Computational and Applied Mathematics

Program of Study

The Departments of Computer Science, Mathematics, and Statistics offer a BS in Computational and Applied Mathematics. The program is designed for students who intend to specialize in computational and/or applied mathematics, as well as students who want to acquire a strong quantitative background to be applied in such varied areas as physics, biological sciences, engineering, operations research, economics, and finance.

Summary of Requirements

General Education

One of the following sequences:
- CHEM 12100
  & CHEM 12200
  Honors General Chemistry I
  and Honors General Chemistry II (or higher)
  OR
- PHYS 13100-13200
  Mechanics; Electricity and Magnetism (or higher)

One of the following sequences:
- MATH 13100-13200
  Elementary Functions and Calculus I-II
  OR
- MATH 15100-15200
  Calculus I-II
  OR
- MATH 16100-16200
  Honors Calculus I-II

Total Units 400

Major

One of the following: *
- MATH 16300
- MATH 15910
  Introduction to Proofs in Analysis

One of the following sequences:
- MATH 20300-20400-20500
  Analysis in Rn I-II-III
  OR
- MATH 20700-20800-20900
  Honors Analysis in Rn I-II-III

One of the following:
- STAT 24300
  Numerical Linear Algebra
  or MATH 20250
  Abstract Linear Algebra

One of the following sequences:
- CMSC 12100-12200
  Computer Science with Applications I-II
- CMSC 15100-15200
  Introduction to Computer Science I-II
- CMSC 16100-16200
  Honors Introduction to Computer Science I-II
- CMSC 27100
  Discrete Mathematics
- CMSC 27200
  Theory of Algorithms
- MATH 27300
  Basic Theory of Ordinary Differential Equations

One of the following:
- MATH 21100
  Basic Numerical Analysis
- MATH 21200
  Advanced Numerical Analysis
- STAT 24400-24500
  Statistical Theory and Methods I-II

One of the following: **
- STAT 25100
  Introduction to Mathematical Probability
- STAT 25150
  Introduction to Mathematical Probability-A
- MATH 23500
  Markov Chains, Martingales, and Brownian Motion
- STAT 28000
  Optimization
Three approved electives (see Elective Courses below) 300
Total Units 1800

* Students with AP credit for PHYS 12100-12200 may substitute quantitative courses in other scientific departments with permission of the director of undergraduate studies; whether these other courses count as electives within the major or as general electives will be determined by the director of undergraduate studies.

+ Credit may be granted by examination.

§ Students who take MATH 13100-13200 or MATH 15100-15200 must also take the third quarter of the sequence as a prerequisite for MATH 15910; however, neither MATH 13300 nor MATH 15300 will be counted toward the major.

** Students may substitute a higher-level Computer Science course in discrete mathematics or algorithms with approval of the director of undergraduate studies.

*** Students who take STAT 25100 or STAT 25150 may take MATH 23500 as one of their electives with approval of the director of undergraduate studies. STAT 31200 may be substituted for MATH 23500.

**ELECTIVE COURSES**

Students will propose a coherent set of three courses to complete the major program. These will be chosen to complete a specialization. Possibilities include: preparation for PhD programs in applied mathematics, scientific computing, machine learning, operations research, economics and finance, physical sciences, or biological sciences. These are intended to be mathematical and computational courses that complement the program and at least at the mathematical level of the advanced classes in the required courses. The program must be approved by the undergraduate adviser, who will also serve as a resource for suggested mentors and programs in different areas.

**GRADING**

Students must receive quality grades in all courses required in the degree program. To qualify for the BS degree, students must complete the 18 courses above with (1) a GPA of 2.0 or higher and (2) no grade lower than C-.

**HONORS**

A BS with honors in Computational and Applied Mathematics requires an overall GPA of at least 3.0, a GPA in the required courses for the major of at least 3.25, and the completion of an honors paper written under the supervision of a faculty member and approved by the undergraduate adviser for the major. Students planning to complete an honors paper should submit a short proposal to the undergraduate adviser for approval by the Computational and Applied Mathematics board by the end of the student’s third year. The proposal must be approved by the board no later than the end of fifth week of the Autumn Quarter of the student’s fourth year.