COMPUTATIONAL AND APPLIED MATHEMATICS AND STATISTICS, APPLIED STATISTICS TRACK (BS IN COMPUTATIONAL AND APPLIED MATHEMATICS AND STATISTICS)

CAMS Program

The CAMS (Computational and Applied Mathematics and Statistics) program is by nature inter-disciplinary. In CAMS, applications are the primary driver of the research agenda for scholarly activity. The CAMS program supports a collaborative, multi-disciplinary, and integrative approach to teaching and research in applied and computational mathematics, operations research, mathematical biology and statistics. Course work and research experiences in CAMS provide a strong base in both the knowledge and practical skills necessary to make important contributions to mathematics, industry and the sciences. There are two tracks within the CAMS program: Mathematical Biology and Applied Statistics.

Mathematical Biology aims at modeling natural, biological processes using mathematical techniques and tools. It has both practical and theoretical applications in biological research. Applying mathematics to biology has a long history, but only relatively recently has there been an explosion of interest in the field. Some reasons for this include: the explosion of data-rich information sets, due to the genomics revolution, which are difficult to understand without the use of analytical tools; recent development of mathematical tools such as chaos theory to help understand complex, nonlinear mechanisms in biology; an increase in computing power which enables calculations and simulations to be performed that were not previously possible; and an increasing interest in computer experimentation due to the complications involved in human and animal research.

The Applied Statistics Track provides a major option for undergraduates with an interest in statistics, “big data”, and actuarial science. As humans have developed cheaper and smaller sensors, web cameras and other data collection devices, the amount of data available to be analyzed and understood has exploded. Statistics is the mathematical science that pertains to the collection, analysis, interpretation, explanation, and presentation of data. Because of its empirical roots and its focus on applications, statistics is typically considered a distinct mathematical science rather than a branch of mathematics.

The Applied Statistics major gives students a rigorous training in the highly-interdisciplinary modern practice of statistics. The major draws upon a foundation of topics in mathematics and computer science to build a core specialization in applied and theoretical statistics and enriches this statistical knowledge with cross-disciplinary electives. Possible areas of focus within the major include: econometrics, data science, general applied statistics, and actuarial science.

Course Requirements

Major Writing Requirement

The upper-division writing requirement is satisfied by one of the following ways:

- Completion of ECON 308 Econometrics or ECON 380 Experimental Economics or MATH 352 Statistical Data Analysis or MATH 450 Statistical Learning with Survival Data or MATH 455 Statistical Learning or MATH 459 Topics in Statistics with a grade of C- or better, or
- Completion of CAMS 495 Honors and CAMS 496 Honors , which requires the writing of an Honors thesis.

Major Requirements

Code	Title	Hours
MATH 111	Calculus I	4
or MATH 131	Calculus I for Life Sciences	
MATH 112	Calculus II	4
or MATH 132	Calculus II for Life Sciences	
MATH 214	Foundations of Math	3
Major Computing Requirement		
CSCI 141	Modern Programming Fundamentals	4
CSCI 241	Data Structures	3
or MATH 240	Programming for the Mathematical Sciences	
Major Mathematics Requirement		
MATH 109	Linear Algebra	3
MATH 109L	Computational Linear Algebra Lab	1
and		
MATH 212	Introduction to Multivariable Calculus	3-4
or MATH 213	Multivariable Calculus for Science and Mathematics	
Major Statistics Requirement		
MATH 451	Probability	3
MATH 452	Mathematical Statistics	3
Select one of the following:		3
CSCI 416	Fundamentals of Artificial Intelligence/Machine Learning	
CSCI 688	Topics in Computational Operations Research (Linear Regression) [1]	
ECON 408	Time Series Econometrics	
MATH 352	Statistical Data Analysis	
MATH 450	Statistical Learning with Survival Data	
MATH 455	Statistical Learning	
Electives		
Select 24 elective credits onsisting of: 9-15 credits of Statistics and Math electives; and 9-15 credits of cross-disciplinary electives from the following:		24
Statistics and Mathematics Electives:		
Statistics Courses:		
MATH 351	Probability and Statistics for Scientists	
MATH 352	Statistical Data Analysis	
MATH 353	Advanced Statistical Data Analysis	
MATH 424	Operations Research: Stochastic Models	
MATH 450	Statistical Learning with Survival Data	
MATH 455	Statistical Learning	

	MATH 459	Topics in Statistics
	MATH 465	Mathematics of Financial Economics
Mathematics Courses:		
	MATH 309	Theory of Vector Spaces
	or MATH 408	Matrix Analysis
	MATH 311	Elementary Analysis
	MATH 323	Operations Research: Deterministic Models
	MATH 410	Topics in Mathematics (Subject to approval of CAMS Applied Statistics Track Director)
	MATH 413	Introduction to Numerical Analysis I
Cross-disciplinary Electives:		
Computer Science Courses:		
	CSCI 301	Software Development
	CSCI 303	Algorithms
	CSCI 416	Fundamentals of Artificial Intelligence/Machine Learning
	CSCI 420	Special Topics in Computer Science (depending on material.)
	CSCI 421	Database Systems
	CSCI 426	Simulation
	CSCI 668	Reliability
	CSCI 678	Analysis of Simulation Models [4]
	CSCI 688	Topics in Computational Operations Research (Linear Regression) [4]
	CSCI 688	Topics in Computational Operations Research (Design of Experiments) [4]
	CSCI 688	Topics in Computational Operations Research (Topics in Computational Operations Research) [4]
Economics Courses:		
	ECON 308	Econometrics
	ECON 380	Experimental Economics
	ECON 400	Topics in Economics (subject to approval of CAMS Applied Statistics Track Director)
	ECON 407	Cross Section Econometrics
	ECON 408	Time Series Econometrics
	ECON 414	Bayesian Econometrics
Total Hours		**58-59**

[1] For permission to take CSCI 688 or any other graduate level course, please contact the Department for more information.

Note

Credit for CAMS 495 Honors-CAMS 496 Honors Honors, with faculty advisor approved by the Applied Statistics Track Director, may substitute for any two elective courses, as long as the two courses are not in the same category. In addition, with advisor approval, students may replace one elective course with one or more independent study or research credits, which must total at least 3 credits.