Mathematical Sciences (MASC)

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Degrees Conferred:
M.S. (MATH)  
Ph.D. (MATH) with concentrations in Mathematics and Statistics  
M.A. in Secondary Mathematics (SMTH)  
M.S. in Statistics (STAT) (See Statistics)

Primary Areas of Faculty Research: Analysis, algebra, geometric topology, numerical analysis, statistics.

Prerequisites to Degree Program: Prospective candidates for the Master of Science degree in Mathematics are expected to have completed a program equivalent to that required by the department for a B.S. degree, as set forth in the current catalog of the Fulbright College of Arts and Sciences. Deficiencies may be removed either by taking the appropriate undergraduate courses or by examination. In addition to the application for admission to the Graduate School and the transcripts required for Graduate School admission, applicants for admission to the degree programs of the Department of Mathematical Sciences must submit a) three letters of recommendation from persons familiar with the applicant’s previous academic and professional performance and b) official scores from the Graduate Record Examination (General Test).

The degree of Master of Science is intended for collegiate teachers of mathematics, non-teaching professional mathematicians, and those who desire to continue advanced study.

Requirements for the Master of Science Degree: This degree is offered under two separate options, a general option and a computational mathematics option. The general option is intended for students who plan to be collegiate teachers of mathematics, continue advanced study in mathematics, or obtain a broad background for preparation as a non-teaching professional mathematician. The computational mathematics option is intended for students who intend to specialize in computational and applied mathematics in preparation for professional employment in an interdisciplinary or computationally intensive environment.

The program of a candidate will be determined in conference with the candidate’s graduate adviser. A comprehensive examination must be passed by each candidate for the Master of Science degree. It should be taken near the end of the last semester of residence. At least four weeks prior to the scheduled date, students must notify the department of their intention to take the examination. No student may take the comprehensive examination more than three times. MATH 5001, MATH 504V, MATH 507V, MATH 5013, and MATH 5033 are not applicable to the Master of Science degree in mathematics. The program will include at least two semesters of one-hour credit in MATH 510V Mathematics Seminar.

All candidates must complete a minimum of 32 semester hours of approved graduate course work, including 12 semester hours in mathematics at the 5000-6000 level (excluding MATH 510V). All selected courses are subject to the approval of the Graduate Committee.

Students in the general option may include up to nine semester hours of graduate work in courses outside the department. The comprehensive examination for the general option will include material covered in graduate course work.

The candidate for the computational mathematics option must include at least six but not more than twelve semester hours of graduate work in courses outside of mathematics. The comprehensive examination for the computational mathematics option will include material covered in six semester hours of graduate courses in each of numerical analysis, applied mathematics, and analysis.

Requirements for the Master of Arts Degree with a Major in Secondary Mathematics: This program is designed for secondary school teachers of mathematics. It requires 30 semester hours of graduate work.

Prospective candidates for the Master of Arts degree in secondary mathematics are expected to have earned a baccalaureate degree or equivalent with a major in a mathematical science (mathematics, statistics, operations research, or computer science), engineering, or a physical science, and credit in courses equivalent to MATH 2564, MATH 3083, MATH 3113, and MATH 3773.
The program has four components in which to earn a minimum of 30 semester hours of credit:

1. Graduate course work in mathematics content and content-based pedagogy. At least 12 hours of credit in graduate course work specifically designed for preparation for teaching secondary mathematics. The content will include probability, statistics, algebra, geometry, applied mathematics and advanced calculus with connections to secondary school mathematics. At least one of the courses must be in probability and statistics; one in algebra; and one in advanced calculus. Candidates will sit for examinations in three of the following areas: probability and statistics; algebra; geometry; advanced calculus; and mathematics education. Candidates will also present a portfolio describing the body of work with samples of student work and explanations of connections to secondary school mathematics. These courses are to be selected from:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>MATH 4103</td>
<td>Finite Dimensional Vector Spaces (Irregular)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 4153</td>
<td>Mathematical Modeling (Irregular)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 4353</td>
<td>Numerical Linear Algebra (Sp)</td>
<td>3</td>
</tr>
<tr>
<td>STAT 4003</td>
<td>Statistical Methods (Sp, Fa) (with corequisite STAT 4001L)</td>
<td>3</td>
</tr>
<tr>
<td>STAT 5103</td>
<td>Introduction to Probability Theory (Fa)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 5001</td>
<td>Connections to School Mathematics (Irregular)</td>
<td>1</td>
</tr>
<tr>
<td>MATH 5013</td>
<td>Abstract Algebra with Connections to School Mathematics (Irregular)</td>
<td>3</td>
</tr>
<tr>
<td>MATH 5033</td>
<td>Advanced Calculus with Connections to School Mathematics Teaching (Irregular)</td>
<td>3</td>
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</tbody>
</table>

