

DEGREE REQUIREMENTS

Formal degree requirements are summarized below. Generally speaking, requirements for the M.S. involve course work and the Basic Exam, as well as a project in the case of the M.S. in Applied Mathematics or the Statistics option. Requirements for the Ph.D. involve coursework, Basic and Advanced Exams, thesis and defense.

Coursework requirements may be waived by the GAC, if in its judgment the student has taken acceptable equivalents elsewhere. In some cases, strong performance on one of the written exams might be accepted as a substitute for taking a course. In other cases it may be possible to substitute an alternative course for a required course. To request a waiver of a course requirement, a student should submit the waiver form, available in 1521E, explaining the course to be waived, the alternative course to be taken, if any, and the justification for the request. The GAC will return a decision granting or denying the waiver, and a copy will be placed in the student's file.

Note: One credit seminars may not be used to satisfy the minimum "hours of coursework" below.

Students are reminded that they must complete all degree requirements established by the Graduate School. **Consult the Graduate School Handbook!** It is available online at

<http://www.umass.edu/gradschool/policies-forms>.

Degree application forms for an M.S. or Ph.D. can be picked up in the Office of Degree Requirements, Room 534 Goodell Building. The student must fill out the form, pay all fees, and return the form to Room 1521E for verification and signatures of the Graduate Program Director and the Department Head. The Graduate Program secretary will then submit the form and a covering letter to the Office of Degree Requirements.

As a requirement for the Ph.D. degree, a student must gain experience in communicating the subject by participating in the instruction of students. One way to satisfy this requirement is to perform the duties ordinarily assigned to a Teaching Assistant. However, the precise type and extent of activities needed to satisfy the requirement will be determined for each individual Ph.D. candidate by the GAC (or such persons to whom it may delegate this function), taking into account such factors as the student's academic progress and readiness to perform classroom teaching.

M.S. Requirements

M.S. in Mathematics

1. The student must complete 30 hours of coursework with grades of C or better, including at least 24 hours with grades of B or better. In addition, the student must have at least an overall B average. (**Note:** Any course outside the Department or numbered less than 600 must have the Graduate Program Director's approval to be counted toward the 30 hours. No more than four courses below the 600 level may be counted, and no more than 3 hours per course may be counted toward the 30 hours.)
2. The required 30 hours must include 21 hours of Mathematics and Statistics courses (at least 18 hours numbered above 600), normally including at least four of the courses: Math 611, 621, 623, 645, 651, 671, Stat 607.
3. The student must pass three Basic Exams at the Master's level, including Advanced Calculus/Linear Algebra and two out of the following four parts: Complex Analysis, Numerics, Probability, and Topology.

M.S. in Applied Mathematics

1. The student must complete 30 hours of coursework with grades of C or better, including at least 24 hours with grades of B or better. In addition, the student must have at least an overall B average. (**Note:** Any course outside the Department or numbered less than 600 must have the Graduate Program Director's approval to be counted toward the 30 hours. No more than four courses below the 600 level may be counted, and no more than 3 hours per course may be counted toward the 30 hours.)
2. The required 30 hours must include 21 hours of Mathematics and Statistics courses (at least 18 hours numbered above 600), with at least one semester each of numerical analysis, statistics, and mathematics applied to other disciplines.
3. The student must complete a project in Applied Mathematics under the guidance of a faculty member. This project must have prior approval of the M.S. Applied Mathematics advisor and normally involves 3 credit hours (the credits earned may be used to satisfy the 18 hour

requirement in (2)). The project might involve reading some research papers, analyzing some real data, and doing some computer programming.

4. The student must pass two Basic Exams: the Numerics exam and the Applied Mathematics MS Exam.

M.S. in Mathematics (Statistics Option)

1. The student must complete 30 hours of coursework, with grades of C or better, including at least 24 hours with grades of B or better. In addition, the student must have at least an overall B average. (Note: Any course outside the Department or numbered less than 600 must have the Graduate Program Director's approval to be counted toward the 30 hours. No more than four courses below the 600 level may be counted, and no more than 3 hours per course may be counted toward the 30 hours.)
2. The required 30 hours must include: (a) at least 18 hours of Mathematics and Statistics courses, including Stat 697R (Regression Analysis), Stat 526 (Design of Experiments), Stat 607-608 (Mathematical Statistics I, II), and Stat 705 (Linear Models I); and (b) at least three other courses which are either Statistics courses numbered above 600, within the Department, or approved courses outside the Department. Only one of these three courses can be from outside the Department, and the outside course requires prior approval by the statistics coordinator. Students are expected to have a background in advanced calculus (at the level of Math 425) and in linear algebra. Students with weak background in these areas will be required to take appropriate courses at an early stage of their graduate study here.
3. The student must complete a project in Statistics under the guidance of a faculty member. This project must have prior approval of the Statistics advisor and normally involves 3 credit hours (the credits earned may be used to satisfy the 30 hours requirement in (1)), but cannot be used to satisfy the requirement of 24 hours with grades of B or better.
4. The student must pass two Basic Exams: the Basic exam in Probability and the Basic Statistics exam.

