# APPLIED MATHEMATICS, BS

**More Information:** https://mathstats.case.edu/why/frequently-asked-questions/
**Degree:** Bachelor of Science (BS)
**Major:** Applied Mathematics

## Program Overview

All undergraduate degrees in the department are based on a four-course sequence in calculus and differential equations and have a computational component. The mathematics and applied mathematics degrees all require further mathematics courses in analysis and algebra. The statistics degrees all require a further statistics core. The applied mathematics program has a four-course professional core requirement to promote the understanding of how mathematics is applied in other fields. There are additional requirements particular to each degree program, including technical electives in the major. Each degree program requires a minimum of 120 credit hours.

A student majoring in applied mathematics must design a program of study in consultation with his or her academic advisor. This should include identifying an area of application that the student plans to pursue, four mathematics electives relevant to this area, and a separate professional core of 12 credit hours of coursework to develop scientific background in this area. The program of study must explicitly list the mathematics electives and the professional core in the area of application.

Areas of research in applied mathematics well represented in the department include:

- Applied dynamical systems
- Applied probability and stochastic processes
- Imaging
- Life science
- Scientific computing

## Learning Outcomes

- Students will be able to know the fundamental concepts of linear algebra: Vector spaces, linear operators and matrices, four fundamental subspaces, matrix factorizations, and the solution theory of linear systems.
- Students will be able to correctly analyze the solvability of linear problems in practice, and is able to solve linear systems.
- Students will be able to know the fundamental concepts of calculus and classical mathematical analysis: Metric spaces, limits and convergence, continuity, and differential and integral calculus.
- Students will be able to demonstrate the capability of rigorous abstract thinking, and is able to set up a rigorous mathematical proof.
- Students will be able to know the key concepts of scientific computing: Accuracy, stability, computational complexity.
- Students will be able to know and able to use the key elements of scientific computing, including solving linear and non-linear equations, approximation, interpolation, numerical differentiation and quadrature rules.
- Students will be able to express a given problem in quantitative terms, and/or finds the appropriate set of mathematical tools to tackle the problem, and/or is able to select and implement an algorithm that leads to the solution of the problem.
- Students will be able to communicate effectively the results to a non-expert in mathematics, and is able to put the work in the proper context.

## Undergraduate Policies

For undergraduate policies and procedures, please review the Undergraduate Academics section of the General Bulletin.

## Accelerated Master's Programs

Undergraduate students may participate in accelerated programs toward graduate or professional degrees. For more information and details of the policies and procedures related to accelerated studies, please visit the Undergraduate Academics section of the General Bulletin.

## Program Requirements

Students seeking to complete this major and degree program must meet the general requirements for bachelor's degrees and the Unified General Education Requirements. Students completing this program as a secondary major while completing another undergraduate degree program do not need to satisfy the school-specific requirements associated with this major.

The BS degree in applied mathematics requires at least 50 credit hours of coursework in mathematics and related subjects, a 12 credit hour professional core that is specific to the area of application of interest to the student, and at least 17 credit hours in basic science.

| Code | Title | Credit Hours |
|---|---|---|
| **Required Courses:** | | |
| **Mathematics Requirements:** | | |
| MATH 121 | Calculus for Science and Engineering I | 4 |
| MATH 122 | Calculus for Science and Engineering II | 4 |
| or MATH 124 | Calculus II | |
| MATH 223 | Calculus for Science and Engineering III | 3 |
| or MATH 227 | Calculus III | |
| MATH 224 | Elementary Differential Equations | 3 |
| or MATH 228 | Differential Equations | |
| MATH 307 | Linear Algebra | 3 |
| MATH 321 | Fundamentals of Analysis I | 3 |
| MATH 322 | Fundamentals of Analysis II | 3 |
| MATH 330 | Introduction to Scientific Computing | 3 |
| *Choose one of the following:* | | *3* |
| MATH 324 | Introduction to Complex Analysis | |
| MATH 425 | Complex Analysis I | |
| Mathematics Electives [a] | | 21 |
| Professional Core Requirement Courses [b] | | 12 |
| **Other Non-mathematics Requirements:** | | |
| PHYS 121 | General Physics I - Mechanics | 4 |
| PHYS 122 | General Physics II - Electricity and Magnetism | 4 |
| PHYS 221 | Introduction to Modern Physics | 3 |
| *Choose one of the following sequences:* | | *6-8* |

| | |
|---|---|
| ASTR 101 & ASTR 103 | Introduction to the Sun and Its Planets and Introduction to the Stars, Galaxies, and the Universe |
| CHEM 105 & CHEM 106 | Principles of Chemistry I and Principles of Chemistry II |
| CHEM 111 & ENGR 145 | Principles of Chemistry for Engineers and Chemistry of Materials |
| EEPS 110 & EEPS 115 | Physical Geology and Introduction to Oceanography |
| EEPS 110 & EEPS 210 | Physical Geology and Earth History: Time, Tectonics, Climate, and Life |
| **Total Credit Hours** | **79** |

a Seven courses in total. Four approved mathematical courses (12 credit hours) specific to the concentration area of interest to the student. If appropriate, courses other than MATH or STAT may be taken with approval. Three MATH courses (9 credit hours) at the 300-level or higher.

b 12 credit hours specific to an area of application. This requirement is intended to promote scientific breadth and encourage application of mathematics to other fields.