

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
- Rados Radoicic
- Alvany Rocha
- Aaron Todd
- Tai-Ho Wang

Associate Professors:

- Louis-Pierre Arguin
- C. Douglas Howard
- Jakob Reich
- Dan Stefanica
- Ingrid-Mona Zamfirescu

Assistant Professors:

- Michael J. Carlisle
- Feng Chen
- Peter Gregory
- Ivan Matic
- Anja Richter
- Adam Sheffer
- Giulio Trigila

Lecturers:

- April Allen-Materowski
- Evan Fink
- Sarah Harney
- Jarrod Pickens
- Timothy Ridenour
- Ryan Ronan
- Elizabeth Stepp

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Field Description

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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The Majors

- [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 <i>effective spring 2018: course title changes to Mathematical Analysis I</i> | 3 credits |
| MTH 4100 | Linear Algebra and Matrix Methods | 3 credits |
| <i>and <u>may</u> take the following course, depending on the trajectory of their academic career.</i> | | |
| MTH 4009 | Proof Writing for Advanced Calculus * | 1 credit |
| * MTH 4009 Proof Writing for Advanced Calculus is designed for students who want additional exposure to proof writing before enrolling in MTH 4010. It may be used in the mathematics major only if completed as a prerequisite for MTH 4010, and it is not open to students who have credit for one of the following courses: MTH 4000; MTH 4010; MTH 4200; MTH 4210; MTH 4215; MTH 4220; MTH 4240; or MTH 4315. | | |
| Please consult a faculty advisor in the Department of Mathematics before enrolling in this course. | | |
| 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 |

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| | <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. | | |

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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.

| Math Program Prerequisites | | |
|---|------------------------------------|-----------|
| Based on placement follow one of the following preliminary calculus options below: | | |
| <u>Option 1:</u> | | |
| MTH 2610 | Calculus I | 4 credits |
| MTH 3010 | Calculus II | 4 credits |
| <i>or</i> | | |
| <u>Option 2:</u> | | |
| MTH 2205 | Applied Calculus | 3 credits |
| MTH 3006 | Integral Calculus | 4 credits |
| <i>or</i> | | |
| <u>Option 3:</u> | | |
| MTH 2207 | Applied Calculus | 3 credits |
| MTH 3006 | Integral Calculus | 4 credits |
| <i>or</i> | | |
| <u>Option 4:</u> | | |
| MTH 3006 | Integral Calculus | 4 credits |
| <i>or</i> | | |
| MTH 3010 | Calculus II | 4 credits |
| <i>or</i> | | |
| <u>Option 5: *</u> | | |
| MTH 3006 | Integral Calculus | 4 credits |
| <i>and</i> | | |
| MTH 3007 | Infinite Series | 1 credit |
| <i>And complete one of the following courses:</i> | | |
| 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 |
| Business Program Prerequisites | | |
| ACC 2101 | Principles of Accounting | |

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| BUS 1000 | Introduction to Business ** | 3 credits |
| <i>or</i> | | |
| BUS 1011 | Business Fundamentals: The Contemporary Business Landscape ** | 3 credits |
| CIS 2200 | Introduction to Information Systems and Technologies ** | 3 credits |
| ECO 1001 | Micro-Economics | 3 credits |
| ECO 1002 | Macro-Economics | 3 credits |
| STA 2000 | Business Statistics ** | 3 credits |

NOTES:

* Students who completed Option 5 (both MTH 3006 and MTH 3007) may register for MTH 3020 or MTH 3050.

** Students who have completed MTH 4120 Introduction to Probability, may be waived from BUS 1000/1011, CIS 2200, and STA 2000. Please consult the Weissman Office of the Associate

Dean (WSAS.AssocDean@baruch.cuny.edu; 646-312-3890; NVC 8-265) to request registration permission.

Required Courses

| | | |
|----------|--|-----------|
| 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 cannot enroll in MTH 4120. They must satisfy the probability requirement by registering 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:

| | | |
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| 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.

NOTE: Depending on a student's starting mathematics proficiency, this program may require more than 120 credits to complete.

