# APPLIED MATHEMATICS, BS

## Contact

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## Advisors

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B.S. in Applied Mathematics is recommended for those students who intend to pursue a career in a field that requires advanced mathematical training, often beyond an undergraduate degree. Students who plan to pursue graduate study in applied mathematics should obtain the B.S. degree and consider taking at least one first-year graduate (600-level) course.

## Student Learning Outcomes

1. Demonstrate facility with the techniques of single and multivariable calculus and linear algebra
2. Effectively communicate mathematical ideas orally and in writing
3. Make symbolic calculations by hand and numerical calculations using MATLAB (or other appropriate software)
4. Reproduce essential assumptions, definitions, examples, and statements of important theorems
5. Solve standard science and engineering problems by selecting and applying and appropriate mathematical model
6. Solve problems using advanced undergraduate methods from each of the following areas: differential and linear equations, analysis, probability and statistics

## Preliminary and Extra-disciplinary Requirements

Preliminary and extra-disciplinary requirements for both B.A and B.S. degrees

1. Complete 18 credits in the following classes with no grade below a C: MAT 295 Calculus I, MAT 296 Calculus II, MAT 331 First Course in Linear Algebra, MAT 397 Calculus III, and MAT 375 Introduction to Abstract Mathematics or CIS 375 Introduction to Discrete Mathematics. These courses are prerequisites for most upper-division courses. The following sequence is recommended: MAT 295 Calculus I in the first semester; MAT 296 Calculus II in the second semester; MAT 331 First Course in Linear Algebra, MAT 397 Calculus III in the third semester; and MAT 375 Introduction to Abstract Mathematics/CIS 375 Introduction to Discrete Mathematics when appropriate. However, a student with knowledge of trigonometry and a year of high school calculus may be able to enter the sequence at MAT 296 Calculus II or even MAT 397 Calculus III; a student with less preparation may be advised to complete MAT 194 Precalculus before beginning the calculus sequence. Students considering becoming mathematics majors are strongly encouraged to talk to a mathematics major advisor as soon as possible to ensure appropriate selection of courses.
2. Complete a course in computing such as CPS 196 Introduction to Computer Programming, ECS 102 Introduction to Computing or ECS 104 Engineering Computational Tools. A similar course may be substituted with advisor's approval.
3. Complete two sequences of two approved science courses for a total of four different courses outside of the mathematics department, such as BIO 121 General Biology I - BIO 123 General Biology II, CHE 106 General Chemistry Lecture I (CHE 107 General Chemistry Laboratory I) - CHE 116 General Chemistry Lecture II (CHE 117 General Chemistry Laboratory II), PHY 211 General Physics I (PHY 221 General Physics Laboratory I) - PHY 212 General Physics II (PHY 222 General Physics Laboratory II), ECN 101 Introductory Microeconomics - ECN 102 Introductory Macroeconomics, or ECN 101 Introductory Microeconomics - ECN 203 Economic Ideas and Issues, ECS 221 Statics - ECS 222 Dynamics, ELE 231 Electrical Engineering Fundamentals, or another, more advanced sequence with the approval of a mathematics major advisor. This requirement is waived if the student earns either
   a. a minor in Applied Statistics, Biology, Chemistry, Computer Science, Economics, Engineering disciplines, Information Management & Technology, or Physics, or
   b. a major in one of natural sciences, engineering/technology disciplines, economics or finance.

## B.S. Degree Requirements

Students interested in pursuing the B.S. degree in Applied Mathematics obtain, in advance, the approval of a mathematics major advisor and the department chair of a petition to the effect that the upper-division courses to be taken satisfy the requirement for a B.S. degree.

In addition to the preliminary and extra-disciplinary requirements described above, the student must earn credit for the following courses, with a grade average of at least 2.0.

### Differential Equations Sequence

| Code | Title | Credits |
|---|---|---|
| MAT 414 | Introduction to Ordinary Differential Equations | 3 |
| MAT 517 | Partial Differential Equations and Fourier Series | 3 |

### Numerical Methods Course

| Code | Title | Credits |
|---|---|---|
| MAT 581 | Numerical Methods with Programming | 3 |

### Table 1: sequences for B.S. in Applied Mathematics

First course in each of the sequences in Table 1. Second course in one of the sequences in Table 1.

### Linear Transforms Sequence

| Code | Title | Credits |
|---|---|---|
| **First Course** | | |
| MAT 532 | Applied Linear Algebra | 3 |
| or MAT 531 | Second Course in Linear Algebra | |
| **Second Course** | | |
| Select one of the following: | | 3 |
| MAT 518 | Fourier Series, Transforms and Wavelets | |
| MAT 682 | Numerical Linear Algebra (See graduate catalog for course description) | |

### Analysis Sequence

| Code | Title | Credits |
|---|---|---|
| **First Course** | | |
| MAT 412 | Introduction to Real Analysis I | 3 |
| **Second Course** | | |
| Select one of the following: | | 3 |
| MAT 511 | Advanced Calculus | |
| MAT 512 | Introduction to Real Analysis II | |
| MAT 513 | Introduction to Complex Analysis | |
| MAT 554 | Differential Geometry | |

### Probability and Statistics Sequence

| Code | Title | Credits |
|---|---|---|
| **First Course** | | |
| MAT 521 | Introduction to Probability | 3 |
| **Second Course** | | |
| MAT 525 | Mathematical Statistics | 3 |

## Electives

9 credits of elective mathematics courses numbered 490 or higher, except MAT 503 Matrix Methods for Data Science. With prior approval of the student's major advisor, mathematically rich 500+ level courses in other departments may be substituted for the mathematics electives.

## Additional Information

Distinction in Applied Mathematics is awarded by the Mathematics Department upon completion of a B.S. in Applied Mathematics with a minimum cumulative GPA of 3.4, a minimum GPA of 3.6 in mathematics (MAT) courses at the 300+ level, and either an A or A- in the Senior Seminar or a high-quality Capstone Thesis. See the Mathematics Department undergraduate advisor for additional requirements.

#### College of Arts and Sciences Requirements

For all Arts and Sciences|Maxwell students, successful completion of a bachelor's degree in this major requires a minimum of 120 credits, 96 of which must be Arts and Sciences|Maxwell credits, completion of the Liberal Arts Core (https://coursecatalog.syracuse.edu/undergraduate/arts-sciences/#text) requirements, and the requirements for this major (30 credits) that are listed above.

#### Dual Enrollments:

Students dually enrolled in **Newhouse*** and Arts and Sciences|Maxwell will complete a minimum of 122 credits, with at least 90 credits in Arts and Sciences|Maxwell coursework and an Arts and Sciences|Maxwell major.

*Students dually enrolled in the College of Arts and Sciences|Maxwell as first year students must complete the Liberal Arts Core (https://coursecatalog.syracuse.edu/undergraduate/arts-sciences/#text). Students who transfer to the dual program after their first year as singly enrolled students in the Newhouse School will satisfy general requirements for the dual degree program by completing the Newhouse Core Requirements.

#### Undergraduate University Requirements

The following requirements and experiences apply to all Syracuse University Undergraduate matriculated degree programs.

- IDEA Course Requirement (https://coursecatalog.syracuse.edu/undergraduate/idea-course-requirement/)
- First Year Seminar (https://coursecatalog.syracuse.edu/undergraduate/courses/fys/)