Master of Science

Computational and Applied Mathematics with a Concentration in Mathematics of Data Science (MS)

The M.S. candidate must complete a minimum of 36 normal credit hours of course work designed to fulfill an option in either applied mathematics, statistics or biostatistics. Each option includes 18 credit hours of Core Courses. With approval of the graduate program director, up to six of the 36 credits may be chosen from a field of application (e.g. oceanography, ecosystem analysis, computer science, economics, health sciences, operations research, physics and engineering mechanics) in which the student applies analytical and numerical techniques to another discipline. All programs of study must be approved by the graduate program director, and substitutions may be made only with their approval.

Concentrations

- Applied Mathematics: Students electing the concentration in Applied Mathematics will pursue course work in advanced mathematical analysis, differential equations, numerical methods, transform methods and data science. They will take electives in other methods of applied mathematics, or in an application area. A Master's Project will bring them in contact with the research frontier.
- Statistics: Students electing the concentration in Statistics will pursue course work in mathematical statistics, advanced regression analysis including responses surfaces, factorial designs, time series, advanced statistical computing. They will take electives in other areas of statistics and biostatistics. A Modeling Project involving statistical analysis of real-life data is required.
- Biostatistics Concentration: Students electing the concentration in Biostatistics will pursue course work in mathematical statistics, and biostatistical methods including survival analysis, clinical trials, categorical and longitudinal data analysis. They will take electives in other areas of statistics and biostatistics. A Modeling Project involving statistical analysis of biomedical or health care data is required.
- Mathematics of Data Science: Students electing the concentration in Mathematics of Data Science will pursue course work in data science including mathematical statistics, regression and time series analysis, mathematical foundation of machine learning and genome data science. A Master's Project will bring them in contact to the real world applications.

Admission

An applicant to the master's program in computational and applied mathematics should have a bachelor's degree in mathematics, statistics, computer science, or an application area with a strong mathematics component (e.g., physics or engineering). Undergraduate mathematics preparation should include course work in linear algebra, advanced calculus, differential equations, probability, real analysis, and numerical methods. Undergraduate averages of 2.80 overall (4.00 scale) and 3.00 in the major and related mathematics courses are required.

A student who does not fully meet all requirements for admission as a regular graduate student may be allowed, with permission of the program director, to enroll as a provisional graduate student. Students lacking adequate preparation will be required to make up their deficiencies by taking appropriate undergraduate courses in addition to those specified for the master's program.

A formal application form, official transcripts, and two letters of recommendation should be forwarded to the Office of Admissions. It is recommended that applicants supply Graduate Record Examination aptitude scores.

The following material should be mailed directly to the director of the graduate program in computational and applied mathematics, Department of Mathematics and Statistics: a list of all mathematics courses taken and other courses closely allied to the applicant's primary interests in applied math or statistics along with the texts used (titles and authors), chapters studied or topics covered, and grades. This information should be enclosed with the financial aid application (if the applicant is submitting one).

Students may enroll in the program on either a full-time or part-time basis. Courses are offered on a regular basis during the late afternoon and early evening hours which allows part-time students to obtain master's degrees or post-master's graduate credit.

Curriculum Requirements

Computational and Applied Mathematics

Common Core Courses		
BDA 501	Programming Languages for Data Science	3
BDA 511	Introduction to Machine Learning	3
BDA 531	Modern Statistical Methods for Big Data Analytics	3
MATH 616	Computational Linear Algebra	3
STAT 625	Probability Theory for Data Science	3
MATH 632	Master's Project	3
or STAT 632	Master's Project	
or BDA 632	Computational Data Analytics Project	
Computational and Applied Mathematics Core Courses		**18**
Concentration Total		**18**
Total Credit Hours		**36**

Mathematics of Data Science

BDA 611	Mathematical Foundations of Machine Learning	3
BDA 620	Large-Scale Optimization	3
BDA 640	Genomic Data Science	3
BDA 745	Transform Methods for Data Science	3
STAT 626	Statistical Theory for Data Science	3
STAT 637	Advanced Regression and Time Series	3
or MATH 622	Numerical Solutions to Differential Equations	
or BDA 721	High-Dimensional Statistics	
Total Credit Hours		**18**

Additional Requirements

Master's Project Requirement

The M.S. candidate will be assigned to a faculty advisor for a master's project. Each student will enroll in MATH 632, STAT 632 and BDA 632 to complete his/her project. The master's project is designed not only to broaden students' analytical competency but also to enhance students' writing and reporting skills on a technical subject.

Colloquium Requirement

In order to develop an appreciation for the breadth of contemporary research in applied mathematics and statistics, all M.S. candidates will attend at least 80% and succinctly summarize and evaluate in writing at least eight professional seminars given by research faculty or external seminar visitors. The Richard F. Barry Colloquium Series is run by the department throughout the academic year. The department also conducts seminars jointly with other departments.