APPLIED MATHEMATICS - MINOR

A minor is offered in applied mathematics. Declaration of a minor is open to any student enrolled at CU Boulder, regardless of college or school.

The minor in applied mathematics was developed to provide in-depth training in mathematical techniques and computational methods well beyond the training usually received by science and engineering majors. The minor currently offers three tracks: general emphasis, scientific computing and mathematical software, or probability and statistics. The goals of each track are to introduce students to more advanced mathematical techniques and problem-solving strategies. Such skills are becoming increasingly important for students who expect to participate in areas requiring analysis or modeling of real world situations.

The department also offers a minor in statistics (https://catalog.colorado.edu/undergraduate/colleges-schools/arts-sciences/programs-study/applied-mathematics/statistics-minor/) which was developed to provide in-depth training in statistical methods and techniques well beyond the training usually received by science and engineering majors. The ability to understand, visualize and analyze data is becoming an increasingly important skill in many disparate fields. This minor offers undergraduate students from any major the opportunity to develop their statistical knowledge.

Requirements
Prerequisites
Prerequisites for the applied math minor are two semesters of calculus and computing experience, as provided by APPM 1650, CSCI 1300, CSCI 2275 or CHEN 1310.

Residency
A minimum of 20 credits at the 2000 level and above is required. At least three APPM or STAT courses, two of which must be at the 3000 level or above, need to be taken on the Boulder campus. No more than 9 credits may be applied from transfer work; of those, no more than 6 credits may be 3000 level or above.

Minimum Grades
A cumulative GPA of 2.00 or better is required in the courses that are used to satisfy the requirements for this minor. Each individual course that is counted towards these degree requirements must be passed with a grade of C- or better.

Required Courses and Credits

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Requirements</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>APPM 2350</td>
<td>Calculus 3 for Engineers</td>
<td>4</td>
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<tr>
<td>or MATH 2400</td>
<td>Calculus 3</td>
<td></td>
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<tr>
<td>APPM 2360</td>
<td>Introduction to Differential Equations with Linear Algebra</td>
<td>4</td>
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<tr>
<td>APPM 3310</td>
<td>Matrix Methods and Applications</td>
<td>3</td>
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Choose one area of emphasis:

General Emphasis:
Choose two of the following three courses:

APPM 4650 Intermediate Numerical Analysis 1
APPM 4350 Methods in Applied Mathematics: Fourier Series and Boundary Value Problems
APPM 4360 Methods in Applied Mathematics: Complex Variables and Applications

One 3-credit upper division APPM or STAT course at the 3000 or 4000 level

Scientific Computation Emphasis:
APPM 3050 Scientific Computing in Matlab
APPM 4650 & APPM 4660 Intermediate Numerical Analysis 1 and Intermediate Numerical Analysis 2

Probability and Statistics Emphasis:
APPM 3570 Applied Probability
One of the following sequences:
STAT 4000 & STAT 4010 Statistical Methods and Application I and Statistical Methods and Applications II
APPM 4560 & STAT 4520 Markov Processes, Queues, and Monte Carlo Simulations and Introduction to Mathematical Statistics

1 APPM 3050 is not appropriate for junior or senior aerospace engineering sciences majors. These students should substitute another upper division applied math course.

2 A student cannot earn a minor in statistics (https://catalog.colorado.edu/undergraduate/colleges-schools/arts-sciences/programs-study/applied-mathematics/statistics-minor/) and a minor in applied mathematics with probability and statistics emphasis.

Plan(s) of Study

Year One
Fall Semester
APPM 1350 Calculus 1 for Engineers
APPM 1650 or CSCI 1300 or CSCI 2275 or ASEN 1320 Python for Mathematical and Statistical Applications or Computer Science 1: Starting Computing or Programming and Data Structures or Aerospace Computing and Engineering Applications

Spring Semester
APPM 1360 Calculus 2 for Engineers

Year Two
Fall Semester
APPM 2350 Calculus 3 for Engineers

Spring Semester
APPM 2360 Introduction to Differential Equations with Linear Algebra

Credit Hours
7

Credit Hours
4

Credit Hours
4

Credit Hours
4

Credit Hours
4
Year Three

Fall Semester

APPM 3310  Matrix Methods and Applications  3

Credit Hours  3

Spring Semester

One of the following for 3 credit hours:

General Emphasis:

APPM 4650  Intermediate Numerical Analysis 1  3

or APPM 4360  Methods in Applied Mathematics:

Complex Variables and Applications

Scientific Computing Emphasis

APPM 3050  Scientific Computing in Matlab  3

Probability and Statistics Emphasis

APPM 3570  Applied Probability

Credit Hours  3

Year Four

Fall Semester

Course based on Minor Track:  3

General Emphasis

APPM 4350  Methods in Applied Mathematics: Fourier

Series and Boundary Value Problems

Scientific Computation Emphasis

APPM 4650  Intermediate Numerical Analysis 1  3

Probability and Statistics (Choose ONE)

STAT 4000  Statistical Methods and Application I  3

STAT 4520  Introduction to Mathematical Statistics

Credit Hours  3

Spring Semester

Course based on Minor Track  3

General Emphasis

ONE 3-credit APPM or STAT course at the 3000 or 4000 level

Scientific Computation

APPM 4660  Intermediate Numerical Analysis 2  3

Probability and Statistics

If STAT 4000 was taken in the Fall:

STAT 4010  Statistical Methods and Applications II  3

If STAT 4520 was taken in Fall:

STAT 4100  Markov Processes, Queues, and Monte

Carlo Simulations

Credit Hours  3

Total Credit Hours  31