Computer Science

Computer science is now a critical tool for pursuing an ever-broadening range of topics, from outer space to the workings of the human mind. In most areas of science and in many liberal arts fields, cutting-edge work depends increasingly on computational approaches. The undergraduate program at Brown is designed to combine breadth in practical and theoretical computer science with depth in specialized areas. These areas range from traditional topics, such as analysis of algorithms, artificial intelligence, databases, distributed systems, graphics, mobile computing, networks, operating systems, programming languages, robotics and security, to novel areas including games and scientific visualization.

Requirements for the Standard Track of the Sc.B. degree

Prerequisites (1 or 2 courses)
Two semesters of Calculus, for example:
- MATH 0100 Introductory Calculus, Part II
- or MATH 0170 Advanced Placement Calculus

Concentration Requirements (15 courses)

Core-Computer Science:
Select one of the following introductory course Series: 2
Series A
CSCI 0150 & CSCI 0160 Introduction to Object-Oriented Programming and Computer Science and Introduction to Algorithms and Data Structures
Series B
CSCI 0170 & CSCI 0180 Computer Science: An Integrated Introduction and Computer Science: An Integrated Introduction
Series C
CSCI 0190 Accelerated Introduction to Computer Science (and an additional CS course not otherwise used to satisfy a concentration requirement; this course may be CSCI 0180, an intermediate-level course, or an advanced course)

Select three of the following intermediate-level courses, one of which must be math-oriented and one systems-oriented: 3
- CSCI 0220 Introduction to Discrete Structures and Probability (math)
- CSCI 0320 Introduction to Software Engineering (systems)
- CSCI 0330 Introduction to Computer Systems (systems)
- CSCI 1010 Theory of Computation (math) 3
- CSCI 1450 Probability and Computing (math) 4

Additional Computer Science Courses: 1
Select one theoretical computer science course: 2
- CSCI 1010 Theory of Computation 3
- CSCI 1510 Introduction to Cryptography and Computer Security
- CSCI 1550 Probabilistic Methods in Computer Science
- CSCI 1570 Design and Analysis of Algorithms
- CSCI 1590 Introduction to Computational Complexity
- CSCI 1760 Multiprocessor Synchronization
- CSCI 1950H Computational Topology
- CSCI 1820 Algorithmic Foundations of Computational Biology

Select one artificial intelligence course: 2
- CSCI 1410 Artificial Intelligence
- CSCI 1420 Machine Learning
- CSCI 1430 Computer Vision
- CSCI 1450 Probability and Computing
- CSCI 1460 Computational Linguistics

Select one computer science systems course: 1
- CSCI 1230 Introduction to Computer Graphics
- CSCI 1260 Compilers and Program Analysis
- CSCI 1270 Database Management Systems
- CSCI 1300 User Interfaces and User Experience
- CSCI 1320 Creating Modern Web Applications
- CSCI 1380 Distributed Computer Systems
- CSCI 1600 Real-Time and Embedded Software
- CSCI 1660 Introduction to Computer Systems Security
- CSCI 1670 Operating Systems
- CSCI 1680 Computer Networks
- CSCI 1730 Design and Implementation of Programming Languages
- CSCI 1900 csciStartup

Four additional advanced computer science or related courses. 4
Five of the 8 advanced courses must be from CS. In addition to those listed above, students can choose:
- CSCI 1250 Introduction to Computer Animation
- CSCI 1280 Intermediate 3D Computer Animation
- CSCI 1370 Virtual Reality Design for Science
- CSCI 1780 Parallel and Distributed Programming
- CSCI 1800 Cybersecurity and International Relations
- CSCI 1810 Computational Molecular Biology
- CSCI 1900 csciStartup
- CSCI 1950A Computational Modeling and Algorithmic Thinking
- CSCI 1950B Computational Topology and Discrete Geometry
- CSCI 1950N 2D Game Engines
- CSCI 1950R Compiler Practice
- CSCI 1950T Advanced Animation Production
- CSCI 1950U Topics in 3D Game Engine Development
- CSCI 1950X Software Foundations
- CSCI 1950Y Logic for Systems
- CSCI 1950Z Computational Methods for Biology
- CSCI 1951A Data Science
- CSCI 1951C Designing Humanity Centered Robots
- CSCI 1951F Computers, Freedom and Privacy: Current Topics in Law and Policy
- CSCI 1951G Optimization Methods in Finance
- CSCI 1951H Software Security Exploitation
- CSCI 1951J Interdisciplinary Scientific Visualization
- CSCI 1970 Individual Independent Study

A capstone course 5
Math: Two semesters of Mathematics or Applied Mathematics beyond MATH 0100/0170. One of these courses must be a linear algebra course
- MATH 0520 Linear Algebra
- MATH 0540 Honors Linear Algebra
- CSCI 0530 Directions: The Matrix in Computer Science

Total Credits 15
The requirements for the professional track include all those of the standard track, as well as the following:

Students must complete two two-to-four-month full-time professional experiences, doing work that is related to their concentration programs. Such work is normally done within an industrial organization, but may also be at a university under the supervision of a faculty member.

