

Department of Mathematics

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The Faculty

Chair: Warren B. Gordon

University Distinguished Professor:

- Arthur Apter

Presidential Professor:

- Jim Gatheral

Professors:

- Warren B. Gordon
- Miriam Hausman
- Bruce Jordan
- Laurence Kirby
- Elena Kosygina
- Andrew Lesniewski
- Anita Mayo
- Carlos Julio Moreno
- Rados Radoicic
- Alvany Rocha
- Aaron Todd
- Tai-Ho Wang

Associate Professors:

- C. Douglas Howard
- Jakob Reich
- Beryl I. Shaw
- Dan Stefanica
- Sherman Wong
- Ingrid-Mona Zamfirescu

Assistant Professors:

- Louis-Pierre Arguin
- Michael J. Carlisle
- Feng Chen
- Peter Gregory
- Ivan Matic
- Anja Richter

Lecturers:

- April Allen-Materowski
- Evan Fink
- Sarah Patterson
- Jarrod Pickens
- Timothy Ridenour
- Elizabeth Stepp

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Mathematics has been described as the queen of all sciences. Understanding mathematics enables one to explain and analyze not only science and nature but almost all disciplines from archeology to zoology. Most recently, mathematics has become an indispensable tool in finance and other business related areas. To ensure that mathematics is available for students with varied backgrounds and different professional goals, the department offers courses at all levels. Advanced courses are designed to be taken by mathematics and actuarial science majors and those in related fields.

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- [Mathematics](#)
- [Actuarial Science](#)
- [Financial Mathematics](#)

Mathematics

The major in mathematics is designed to enable the student to enter the marketplace (industrial or educational) or to pursue further studies in mathematics or allied fields at the graduate level. Interested students are urged to contact the Department of Mathematics as early as possible. The student will be assigned an advisor who will aid in formulating an appropriate course of study. Students who want to teach mathematics in the secondary schools should consult an advisor in the Center for Advisement and Orientation.

Required Courses All students must take the following three courses:		
MTH 3300	Algorithms, Computers and Programming I	3 credits
MTH 4010	Advanced Calculus I	3 credits
MTH 4100	Linear Algebra and Matrix Methods	3 credits
Students may fulfill their calculus requirements by any one of the following three alternate calculus tracks:		
Track I:		
MTH 2610	Calculus I	4 credits
MTH 3010	Calculus II	4 credits
MTH 3020	Intermediate Calculus	4 credits
	<i>or</i>	

MTH 3050	Multi-Variable and Vector Calculus	4 credits
<i>or</i> Track II:		
MTH 2630	Analytic Geometry and Calculus I	5 credits
MTH 3030	Analytic Geometry and Calculus II	5 credits
<i>or</i> Track III:		
MTH 2205	Applied Calculus	3 credits
	<i>or</i>	
MTH 2207	Applied Calculus and Matrix Applications	4 credits
MTH 3006	Integral Calculus	4 credits
MTH 3030	Analytic Geometry and Calculus II	5 credits
Electives		
Any four 4000-level or 5000-level courses from the following group:		
MTH 4030	Topology	3 credits
MTH 4020	Advanced Calculus II	3 credits
MTH 4110	Ordinary Differential Equations	3 credits
MTH 4120	Introduction to Probability	4 credits
MTH 4115	Numerical Methods for Differential Equations in Finance	4 credits
MTH 4125	Introduction to Stochastic Process	4 credits
MTH 4130	Mathematics of Statistics	4 credits
MTH 4135	Computational Methods in Probability	3 credits
MTH 4140	Graph Theory	3 credits
MTH 4145	Mathematical Modeling *	3 credits
MTH 4150	Combinatorics	3 credits
MTH 4200	Theory of Numbers	3 credits
MTH 4210	Elements of Modern Algebra	3 credits
MTH 4230	History of Mathematics	3 credits
MTH 4240	Differential Geometry *	3 credits
MTH 4300	Algorithms, Computers and Programming II *	3 credits
MTH 4310	Methods of Numerical Analysis	3 credits