Ph.D. Requirements

Dissertation Committee, Prospectus, Dissertation Credits

The Ph.D. candidate must form a **dissertation committee**, consisting of a thesis advisor together with three other graduate faculty members (one of

whom must be from another department on campus). Students are encouraged to form their dissertation committee as soon as possible after selecting their thesis advisor.

The committee should advise the student about any expected need (in thesis research or later) for reading material in a foreign language such as French or German.

A written **prospectus** of the proposed thesis research must be drawn up with the advisor's help and signed by all committee members. This prospectus must be submitted to the graduate school at least **seven** months before the thesis defense takes place. A \LaTeX form for this purpose may be obtained from the Graduate Program Secretary.

After passing the advanced exams and forming the thesis committee, the student may enroll for **dissertation credits**: a minimum of **18** such credits are required. In exceptional cases the Graduate Program Director may allow a student to sign-up for dissertation credits after choosing a thesis advisor but before the dissertation committee has been formed.

Ph.D. in Mathematics

1. The student must complete successfully 36 hours of coursework, including three of the full year sequences (Math 611–612, 623–624, 645–731, 671–703, Stat 607–608), together with the first semester of the remaining two. (Math 651, Numerical Analysis I, may be substituted for either Math 645 or Stat 607 to fulfill the latter requirement. The Graduate Program Director may allow a student to substitute an advanced course such as Stat 605 for the basic course in the same area).
2. The 36 hours of coursework must include Math 621 (Complex Analysis).
3. The student must pass three Basic Exams at the Ph.D. level, including Advanced Calculus/Linear Algebra and two out of the following four parts: Complex Analysis, Numerics, Probability, and Topology.
4. The student must pass two Advanced Exams chosen from among Algebra, Analysis, Differential Equations, and Geometry.
5. The student must write a satisfactory dissertation and pass a final oral examination (primarily a defense of the dissertation), and must satisfy all other requirements of his or her dissertation committee. The student is required to register for a minimum of 18 dissertation credits.

Ph.D. in Mathematics (Statistics Option)

1. The student must complete successfully 36 hours of coursework, including Math 523 (or Math 623, or Math 605), Stat 597A, 607, 608, 697R, 705, and 725.
2. The student must also complete five elective courses, including two 600 level statistics courses, and 3 courses of the student's choice, which require prior approval by the statistics coordinator.
3. The student must pass three Basic Exams at the Ph.D. level: the Applied Statistics exam, and the Basic Probability and Basic Statistics exams, which cover the material from Stat 597A and Stat 697R, Stat 607 and Stat 608 respectively.
4. The student must pass the Advanced Exam in advanced statistics and the oral literature-based exam. The advanced statistics exam version I is based on advanced topics in Stat 607 and Stat 608, and topics from Stat 705. The advanced statistics exam version II is based on advanced topics in Stat 607 and Stat 608, and topics from Stat 725. The two versions are offered in alternate years depending which of Stat 705 and Stat 725 is offered in a year.

For the literature-based exam, students need to choose a topic from the list of topics in the **Axioms** and form an exam committee that includes the primary faculty of that topic and two secondary faculty. Students are then given reference papers on the chosen topic to read. The exam is in the form of oral presentation and responding questions in front of the exam committee. A student may select a non-standard exam topic, in which case, the student must have the agreement of their committee members on the topic and the reading list.

In order to take the literature-based exam, a student is responsible for forming an exam committee by the end of September for a January exam, or by the last day of spring classes for an August exam. Decisions on passing the exam are by unanimous consent of the exam committee. A student who does not pass will have one more chance to pass the literature-based exam. The second attempt may be on the same or a different topic.

5. The student must write a satisfactory dissertation and pass a final oral examination (primarily a defense of the dissertation), and must satisfy all other requirements of his or her dissertation committee. The student is required to register for a minimum of 18 dissertation credits.