

# APPLIED MATHEMATICS - MASTER OF SCIENCE (MS)

The MS degree is only available to current degree-seeking students at CU Boulder who are in the applied mathematics PhD program, another CU Boulder PhD program or the applied mathematics bachelor's–accelerated master's.

*Those who are not currently attending CU Boulder should apply to the Applied Mathematics - Professional Master of Science (MSAM) (<https://catalog.colorado.edu/graduate/colleges-schools/arts-sciences/programs-study/applied-mathematics/applied-mathematics-professional-master-science-msam/>) program.*

Students should carefully read the program's Requirements (<https://catalog.colorado.edu/graduate/degree-requirements/masters-degree-requirements/>) section. For more information, visit the department's Applied Mathematics Graduate Student Supplement (<http://www.colorado.edu/amath/prospective-students/graduate/supplement-course-catalog-degree-requirements/>).

## Bachelor's–Accelerated Master's Degree Program

Students may earn this degree as part of the bachelor's–accelerated master's (BAM) degree program, which allows currently enrolled CU Boulder undergraduate students the opportunity to earn a bachelor's and master's degree in a shorter period of time.

For more information, see the Accelerated Master's tab for the associated bachelor's degree(s): Applied Mathematics - Bachelor of Science (BS) (<https://catalog.colorado.edu/undergraduate/colleges-schools/engineering-applied-science/programs-study/applied-mathematics/applied-mathematics-bachelor-science-bsam/#acceleratedmasterstext>)

## Requirements

### Prerequisites

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Prerequisites for graduate study in applied mathematics include three semesters of calculus and a course in differential equations and linear algebra. The overall grade point average for mathematics and applied mathematics must be B or better.

Other strongly recommended courses are:

Code	Title	Credit Hours
<b>Strongly Recommended Prerequisites</b>		
APPM 3310	Matrix Methods and Applications	3

APPM 4350 & APPM 4360	Methods in Applied Mathematics: Fourier Series and Boundary Value Problems and Methods in Applied Mathematics: Complex Variables and Applications	6
APPM 4440	Undergraduate Applied Analysis 1	3
APPM 4600 & APPM 4610	Numerical Methods and Scientific Computing and Numerical Differential Equations	7

## Course Requirements

The department requires a master's degree candidate to complete an approved program of study consisting of at least 30 credits, at least 18 of which must be applied mathematics courses at the 5000 level or above. A grade of C (2.0) or higher must be attained in each course.

Generally, the following courses do not count toward the 30-credit requirement: APPM 5350, APPM 5360, STAT 5000, and APPM 5720.

*Note:* The APPM 5720 course number is used for a variety of courses that are either run for the first time or on an ad hoc basis. When appropriate, the Graduate Committee may decide that a particular version of this course should count towards graduate credits. If a student would like to count credits from APPM 5720 toward an APPM graduate degree, advice should be sought from the chair of the graduate committee on whether this would be permissible.

All master's degree students must complete two year-long, 5000-level course sequences in applied mathematics:

- APPM 5600 & APPM 5610 (required; may be waived for students who obtain a pass on the numerical analysis preliminary exam) AND
- a sequence listed in the "Graduate Courses" section of the Applied Mathematics Graduate Student Supplement (<http://www.colorado.edu/amath/prospective-students/graduate/supplement-course-catalog-degree-requirements/>) (other sequences require approval from the chair of the graduate committee).

MS candidates must take a yearlong 5000-level graduate sequence outside of applied mathematics in an area where mathematics has significant application. This sequence must be approved by the chair of the graduate committee.

Upon approval by petition to the graduate committee, up to 6 credit hours may be taken in 4000-level courses in other departments, provided members of the graduate faculty teach those courses.

## Degree Plans

There are two courses of action for graduate students who are looking to graduate with a master's degree.

### Plan I: Thesis Option

A student electing to do a thesis must enroll in 4–6 hours of thesis credit, which count toward the required 30 hours, and must take an oral comprehensive exam (also referred to as a defense) on that thesis work. A student can only enroll in a total of 6 thesis hours for the course of the degree program. This exam will be administered by a committee consisting of the faculty advisor, who serves as committee chair, and two other faculty members. Each committee member must hold a current graduate faculty appointment. The chair must have a regular graduate faculty appointment, and the remaining committee members must hold either regular or special membership. At least one committee member

must hold a regular (tenure or tenure-track) faculty appointment in Applied Mathematics.

### Plan II: Non-Thesis Option

A student choosing the non-thesis option must pass any one of four PhD preliminary exams. Details are provided in the Applied Mathematics Graduate Student Supplement (<http://www.colorado.edu/amath/prospective-students/graduate/supplement-course-catalog-degree-requirements/>).

Each MS student electing the non-thesis option must submit a completed MS degree audit form to the graduate chair upon submitting the Candidacy Application for an Advanced Degree.

A student who fails a written preliminary exam may, in a later semester, make one and only one more attempt to satisfy this requirement. In doing so, the student may switch between the thesis and the non-thesis option of the program, or between one preliminary exam area and another. Students who fail two preliminary exams are subject to dismissal from the program.

- Develop fluency and deep proficiency in a particular area of applied mathematics through written work and oral presentations.
- Become self-directed (independent) learners who can obtain technical skills through their own reading, development and academic exploration. This outcome should be driven by the student first and foremost rather than by a supervisor or mentor.

## Plan(s) of Study

The following plan of study is an example track for students looking to study partial differential equations.

Year One		Credit Hours
APPM 5600	Numerical Analysis 1	3
APPM 5610	Numerical Analysis 2	3
Part 1 Out of Department Sequence		3
APPM 5470	Methods of Applied Mathematics: Partial Differential and Integral Equations	3
APPM 5620	Numerical Linear Algebra	3
APPM 6610	Introduction to Numerical Partial Differential Equations	3
<b>Credit Hours</b>		<b>18</b>
Year Two		Credit Hours
APPM 5480	Methods of Applied Mathematics: Approximation Methods	3
APPM 5460	Methods in Applied Mathematics: Dynamical Systems and Differential Equations	3
APPM 5720	Open Topics in Applied Mathematics	1-3
Part 2 Out of Department Sequence		3
APPM 6950	Master's Thesis	4-6
<b>Credit Hours</b>		<b>14-18</b>
<b>Total Credit Hours</b>		<b>32-36</b>

## Learning Outcomes

By the completion of our program, students will be able to:

- Utilize technical training in core methods of applied mathematics (including numerical analysis, applied analysis, partial differential equations, statistics or probability) which form the foundation of problem solving in modern research problems.
- Apply skills in interdisciplinary methods, data science and/or scientific computation in ways that focus on solving important problems in applied mathematics and related fields.