MTH 4315	Introduction to Mathematical Logic	3 credits
MTH 4320	Fundamental Algorithms	3 credits
MTH 4500	Introductory Financial Mathematics	4 credits
MTH 5010	Advanced Calculus III *	3 credits
MTH 5020	Theory of Functions of a Complex Variable*	3 credits
MTH 5030	Theory of Functions of Real Variables*	3 credits
MTH 5100	Partial Differential Equations and Boundary Value Problems*	4 credits
MTH 5500	Stochastic Calculus for Finance	4 credits
* These courses are offered infrequently, subject to student demand.		
Mathematics of Finance Concentration: Students who wish to have a concentration in the Mathematics of Finance should choose the following five electives:		
MTH 4110	Ordinary Differential Equations	3 credits
MTH 4120	Introduction to Probability *	4 credits
MTH 4125	Introduction to Stochastic Process	4 credits
MTH 4135	Computational Methods in Probability	3 credits
MTH 4500	Introductory Financial Mathematics	4 credits
* Students who have completed MTH 3120 must register for MTH 4119 as an independent study (please consult the Department of Mathematics).		
In addition, students should take:		
ECO 1001	Micro-Economics	3 credits
ECO 1002	Macro-Economics	3 credits
FIN 3000	Principles of Finance	3 credits
FIN 3610	Corporate Finance	3 credits
<i>or</i>		
FIN 3710	Investment Analysis	3 credits

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Actuarial Science

The field of actuarial science applies mathematical principles and techniques to problems in the insurance industry. Progress in the field is generally based upon completion of examinations given by the Society of Actuaries. The Baruch College major is designed to prepare students to pass the P, FM, MFE, MLC and C exams offered by the Society of Actuaries. Students interested in this highly structured program are urged to contact the Department of Mathematics as early as possible so that the department may assign an advisor to aid in formulating an appropriate course of study.

Prerequisites		
MTH 2610	Calculus I	4 credits
MTH 3010	Calculus II	4 credits
<i>or</i>		
MTH 2205	Applied Calculus	3 credits
MTH 3006	Integral Calculus	4 credits
<i>and</i>		
ECO 1001	Micro-Economics	3 credits
ECO 1002	Macro-Economics	3 credits
Required Courses		
MTH 3020	Intermediate Calculus	4 credits
<i>or</i>		
MTH 3030	Analytic Geometry and Calculus II	5 credits
<i>or</i>		
MTH 3050	Multi-Variable and Vector Calculus	4 credits
<i>and</i>		
MTH 3300	Algorithms, Computers, and Programming I	3 credits
MTH 4120	Introduction to Probability *	4 credits
MTH 4410	Theory of Interest	4 credits
MTH 4500	Mathematical Finance	4 credits
FIN 3000	Principles of Finance	3 credits
FIN 3610	Corporate Finance	3 credits
* Students who have completed MTH 3120 must register for MTH 4119 as an independent study (please consult the Department of Mathematics).		
Electives		
In addition, one course must be chosen from the following list of electives:		
MTH 4115	Numerical Methods for Differential Equations in Finance	4 credits
MTH 4125	Introduction to Stochastic Processes	4 credits

MTH 4130	Mathematics of Statistics	4 credits
MTH 4135	Computational Methods in Probability	3 credits
MTH 4420	Actuarial Mathematics	4 credits
MTH 4421	Actuarial Mathematics II	4 credits
MTH 4451	Short-Term Insurance Mathematics (<i>formerly Risk Theory</i>)	4 credits
MTH 5500	Stochastic Calculus for Finance	4 credits
The following courses are recommended, but not required. They are not applicable toward the major.		
ECO 3100 Intermediate Micro-Economics		
ECO 3200 Intermediate Macro-Economics		

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Financial Mathematics

This major is first and foremost a course of study in mathematics, with a focus on the computational tools and techniques needed to thrive in the financial engineering industry. In today's specialized world, a sophisticated level of mathematical understanding is an essential competitive edge. As this program includes courses in Economics and Finance, students who would usually not consider a traditional mathematics major will find this program especially attractive. Interested students are urged to contact the Department of Mathematics as early as possible. The student will be assigned an advisor who will aid in formulating an appropriate course of study.

