

APPLIED MATHEMATICS

Overview

The Applied Mathematics Area of Concentration (AOC) at New College is designed to provide students with a strong foundation in mathematical concepts and the modeling skills needed to apply mathematics to solve real-world problems. The program develops students' analytical and computational math skills and technical abilities through a combination of coursework and hands-on experiences. While this dynamic and fast-growing field once had a heavy emphasis on physics, today at New College and around the world it uses advanced mathematical methods to seek answers to complex problems in the biological and health sciences, physical sciences, engineering, and industry. Many New College students pursue the Applied Mathematics AOC on its own, while others combine the AOC with studies in Biology, Physics, Economics, or other concentrations.

(See also Mathematics (<https://catalog.ncf.edu/undergraduate/natural-sciences/mathematics/>))

Faculty in Applied Mathematics

Christopher Kottke (<https://www.ncf.edu/directory/christopher-kottke/>), Associate Professor of Mathematics

Patrick McDonald (<https://www.ncf.edu/directory/patrick-t-mcdonald/>), Professor of Mathematics

Eirini Poimenidou (<https://www.ncf.edu/directory/eirini-poimenidou/>), Professor of Mathematics (On Leave)

Necmettin Yildirim (<https://www.ncf.edu/directory/necmettin-yildirim/>), Professor of Mathematics/Soo Bong Chae Chair of Applied Mathematics

Requirements for the AOC in Applied Mathematics

A minimum of fourteen and one-half (14.5) academic units.

Code	Title
Core Requirements ¹	
MATH 2311 or MATH 3472	Calculus I*
MATH 2312 or MATH 3473	Calculus with Theory I*
MATH 2313	Calculus II*
MATH 3105 or MATH 4015	Calculus with Theory II
MATH 3105 or MATH 4015	Calculus III
MATH 3105 or MATH 4015	Linear Algebra
MATH 3105 or MATH 4015	Advanced Linear Algebra
MATH 3330	Ordinary Differential Equations*
MATH 2500 & MATH 3510	Probability I and Probability II* ²

Programming Course

Select **one** from the following examples:

CSCI 2200	Introduction to Programming in Python*
CSCI 2400	Object-Oriented Programming
CSCI 2100	Functional Programming in Haskell*

Additional Requirements

STAN 2700 or STAN 2800	Dealing with Data I*
MATH 3410	Dealing with Data II
MATH 3410	Mathematical Modeling

MATH 4410	Introduction to Numerical Methods
MATH 3710	Mathematics Seminar (Three Semesters) ³

Electives

Select **two** from the following examples:

MATH 4015	Advanced Linear Algebra (If not also used for Linear Algebra requirement)
MATH 4341	Partial Differential Equations
MATH 4402	Complex Analysis
MATH 3210	Introduction to Number Theory with Applications to Cryptography*
MATH 3220	Graph Theory*
STAN 3275	Applied Linear Models
MATH 4226	Real Analysis I*
MATH 4227	Real Analysis II
MATH 4301	Abstract Algebra I
MATH 4302	Abstract Algebra II
MATH 4230	Point-Set Topology
MATH 3800	Basic Set Theory*
MATH 4940	Advanced Topics: Applied Math
MATH 4920	Advanced Topics: Analysis
MATH 4930	Advanced Topics: Algebra
MATH 4950	Advanced Topics: Probability
MATH 4960	Advanced Topics: Geometry/ Topology

Additional Requirements

One Independent Study Project (ISP) in Applied Mathematics
Senior Thesis in Applied Mathematics and Baccalaureate Exam

¹ Some requirements can be met with appropriate AP, IB, or transfer credit.

² These are each one-mod courses; together they count as one academic unit.

³ To receive mod course credit (.5 unit) for the Mathematics Seminar, students must prepare and present a talk at one of the seminar sessions. One of the most important roles of the Mathematics Seminar, in addition to honing students' communication skills, has been to build a sense of community in the program.

Requirements for a Secondary Field in Applied Mathematics

A minimum of six and one-half (6.5) academic units.

Code	Title
Core Requirements ¹	
MATH 2311 or MATH 3472	Calculus I*
MATH 2312 or MATH 3473	Calculus with Theory I*
MATH 2312 or MATH 3473	Calculus II*
MATH 3105 or MATH 4015	Calculus with Theory II
MATH 3105 or MATH 4015	Linear Algebra
MATH 3330	Ordinary Differential Equations*
MATH 2500 & MATH 3510	Probability I and Probability II* ²
MATH 3410	Mathematical Modeling

or MATH 4410 Introduction to Numerical Methods

Additional Applied Math Requirement

MATH 3710 Mathematics Seminar (One Semester)³

Optional

A programming course is highly recommended.

- ¹ Some requirements can be met with appropriate AP, IB, or transfer credit.
- ² These are each one-mod courses; together they count as one academic unit.
- ³ To receive mod course credit (.5 unit) for the Mathematics Seminar, students must prepare and present a talk at one of the seminar sessions. One of the most important roles of the Mathematics Seminar, in addition to honing students' communication skills, has been to build a sense of community in the program.

Representative Senior Theses in Applied Mathematics

- Delay Differential Equation Model for G-Protein Pathway Dynamics
- Mathematical Modeling of Protein Synthesis with Autoregulation
- Mathematical Modeling of MAPK Dynamics and Signal Adaptation
- A Systems Biology Approach to Study Differential Regulation of MAPK Dynamics
- Mathematical Modeling and Optimal Experimental Design in Systems Biology
- Mathematical Modeling of Pacific Pink Salmon (*Oncorhynchus Gorbuscha*) Dynamics
- Fluctuations of Beta Rhythm: Mathematical Modeling and Periodic Forcing of a Cortical Microcircuit
- Mathematical Model Relating Soil Organic Matter Decomposition to Microbial Community Dynamics