On completion of each professional experience, the student must write and upload to ASK a reflective essay about the experience addressing the following prompts, to be approved by the student’s concentration advisor:

- Which courses were put to use in your summer’s work? Which topics, in particular, were important?
- In retrospect, which courses should you have taken before embarking on your summer experience? What are the topics from these courses that would have helped you over the summer if you had been more familiar with them?
- Are there topics you should have been familiar with in preparation for your summer experience, but are not taught at Brown? What are these topics?
- What did you learn from the experience that probably could not have been picked up from course work?
- Is the sort of work you did over the summer something you would like to continue doing once you graduate? Explain.
- Would you recommend your summer experience to other Brown students? Explain.

Requirements for the Standard Track of the A.B. degree

**Prerequisites**

Two semesters of Calculus, for example:

- MATH 0100 Introductory Calculus, Part II
- MATH 0170 Advanced Placement Calculus

**Concentration Requirements (9 courses)**

Core Computer Science:

Select one of the following series:

**Series A**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 0150</td>
<td>Introduction to Object-Oriented Programming and Computer Science</td>
</tr>
<tr>
<td>CSCI 0160</td>
<td>and Introduction to Algorithms and Data Structures</td>
</tr>
<tr>
<td>CSCI 0170</td>
<td>Computer Science: An Integrated Introduction</td>
</tr>
<tr>
<td>CSCI 0180</td>
<td>and Computer Science: An Integrated Introduction</td>
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<tr>
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<td>Accelerated Introduction to Computer Science (and an additional CS course not otherwise used to satisfy a concentration requirement; this course may be CSCI 0180, an intermediate-level course, or an advanced course)</td>
</tr>
</tbody>
</table>

Three intermediate courses from the following, of which one must be math-oriented and one must be systems-oriented:

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<tr>
<td>CSCI 0530</td>
<td>Directions: The Matrix in Computer Science (math)</td>
</tr>
<tr>
<td>CSCI 1010</td>
<td>Theory of Computation (math)</td>
</tr>
<tr>
<td>CSCI 1450</td>
<td>Probability and Computing (math)</td>
</tr>
</tbody>
</table>

Four additional 1000-level courses in computer science or related areas are required. 3 of the 4 courses must be in CS.

**Total Credits**

1 CSCI 1010 may be used as either a math-oriented intermediate course or as an advanced course, but not as both. It was formerly known as CSCI 0510.

2 Three must be advanced courses (at the 1000-level or higher), the fourth may be either an intermediate-level course not used to satisfy a core requirement or an advanced course. These three courses must include a pair of courses forming a coherent theme. A list of pre-approved pairs may be found at the approved-pairs web page. You are not restricted to pairs on this list, but any pair not on the list must be approved by the director of undergraduate studies.

- CSCI 1450 may be used either as a math-oriented intermediate course or as an advanced course. CSCI 1450 was formerly known as CSCI 450; they are the same course and hence only one may be taken for credit. Applied Math 1650 may be used in place of CSCI 1450. However, concentration credit will be given for only one of Applied Math 1650 and CSCI 1450.

Requirements for the Professional Track of the A.B. degree

The requirements for the professional track include all those of the standard track, as well as the following:

Students must complete two two-to-four-month full-time professional experiences, doing work that is related to their concentration programs. Such work is normally done within an industrial organization, but may also be at a university under the supervision of a faculty member.

On completion of each professional experience, the student must write and upload to ASK a reflective essay about the experience addressing the following prompts, to be approved by the student’s concentration advisor:

- Which courses were put to use in your summer’s work? Which topics, in particular, were important?
- In retrospect, which courses should you have taken before embarking on your summer experience? What are the topics from these courses that would have helped you over the summer if you had been more familiar with them?
- Are there topics you should have been familiar with in preparation for your summer experience, but are not taught at Brown? What are these topics?
• What did you learn from the experience that probably could not have been picked up from course work?
• Is the sort of work you did over the summer something you would like to continue doing once you graduate? Explain.
• Would you recommend your summer experience to other Brown students? Explain.
Font Notice

This document should contain certain fonts with restrictive licenses. For this draft, substitutions were made using less legally restrictive fonts. Specifically:

Helvetica was used instead of Arial.

The editor may contact Leepfrog for a draft with the correct fonts in place.