td>4</td>
</tr>
<tr>
<td>CSDS 312</td>
<td>Introduction to Data Science Systems</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 313</td>
<td>Introduction to Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 337</td>
<td>Compiler Design</td>
<td>4</td>
</tr>
<tr>
<td>CSDS 339</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CSDS 343</td>
<td>Theoretical Computer Science</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 344</td>
<td>Computer Security</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 356</td>
<td>Data Privacy</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 392</td>
<td>App Development for iOS</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 394</td>
<td>Introduction to Information Theory</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 405</td>
<td>Data Structures and File Management</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 427</td>
<td>Internet Security and Privacy</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 428</td>
<td>Computer Communications Networks II</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 433</td>
<td>Database Systems</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 435</td>
<td>Data Mining</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 438</td>
<td>High Performance Data and Computing</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 440</td>
<td>Machine Learning</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 442</td>
<td>Causal Learning from Data</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 448</td>
<td>Smartphone Security</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 455</td>
<td>Applied Graph Theory</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 458</td>
<td>Introduction to Bioinformatics</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 459</td>
<td>Bioinformatics for Systems Biology</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 465</td>
<td>Computer Vision</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 477</td>
<td>Advanced Algorithms</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 491</td>
<td>Artificial Intelligence: Probabilistic Graphical Models</td>
<td>3</td>
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<tr>
<td>CSDS 496</td>
<td>Artificial Intelligence: Sequential Decision Making</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 497</td>
<td>Artificial Intelligence: Statistical Natural Language Processing</td>
<td>3</td>
</tr>
<tr>
<td>CSDS 499</td>
<td>Algorithmic Robotics</td>
<td>3</td>
</tr>
<tr>
<td>ECSE 301</td>
<td>Digital Logic Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>ECSE 303</td>
<td>Embedded Systems Design and Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>ECSE 317</td>
<td>Computer Design - FPGAs</td>
<td>3</td>
</tr>
<tr>
<td>ECSE 318</td>
<td>VLSI/CAD</td>
<td>4</td>
</tr>
<tr>
<td>ECSE 419</td>
<td>Computer System Architecture</td>
<td>3</td>
</tr>
<tr>
<td>ECSE 485</td>
<td>VLSI Systems</td>
<td>3</td>
</tr>
<tr>
<td>ECSE 488</td>
<td>Embedded Systems Design</td>
<td>3</td>
</tr>
<tr>
<td>MATH 330</td>
<td>Introduction to Scientific Computing</td>
<td>3</td>
</tr>
<tr>
<td>MATH 431</td>
<td>Introduction to Numerical Analysis I</td>
<td>3</td>
</tr>
</tbody>
</table>

**Approved Technical Electives**

For Computer Science BA students, up to 3 of the 13 computer science and computer science related courses may come from the group 1 and group 3 lists. Computer science related courses not listed below may be used as a technical elective but require prior permission from the student’s academic advisor.

<table>
<thead>
<tr>
<th>Group 1 Code</th>
<th>Group 1 Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any CSDS course</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECSE 301</td>
<td>Digital Logic Laboratory</td>
<td>2</td>
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<td>ECSE 303</td>
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<table>
<thead>
<tr>
<th>Group 3 Code</th>
<th>Group 3 Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>MATH 201</td>
<td>Introduction to Linear Algebra for Applications</td>
<td>3</td>
</tr>
<tr>
<td>MATH 307</td>
<td>Introduction to Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 380</td>
<td>Introduction to Probability</td>
<td>3</td>
</tr>
</tbody>
</table>

**Sample Plan of Study**

**First Year**

**Fall**

- CSDS 132 Programming in Java 3
- Breadth elective ** 3
- Select one of the following: 4
  - MATH 125 Math and Calculus Applications for Life, Managerial, and Social Sci I
  - MATH 123
  - MATH 121 Calculus for Science and Engineering I
- Open elective 3
- PHED (2 half semester courses) * 0
- SAGES First Year Seminar * 4

**Hours** 17

**Spring**

- Select one of the following: 4
  - MATH 126 Math and Calculus Applications for Life, Managerial, and Social Sci II
Math 124  Calculus II
Math 122  Calculus for Science and Engineering II
Breadth elective ** 3
Open elective 3
Open elective 3
PHED (2 half semester courses)* 0
SAGES University Seminar* 3

| Hours | 16 |

** Second Year**

Fall
CSDS 281  Logic Design and Computer Organization 4
Breadth elective ** 3
Open elective 3
Open elective 3
SAGES University Seminar* 3

| Hours | 16 |

Spring
CSDS 233  Introduction to Data Structures 4
CSDS 302  Discrete Mathematics 3
Breadth elective ** 3
Open elective 3
Open elective 3

| Hours | 16 |

** Third Year**

Fall
Computer science breadth course a 3
Computer science breadth course a 3
Open elective 3
SAGES Department Seminar 3

| Hours | 12 |

Spring
Computer science breadth course a 3
Open elective 3
Technical elective b 3
Technical elective b 3

| Hours | 12 |

** Fourth Year**

Fall
CSDS 310  Algorithms 3
Open elective 3
Open elective 3
Open elective 3
Technical elective b 3

| Hours | 15 |

Spring
CSDS 395  Senior Project in Computer Science 4
Open elective 3
Open elective 3
Open elective 3

| Hours | |