APPLIED MATHEMATICS, MS

Degree: Master of Science (MS)
Field of Study: Applied Mathematics

Program Overview
A student must satisfy all of the general requirements of the School of Graduate Studies as well as the more specific requirements of the department to earn a master's degree. Each graduate student is assigned an academic advisor upon matriculation. The academic advisor's primary responsibility is to help the student plan an appropriate and sufficiently broad program of coursework and study that will satisfy both the degree requirements and the special interests of the student. With the aid of the academic advisor, each student must present a study plan indicating how they intend to satisfy the requirements for a graduate degree. Master's students completing a thesis as part of their program will also form a thesis committee, chaired by their research advisor, to advise on and evaluate both the thesis and its oral defense.

Graduate Policies
For graduate policies and procedures, please review the School of Graduate Studies section of the General Bulletin.

Program Requirements
The department offers specialized programs in applied mathematics. For each of the programs, there is a minimum requirement of 30 credit hours of coursework, at least 18 of which must be at the 400 level or higher. Students in the program must complete coursework requirements in each of the following groups:

- At least 15 hours of courses designated MATH
- At least 6 hours of courses not designated MATH
- 6 hours of thesis work (see below) or successful completion of a comprehensive exam

Given the great diversity of topics used in applications, there cannot be a large common core of requirements for the MS in applied mathematics. Still, all students pursuing this degree are strongly advised to take MATH 431 and MATH 441. In addition, to add breadth to the student's education, the set of courses taken within the department must include three credit hours of approved coursework in at least three of the following seven breadth areas. Examples of acceptable courses in each area are listed below; other courses require approval of a student petition by the department graduate committee. Although some courses are listed in multiple areas, a course may be used to satisfy only one breadth area requirement.

Applied Mathematics Breadth Areas

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>MATH 471</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>MATH 423</td>
<td>Introduction to Real Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 405</td>
<td>Advanced Matrix Analysis</td>
<td>3</td>
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Probability and its Applications:

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<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>MATH 439</td>
<td>Bayesian Scientific Computing</td>
<td>3</td>
</tr>
<tr>
<td>MATH 491</td>
<td>Probability I</td>
<td>3</td>
</tr>
</tbody>
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Numerical Analysis and Scientific Computing:

- MATH 431 Introduction to Numerical Analysis I
- MATH 432 Numerical Differential Equations
- MATH 433 Numerical Solutions of Nonlinear Systems and Optimization

Differential Equations:

- MATH 435 Ordinary Differential Equations
- MATH 445 Introduction to Partial Differential Equations
- MATH 449 Dynamical Models for Biology and Medicine

Inverse Problems and Imaging:

- MATH 439 Bayesian Scientific Computing
- MATH 440 Computational Inverse Problems
- MATH 473 Introduction to Mathematical Image Processing and Computer Vision

Logic and Discrete Mathematics:

- MATH 406 Mathematical Logic and Model Theory
- MATH 408 Introduction to Cryptology

Life Science:

- MATH 419 Applied Probability and Stochastic Processes for Biology
- MATH 441 Mathematical Modeling
- MATH 449 Dynamical Models for Biology and Medicine
- MATH 478 Computational Neuroscience

* Not suitable for credit towards the PhD requirements.

Other suitable courses for students in applied mathematics include:

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<tr>
<th>Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>MATH 424</td>
<td>Introduction to Real Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>MATH 425</td>
<td>Complex Analysis I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 427</td>
<td>Convexity and Optimization</td>
<td>3</td>
</tr>
<tr>
<td>MATH 444</td>
<td>Mathematics of Data Mining and Pattern Recognition</td>
<td>3</td>
</tr>
<tr>
<td>MATH 492</td>
<td>Probability II</td>
<td>3</td>
</tr>
</tbody>
</table>

The student must pass a comprehensive oral examination on three areas, two of which must be on the list of breadth areas (although no particular courses are specified). The third area for the examination may be any approved subject.

A student in the MS program in applied mathematics may substitute the comprehensive examination requirement with an expository or original thesis, which will count as 6 credit hours of coursework. The thesis will be defended in the course of an oral examination, during which the student will be questioned about the thesis and related topics. These two variants correspond to the graduate school's Master's Thesis and Master's Non-Thesis options.