

# M.S. in Mathematics

## Program Guidelines

The Master of Science degree in Mathematics at Montana State University is designed to prepare students for conducting independent research in mathematics, either by pursuing further graduate work or pursuing a professional career in academia, business, industry or government. Upon entrance, each student meets with the department's Graduate Program Committee to discuss career objectives and first year course work. During the second semester in the program the student forms a Graduate Committee and together, they outline the student's degree program.

## Program Admission Requirements

An undergraduate GPA of at least 3.00 (on a 4.00 scale) is required for admission. The prerequisites for the master's degree program in mathematics consist of the following course work, or their equivalent if the student is coming from another institution. Please refer to the MSU course description within each link for a list of topics covered in the course:

1. Four semesters of Calculus through Differential Equations,
2. Linear Algebra (M 333),
3. A proof-based course in Advanced Calculus or Introduction to Analysis I (M 383). A second semester of Analysis is preferred, but not required.

**International Students:** Please refer to The Graduate School's page describing the International Application Process ([http://www.montana.edu/gradschool/policy/admissions\\_intl.html](http://www.montana.edu/gradschool/policy/admissions_intl.html)) for a detailed description of additional requirements for admission including those on how to provide evidence of English proficiency.

- In order to be eligible for admission to the program, the department requires that the applicant demonstrate a minimum score on one of the following TOEFL (<http://www.toefl.org/>): 80-internet-based [iBT] or 550-PBT, IELTS (<http://www.ielts.org/>): 6.5: 54, or Duolingo (<http://englishtest.duolingo.com/>): 120.
- In order to be eligible for a GTA position, the applicant must provide documentation of a minimum score of TOEFL (<http://www.toefl.org/>): 93-internet-based [iBT] or 550-PBT, IELTS (<http://www.ielts.org/>): 7.0: 65, or Duolingo (<http://englishtest.duolingo.com/>): 135

## Program Requirements

The Master of Science degree can include a thesis or not, and each plan is described below. In the thesis plan, the student is required to complete course work, pass a comprehensive exam, and to write and defend a thesis that is based on original scholarship. In the non-thesis plan, the student is required to complete course work and pass a comprehensive exam.

### Non-Thesis Plan

This plan requires both completing the course work and passing the written comprehensive exam. At least 30 credits of course work are required. Of these, at least 18 credits must be numbered 500 or higher. Regardless, all of the following core courses must be completed:

M 503	Advanced Linear Algebra	3
M 504	Abstract Algebra	3
M 505	Principles of Mathematical Analysis	3
M 511	General Topology	3

Additionally, students must fulfill a breadth requirement by completing at least two of the following:

M 441	Numerical Linear Algebra & Optimization
M 450	Applied Mathematics I
M 454	Introduction of Dynamical Systems I
STAT 421	Probability Theory

- \* Either or both of these two required courses may be replaced by the corresponding semester of the appropriate 500 level course: M 581 Numerical Solution of Partial Differential Equations I, M 560 Methods of Applied Mathematics I, M 595 Dynamical Systems I, M 507 Mathematical Optimization, M 508 Mathematics of Machine Learning or STAT 501 Intermediate Probability and Statistics, respectively. Any other exceptions to the course requirements must be approved by the student's graduate committee and adhere to the minimum policy requirements set forth in the Graduate Handbook.

Requirements for the written comprehensive exam are listed below.

### M.S. in Mathematics Comprehensive Exam

The M.S. comprehensive exam for mathematics is a written exam administered in two disjoint 3-hour components, one on Analysis (M 505) and one on Linear Algebra (M 503). Each component is graded as Ph.D. pass, M.S. pass, or fail. In order to pass the written comprehensive exam, a student must pass each component at the M.S. pass or Ph.D. pass level within two examination periods. The examinations are given in August and January with specific dates and times for each component determined by the department. Typically, the student takes the exams in August before their third semester of study.

If the student fails one or more components in the first examination period, a failure will be reported to The Graduate School. The student must then pass the remaining required components in a second examination period. If the student has not passed the remaining required components after the second examination period, a second failure of the comprehensive exam will be reported to The Graduate School and the student will be dismissed from the program.

### Thesis Plan

This plan requires completing at least 20 credits of course work, writing a thesis, and an oral defense of the thesis, and passing the written comprehensive exam. At least 30 credits must be completed, of which, 10 must be thesis credits. Students must complete both the core and breadth course requirements described in the Non-Thesis Plan above. Any exceptions to the course requirements must be approved by the student's graduate committee and adhere to the minimum policy requirements set forth in the Graduate Handbook. Thesis and oral defense requirements must be arranged with and approved by the student's graduate committee.

### Accelerated M.S. Plan

The Accelerated M.S. Program (AMSP) is designed to provide MSU undergraduates a path to earning both the B.S. and the M.S. in Mathematics in a total of five years. Undergraduate students earning a B.S. in Mathematics at Montana State University may accelerate their program through any combination of Advanced Placement Credit, transfer credit, and higher semester credit loads so that they may receive their B.S. degree after four years and their M.S. degree after the fifth year. The undergraduate student can complete specific graduate level course work during year 4 of the undergraduate program. These courses can be **reserved for graduate credit** towards the M.S. degree. With careful planning by the student

and the academic advisor, this can compress the time required to fulfill requirements of both the B.S. and M.S. degrees to a total of five years. The M.S. degree is typically a non-thesis degree (course work and exams only), and **all M.S. requirements described above in the Non-Thesis Plan must be fulfilled**, unless otherwise approved by the student's graduate committee.

## AMSP Application and Timeline Information

Students typically apply to the AMSP program during spring term of the third year of the B.S. degree program. A minimum of 90 undergraduate credits must be completed at the time of application. Normally the B.S. will be awarded at the end of the student's senior (transition) year, and enrollment in the M.S. degree program will commence at the start of the fifth (graduate) year. All M.S. program admission prerequisites listed above and all application procedures required by both the Department of Mathematical Sciences and the Graduate School apply. This includes the application fees.

Students apply to the AMSP program by applying to the Graduate School and selecting the term that they intend to start their graduate program, i.e. the term after they finish their undergraduate degree.

**Reserved Credits:** Students planning to apply to the AMSP program should seek permission to register in graduate level courses during the second semester of their third year. In total, a student at MSU may take up to fifteen graduate level credits to reserve towards a graduate degree. **The coursework used for reserved credits may not be counted toward the B.S. degree requirements.** In order to obtain permission to register in graduate level courses and to reserve credits toward the M.S. degree, the student must request approval through the department's advisor overseeing the AMSP. The Advisor must approve the request and document the specific courses to be reserved within DegreeWorks.

## AMSP Program Requirements

- The AMSP degree requirements are exactly the same as those in the Non-Thesis Plan described above.
- Prospective students are required to keep their undergraduate coursework cumulative GPA at 3.3 or higher and their graduate coursework cumulative GPA at 3.0 or higher in order to be admitted to the AMSP.
- If accepted into the AMSP program, students will be granted graduate status and be eligible for graduate assistantships and tuition waivers only after the B.S. degree confers.
- At least 15 credits of graduate level coursework must be taken once the student obtains graduate status.

Participation in the AMSP requires significant planning of coursework and application procedures. Interested students should discuss this option with their undergraduate academic advisor within the Department of Mathematical Sciences as early as the first year of the B.S. degree program.

Students must also consult the Graduate Program Coordinator within the department as early as possible.

**For more information, refer to the Department of Mathematical Sciences (<http://www.math.montana.edu/>).**