Other graduate mathematics or statistics courses may be used in place of these courses with the approval of the student’s committee.

2. Independent study and research in mathematics or mathematics education. From three to six hours of credit is available in independent study and research under the direction of mathematical sciences faculty. The results will be evidenced by a report roughly equivalent to a master’s thesis.

3. Advanced work in professional teacher preparation. Up to six hours of credit in MATH 507V is available for advanced work in preparation for teaching AP calculus, AP statistics, International Baccalaureate (IB) mathematics, or for achieving National Board Certification in (Adolescence and Young Adulthood) Mathematics. Other professional development activities with quality control features similar to those of the AP, IB, and National Board programs may be presented for consideration for credit. All such work must be sanctioned by the sponsoring organizations.

4. Graduate courses in education. Up to six hours of credit is available in graduate courses in education. The student’s committee must approve the courses. Recommended courses include:

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CIED 5483</td>
<td>Teaching Mathematics (Irregular)</td>
<td>3</td>
</tr>
<tr>
<td>CIED 6013</td>
<td>Curriculum Development (Fa)</td>
<td>3</td>
</tr>
<tr>
<td>CIED 6023</td>
<td>Instructional Theory (Irregular)</td>
<td>3</td>
</tr>
<tr>
<td>CIED 6033</td>
<td>Content Specific Pedagogy (Irregular)</td>
<td>3</td>
</tr>
<tr>
<td>CIED 6043</td>
<td>Analysis of Teacher Education (Irregular)</td>
<td>3</td>
</tr>
<tr>
<td>CIED 6053</td>
<td>Program Assessment (Even years, Fa)</td>
<td>3</td>
</tr>
</tbody>
</table>

Other graduate courses in education may be used in place of these courses with the approval of the student’s advisory committee.

If allowed by Graduate School rules, credit previously earned may be applied to the requirements for this degree with the approval of the student’s advisory committee.

Each person receiving the Master of Arts degree in secondary mathematics must pass a written examination in three of the following areas: probability and statistics; algebra; geometry; advanced calculus; and mathematics education. No student will be allowed to take the examination more than three times. Candidates will also present a portfolio describing the body of work with samples of their work as students and explanations of connections to secondary school mathematics.

Requirements for the Doctor of Philosophy Degree: Candidates for the degree of Doctor of Philosophy with a major in mathematics will be required to earn not less than 60 semester hours of course credit beyond the bachelor’s degree in mathematics and closely related fields. The number of hours and the courses for each student will be determined by the advisory committee. The candidate must fulfill the course requirements for the Master of Science degree in mathematics.

The basic requirement for the Ph.D. degree is the preparation of an acceptable dissertation. This dissertation must demonstrate the candidate’s ability to do independent, original, and significant work in mathematics. It is required that this dissertation possess the degree of excellence of research papers ordinarily published in the leading mathematical journals.

A comprehensive examination is given each year during the weeks preceding the beginning of the fall and spring semesters. This examination is taken by all students in the graduate program who have completed the course requirements for the M.S. degree. The prospective candidate for the Ph.D. will be allowed to take the examination at most two times. A second failure to qualify eliminates a student from the graduate program in mathematics. After qualifying, a candidacy examination will be given covering the intended areas of specialization beyond the level of the qualifying comprehensive examination. It may be repeated once.

In addition to extending knowledge by personal reading and research, a doctoral candidate in mathematics will normally communicate knowledge to others. Therefore each student in the Ph.D. program is required to acquire the equivalent of one semester of full-time experience in teaching; this requirement may be fulfilled by part-time experience over several semesters. Typically, teaching assistantship appointments will satisfy this requirement, but other similar experience may qualify as approved by the department.