APPLIED MATHEMATICS - DOCTOR OF PHILOSOPHY (PHD)

The Department of Applied Mathematics offers course work and research leading to the PhD degree in applied mathematics. The aim of the department is to train graduate students to perform independent research on the methods and applications of applied mathematics. Research areas represented in the department include:

- physical applied mathematics
- dynamical systems
- nonlinear phenomena and analysis
- mathematical biology
- computational mathematics
- applied probability, statistics and data science

For more information on the department and degree requirements, download the supplement to the catalog (http://www.colorado.edu/amath/prospective-students/graduate/supplement-course-catalog-degree-requirements) or visit the Applied Mathematics (http://www.colorado.edu/amath) website.

PhD with Certificate in Interdisciplinary Quantitative Biology

Applied mathematicians interested in collaborations with bioscientists will need a breadth of knowledge in quantitative bioscience to be successful. The interdisciplinary quantitative biology (IQ biology) graduate certificate (catalog.colorado.edu/graduate/colleges-schools/interdisciplinary-programs/quantitative-biology-graduate-certificate) program emphasizes training at the intersection of biochemistry, biology, computer science, engineering, applied mathematics and physics. The PhD in applied mathematics with a certificate in IQ biology will strengthen this training with additional foundations in numerical and mathematical analysis, probability and statistics, mathematical biology and network analysis.

Candidates interested in this program should apply directly to IQ biology and select applied mathematics as one of their graduate programs of interest. In addition to satisfying the requirements for the PhD in applied mathematics, students in this program must take 12 credit hours in three IQ biology core courses (Quantitative Biology Foundations, Statistics and Computations for Genomes and Meta-Genomes and Forces in Biology), which can serve as the out-of-department sequence for the PhD, as well as three 10-week rotations in labs associated with the IQ biology program.

For more information, visit the BioFrontiers Institute’s IQ Biology PhD Program (http://iqbiology.colorado.edu) website.

Requirements

A minimum of 60 credit hours is required for the degree, including 30 credit hours in courses numbered 5000 or above (APPM 5350, APPM 5360, APPM 5570 and APPM 5720 generally do not count toward this requirement) and 30 credit hours of applied math dissertation credit.

A grade of B- or higher must be attained in each course. PhD students must maintain a grade point average of 3.0 or better each semester.

Required Courses and Semester Credit Hours

<table>
<thead>
<tr>
<th>Required Courses</th>
<th>Semester Credit Hours</th>
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<tbody>
<tr>
<td>APPM 5440 &amp; APPM 5450</td>
<td>6</td>
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<tr>
<td>APPM 5600 &amp; APPM 5610</td>
<td>6</td>
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<tr>
<td>APPM 8990</td>
<td>30</td>
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Electives

<table>
<thead>
<tr>
<th>Electives</th>
<th>Semester Credit Hours</th>
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<tr>
<td>One sequence in applied mathematics; possibilities include:</td>
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<tr>
<td>or APPM 5460</td>
<td>Methods of Applied Mathematics: Dynamical Systems and Differential Equations</td>
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<tr>
<td>or APPM 5430</td>
<td>Methods of Applied Mathematics: Approximation Methods</td>
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<tr>
<td>APPM 5520 &amp; APPM 5540</td>
<td>Introduction to Mathematical Statistics and Introduction to Time Series</td>
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<tr>
<td>or APPM 5560</td>
<td>Markov Processes, Queues, and Monte Carlo Simulations</td>
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Two semesters of seminars: 2

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<tbody>
<tr>
<td>APPM 8000</td>
<td>Colloquium in Applied Mathematics</td>
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<tr>
<td>APPM 8100</td>
<td>Seminar in Dynamical Systems</td>
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<td>APPM 8300</td>
<td>Nonlinear Waves Seminar</td>
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<td>APPM 8400</td>
<td>Mathematical Biology Seminar</td>
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<tr>
<td>APPM 8500</td>
<td>Statistics, Optimization and Machine Learning Seminar</td>
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<tr>
<td>APPM 8600</td>
<td>Seminar in Computational Mathematics</td>
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</tbody>
</table>

At least one 3-credit course per year (third and fourth years only) in applied mathematics at the 6000 level or above. 3

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A yearlong graduate sequence outside of applied mathematics in an area where mathematics has significant application. Approval of the sequence from the graduate committee chair is required.

Total Credit Hours 62

1 A student may opt out of either one of these two sequences only if they have demonstrated proficiency in the subject by passing the corresponding preliminary exam.

2 To be taken no earlier than the second year of graduate study in the department.

Exams

Preliminary exams are offered in four areas: analysis, numerics, partial differential equations and probability/statistics. Students must take the numerics and analysis exams, and either one of the other two.