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:		200
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:		200
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: +		100
MATH 16300	Honors Calculus III	
MATH 15910	Introduction to Proofs in Analysis	
One of the following sequences:		300
MATH 20300-20400-20500	Analysis in Rn I-II-III	
MATH 20700-20800-20900	Honors Analysis in Rn I-II-III	
One of the following:		100
STAT 24300	Numerical Linear Algebra	
or MATH 20250	Abstract Linear Algebra	
One of the following sequences:		200
CMSC 12100-12200	Computer Science with Applications I-II	
CMSC 14100 & CMSC 14200	Introduction to Computer Science I and Introduction to Computer Science II	
CMSC 15100-15200	Introduction to Computer Science I-II	
CMSC 16100-16200	Honors Introduction to Computer Science I-II	
CMSC 27100	Discrete Mathematics **	100
CMSC 27200	Theory of Algorithms	100
MATH 27300	Basic Theory of Ordinary Differential Equations	100
One of the following:		100
MATH 21100	Basic Numerical Analysis	
MATH 21200	Advanced Numerical Analysis	
STAT 24400-24500	Statistical Theory and Methods I-II	200
One of the following: ***		100
STAT 25100	Introduction to Mathematical Probability	
STAT 25150	Introduction to Mathematical Probability-A	
MATH 23500	Markov Chains, Martingales, and Brownian Motion	
STAT 28000	Optimization	100

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.