

**Applied Mathematics-Computer Science**

The Sc.B. concentration in Applied Math-Computer Science provides a foundation of basic concepts and methodology of mathematical analysis and computation and prepares students for advanced work in computer science, applied mathematics, and scientific computation. Concentrators must complete courses in mathematics, applied math, computer science, and an approved English writing course. While the concentration in Applied Math-Computer Science allows students to develop the use of quantitative methods in thinking about and solving problems, knowledge that is valuable in all walks of life, students who have completed the concentration have pursued graduate study, computer consulting and information industries, and scientific and statistical analysis careers in industry or government. This degree offers a standard track and a professional track.

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

**Prerequisites - two semesters of Calculus, for example**

- MATH 0090  Single Variable Calculus, Part I
- MATH 0170  Single Variable Calculus, Part II (Accelerated)

**Concentration Requirements (17 courses)**

**Core-Math:**

- MATH 0180  Multivariable Calculus
- or MATH 0350  Multivariable Calculus With Theory
- MATH 0520  Linear Algebra
- or MATH 0540  Linear Algebra With Theory
- or CSCI 0530  Coding the Matrix: An Introduction to Linear Algebra for Computer Science

**Core-Applied Mathematics:**

- APMA 0350  Applied Ordinary Differential Equations
- APMA 0360  Applied Partial Differential Equations I
- or APMA 1160  An Introduction to Numerical Optimization
- or APMA 1170  Introduction to Computational Linear Algebra
- or APMA 1180  Introduction to Numerical Solution of Differential Equations
- or APMA 1690  Computational Probability and Statistics
- or APMA 1740  Recent Applications of Probability and Statistics

**Core-Computer Science:**

Select one of the following Series:

**Series A**

- CSCI 0150  Introduction to Object-Oriented Programming and Computer Science
- & CSCI 0160  and Introduction to Algorithms and Data Structures

**Series B**

- CSCI 0170  Computer Science: An Integrated Introduction
- & CSCI 0180  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 CS course, or a 1000-level course)

**Series D**


Select three of the following intermediate-level courses, one of which must be math-oriented and one systems-oriented. The intermediate courses must cover the requirements of the pathway chosen under additional requirements for CS.

- CSCI 0220  Introduction to Discrete Structures and Probability (math)
- CSCI 0320  Introduction to Software Engineering (systems)
- CSCI 0330  Introduction to Computer Systems (systems)
- or CSCI 0300  Fundamentals of Computer Systems
- or CSCI 1010  Theory of Computation (math)
- CSCI 1450  Advanced Introduction to Probability for Computing and Data Science (math)
- or APMA 1650  Statistical Inference I

Three 1000-level Computer Science courses. Two of these courses and the intermediate courses must satisfy one of the CS pathways. Non-CSCI courses are not allowed, even if they are approved as part of a CS pathway or allowed as part of a pure CS concentration. At most one of the three courses can be a designated arts, humanities, or social science oriented CS course (which includes CSCI 1250, 1280, 1370, 1800, 1805, 1870, but see here [https://cs.brown.edu/degrees/undergrad/concentrating-in-cs/concentration-requirements-2020/new-scb-requirements/] for the current list).

Three 1000-level Applied Mathematics courses approved by the concentration advisor, of which two should constitute a standard sequence or address a common theme. Typical sequences include: APMA 1200/1210 and APMA 1650 or 1655/1660. APMA 1910 cannot be used as an elective.

A capstone course: a one-semester course, taken in the student’s last undergraduate year, in which the student (or group of students) use a significant portion of their undergraduate education, broadly interpreted, in studying some current topic in depth, to produce a culminating artifact such as a paper or software project. The title and abstract of the artifact, along with the student’s and faculty-sponsor's names, will be placed in the CS website. The inclusion of a relevant image or system diagram is strongly encouraged. The complete text of the best artifacts of each class will be featured on the CS website. A senior thesis, which involves two semesters of work, may count as a capstone.

**Total Credits**

1 Students wishing to go directly from CSCI 0111 to CSCI 0180 (without CSCI 0112) will need to successfully complete additional exercises to receive an instructor override code for CSCI 0180. In 2020-21, these exercises will be offered within CSCI 0111. Students from prior CSCI 0111 offerings should contact Professor Fisler to arrange to do this work.

2 APMA 1650 may only be used if not being used as an Applied Math course.

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**Courses:**


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- CSCI 0330  Introduction to Computer Systems (systems)
- or CSCI 0300  Fundamentals of Computer Systems
- or CSCI 1010  Theory of Computation (math)
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1 Students wishing to go directly from CSCI 0111 to CSCI 0180 (without CSCI 0112) will need to successfully complete additional exercises to receive an instructor override code for CSCI 0180. In 2020-21, these exercises will be offered within CSCI 0111. Students from prior CSCI 0111 offerings should contact Professor Fisler to arrange to do this work.

2 APMA 1650 may only be used if not being used as an Applied Math course.
Requirements for the Professional Track of the Sc.B. degree.

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

Students must complete full-time professional experiences doing work that is related to their concentration programs, totaling 2-6 months, whereby each internship must be at least one month in duration in cases where students choose to do more than one internship experience. Such work is normally done at a company, but may also be at a university under the supervision of a faculty member. Internships that take place between the end of the fall and the start of the spring semesters cannot be used to fulfill this requirement.

On completion of each professional experience, the student must write and upload to ASK a reflective essay about the experience, 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.