Program Prerequisites:		
As a preliminary requirement, students must complete two semesters of calculus, which may be achieved by any one of the following three methods:		
Option 1:	MTH 2610 Calculus I *	4 credits
	<i>and</i>	
	MTH 3010 Calculus II *	4 credits
	* A combined GPA of 3.5 or higher in Calculus I and Calculus II is required.	
Option 2:	Calculus AP exam (BC) with a score of 4 or 5	
Option 3:	Calculus AP exam (AB) with a score of 4 or 5	
	<i>and</i>	
	MTH 3010 Calculus II (<i>with a grade of B+ or higher</i>)	4 credits
Preliminary Courses:		

MTH 3050	Multi-Variable and Vector Calculus *	4 credits
MTH 3300	Algorithms, Computers, and Programming I	3 credits
MTH 4000	Bridge to Higher Mathematics	4 credits

*** Students who have completed:**

- Calculus AP BC with a grade 4 or 5 and MTH 3020 with B+ or higher, or
- MTH 3010 and MTH 3020 with a GPA of at least 3.5 out of 4, or
- MTH 3006 and MTH 3030 with a GPA of at least 3.5 out of 4, or
- MTH 2630 and MTH 3030 with a GPA of at least 3.5 out of 4.

must take MTH 3035 Vector Calculus and earn a grade of B or better. (MTH 3020 or MTH 3030 together with MTH 3035 is equivalent to MTH 3050.) MTH 3035 is a one credit course covering the material in MTH 3050 that is not included in either MTH 3020 or MTH 3030.

To gain official admission to the program, students must complete MTH 3050 and MTH 4000 with a minimum grade of B in each course.

Required Courses:

Economics and Finance courses:

ECO 1001	Micro-economics	3 credits
ECO 1002	Macro-economics	3 credits
FIN 3000	Principles of Finance (Students must complete the following courses as pre-requisites: ACC 2101; BUS 1000; CIS 2200; ECO 1001; ECO 1002; and STA 2000)	3 credits
FIN 3610	Corporate Finance	3 credits

Upper-level Mathematics courses:

MTH 4100	Linear Algebra	3 credits
MTH 4115	Numerical Methods for Differential Equations	4 credits
MTH 4120	Introduction to Probability *	4 credits
MTH 4125	Introduction to Stochastic Processes	4 credits
MTH 4130	Mathematics of Statistics	4 credits
MTH 4300	Algorithms, Computers, and Programming II	3 credits
MTH 4500	Introductory Financial Mathematics	4 credits
MTH 4600	Data Analysis and Simulation for Financial Engineers	4 credits
MTH 5500	Stochastic Calculus for Finance	3 credits

*** Students who have completed MTH 3120 must register for MTH 4119 as an independent study (please consult the Department of Mathematics).**

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The Minor

The minor in mathematics provides students with a background in the various theories and uses of mathematics. The minor requires the completion of MTH 3006 or 3010 and any other 3- or 4-credit mathematics course numbered 3000 or higher. Students must then complete a capstone course consisting of any mathematics course at the 4000-level or higher with the exception of MTH 4410 (which may not be used as a capstone course).

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Courses

Courses in Mathematics (MTH)

MTH 1030	College Algebra	4 hours; 2 credits
MTH 2003	Pre-calculus and Elements of Calculus	4 hours; 3 credits
MTH 2120	Mathematics Appreciation	3 hours; 3 credits
MTH 2140	Mathematics and Quantitative Reasoning	4 hours; 3 credits
MTH 2160	Ideas in Mathematics and Their Applications	4 hours; 3 credits
MTH 2205	Applied Calculus	4 hours; 3 credits
MTH 2206	Applied Calculus	3 hours; 3 credits
MTH 2207	Applied Calculus and Matrix Applications	4 hours; 4 credits
MTH 2301	Concepts of Discrete Mathematics	3 hours; 3 credits
MTH 2610	Calculus I	4 hours; 4 credits
MTH 2630	Analytic Geometry and Calculus I	5 hours; 5 credits
MTH 3006	Integral Calculus	4 hours; 4 credits
MTH 3010	Elementary Calculus II	4 hours; 4 credits
MTH 3020	Intermediate Calculus	4 hours; 4 credits
MTH 3030	Analytic Geometry and Calculus II	5 hours; 5 credits
MTH 3035	Vector Calculus	1 hour; 1 credit
MTH 3040	Actuarial Science Theory and Problem Seminar	2 hours; 2 credits
MTH 3050	Multi-Variable and Vector Calculus	4 hours; 4 credits
MTH 3100	Selected Topics in Discrete Mathematics	3 hours; 3 credits
MTH 3120	Elementary Probability	3 hours; 3 credits

MTH 3300	"Algorithms, Computers, and Programming I"	4 hours; 3 credits
MTH 3901	Actuarial Science Internship	1 hour; 1 credit
MTH 3902	Actuarial Science Internship	1 hour; 1 credit
MTH 3903	Actuarial Science Internship	1 hour; 1 credit
MTH 3904	Actuarial Science Internship	1 hour; 1 credit
MTH 3905	Math Internship	1 hour; 1 credit
MTH 3906	Math Internship	1 hour; 1 credit
MTH 3907	Math Internship	1 hour; 1 credit
MTH 3908	Math Internship	1 hour; 1 credit
MTH 3909	Financial Mathematics Internship	1 hour; 1credit
MTH 3910	Financial Mathematics Internship	1 hour; 1credit
MTH 3911	Financial Mathematics Internship	1 hour; 1credit
MTH 3912	Financial Mathematics Internship	1 hour; 1credit
MTH 4000	Bridge to Higher Mathematics	4 hours; 3 credits
MTH 4005	Problem-Solving Seminar	3 hours; 3 credits
MTH 4010	Advanced Calculus I	3 hours; 3 credits
MTH 4020	Advanced Calculus II	3 hours; 3 credits
MTH 4030	Topology	3 hours; 3 credits
MTH 4100	Linear Algebra and Matrix Methods	3 hours; 3 credits
MTH 4110	Ordinary Differential Equations	3 hours; 3 credits
MTH 4115	Numerical Methods for Differential Equations in Finance	4 hours; 4 credits
MTH 4119	Multivariate Probability Distributions	1 hour; 1 credit
MTH 4120	Introduction to Probability	4 hours; 4 credits
MTH 4125	Introduction to Stochastic Processes	4 hours; 4 credits
MTH 4130	Mathematics of Statistics	4 hours; 4 credits
MTH 4135	Computational Methods in Probability	4 hours; 3 credits
MTH 4140	Graph Theory	3 hours; 3 credits
MTH 4145	Mathematical Modeling	3 hours; 3 credits
MTH 4150	Combinatorics	3 hours; 3 credits
MTH 4200	Theory of Numbers	3 hours; 3 credits

MTH 4210	Elements of Modern Algebra	3 hours; 3 credits
MTH 4215	"Finite Fields, Algebraic Curves, and Applications"	3 hours; 3 credits
MTH 4230	History of Mathematics	4 hours; 4 credits
MTH 4240	Differential Geometry	3 hours; 3 credits
MTH 4300	"Algorithms, Computers, and Programming II"	4 hours; 3 credits
MTH 4310	Methods of Numerical Analysis	3 hours; 3 credits
MTH 4315	Introduction to Mathematical Logic	4 hours; 3 credits
MTH 4320	Fundamental Algorithms	4 hours; 3 credits
MTH 4340	Switching Theory	3 hours; 3 credits
MTH 4395	Special Topics in Computer Science	3 hours; 3 credits
MTH 4400	Finite Differences	4 hours; 4 credits
MTH 4410	Theory of Interest	4 hours; 4 credits
MTH 4420	Actuarial Mathematics	4 hours; 4 credits
MTH 4421	Actuarial Mathematics II	4 hours; 4 credits
MTH 4451	Short-Term Insurance Mathematics (<i>formerly Risk Theory</i>)	4 hours; 4 credits
MTH 4500	Introductory Financial Mathematics	4 hours; 4 credits
MTH 4600	Data Analysis and Simulation for Financial Engineers	4 hours; 4 credits
MTH 5000	Independent Study I	Hours and credits to be arranged
MTH 5001	Independent Study II	Hours and credits to be arranged
MTH 5002	Independent Study III	Hours and credits to be arranged
MTH 5003	Independent Study IV	Hours and credits to be arranged
MTH 5004	Independent Study V	Hours and credits to be arranged
MTH 5010	Advanced Calculus III	3 hours; 3 credits
MTH 5020	Theory of Functions of a Complex Variable	3 hours; 3 credits
MTH 5030	Theory of Functional of Real Variables	3 hours; 3 credits
MTH 5100	Partial Differential Equations and Boundary Value Problems	4 hours; 4 credits
MTH 5500	Stochastic Calculus for Finance	4 hours; 4 credits
MTH 6001H	Honors in Mathematics I	Hours and credits to be arranged
MTH 6002H	Honors in Mathematics II	Hours and credits to be arranged
MTH 6003H	Honors in Mathematics III	Hours and credits to be arranged

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