Mathematics Program Prerequisites:

As a preliminary requirement, students must complete the calculus requirement, which may be achieved by any one of the following six methods:

| | | |
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| Option 1: | | |
| | Calculus AP Exam (BC) with a score of 4 or 5 (<i>transfers to Baruch as MTH 2610 and MTH 3010</i>) | 8 credits |
| MTH 3050 | Multi-Variable and Vector Calculus | 4 credits |
| <i>or</i> | | |
| Option 2: | | |
| | Calculus AP exam (AB) with a score of 4 or 5 (<i>transfers to Baruch as MTH 2610</i>) | 4 credits |
| MTH 3010 | Calculus II | 4 credits |
| MTH 3050 | Multi-Variable and Vector Calculus | 4 credits |
| <i>or</i> | | |
| Option 3: | | |
| MTH 2610 | Calculus I | 4 credits |
| MTH 3010 | Calculus II | 4 credits |
| MTH 3050 | Multi-Variable and Vector Calculus | 4 credits |
| <i>or</i> | | |
| Option 4: | | |
| MTH 2205/ MTH 2206 | Applied Calculus | 3 credits |
| <i>or</i> | | |
| MTH 2207 | Applied Calculus and Matrix Applications | 4 credits |
| and the following three courses: | | |
| MTH 3006 | Integral Calculus | 4 credits |
| MTH 3030 | Analytic Geometry and Calculus II | 5 credits |
| MTH 3035 | Vector Calculus * | 1 credit |

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| | <i>or</i> | |
| Option 5: | | |
| MTH 2205/ MTH 2206 | Applied Calculus | 3 credits |
| MTH 2207 | Applied Calculus and Matrix Applications | 4 credits |
| and the following three courses: | | |
| MTH 3006 | Integral Calculus | 4 credits |
| MTH 3007 | Infinite Series | 1 credit |
| MTH 3050 | Multi-Variable and Vector Calculus * | 4 credits |
| | <i>or</i> | |
| Option 6: | | |
| MTH 2630 | Analytic Geometry and Calculus I | 5 credits |
| MTH 3030 | Analytic Geometry and Calculus II | 5 credits |
| MTH 3035 | Vector Calculus * | 1 credit |
| Each option also requires: | | |
| MTH 4000 * | Bridge to Higher Mathematics | 4 credits |
| * NOTES: | | |
| <ol style="list-style-type: none"> 1. At least an overall B+ average is required for the calculus courses preceding MTH 3020, MTH 3030 or MTH 3050 in each of the above options. 2. MTH 3050 may be replaced with MTH 3020 and MTH 3035 in any of the above options. 3. At least a B or better is required in: MTH 3050; or MTH 3020 and MTH 3035; or MTH 3030 and MTH 3035 as appropriate. 4. To gain official admission to the program students must complete MTH 4000 with a minimum grade of B. | | |
| Business Program Prerequisites: | | |
| ACC 2101 | Principles of Accounting | 3 credits |
| ECO 1001 | Micro-Economics | 3 credits |
| ECO 1002 | Macro-Economics | 3 credits |
| <p>BSFM students are waived from the following FIN 3000 course prerequisites: BUS 1000/1011; CIS 2200; and STA 2000. Please consult the Weissman Office of the Associate Dean</p> <p>(WSAS.AssocDean@baruch.cuny.edu; 646-312-3890; NVC 8-265) to request registration permission.</p> | | |
| Required Finance Courses: | | |
| FIN 3000 | Principles of Finance | 3 credits |

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|--|--|-----------|
| FIN 3610 | Corporate Finance | 3 credits |
| Required Upper-level Mathematics Courses: | | |
| MTH 3300 | Algorithms, Computers, and Programming I | 3 credits |
| 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 | 4 credits |

* Students who have completed **MTH 3120** cannot enroll in **MTH 4120**. They must satisfy the probability requirement by registering 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 **MTH 3010** and any other 3- or 4-credit mathematics course numbered 3000 or higher, **with the exceptions of MTH 3007 and MTH 4009 (which are not applicable toward the minor)**. Students must then complete a capstone course consisting of any mathematics course at the 4000-level or higher **with the exceptions of MTH 4410 (which may not be used as a capstone course)**.

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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 |

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| 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 3007 | Infinite Series | 1 hour; 1 credit |
| 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; 1 credit |
| MTH 3910 | Financial Mathematics Internship | 1 hour; 1 credit |
| MTH 3911 | Financial Mathematics Internship | 1 hour; 1 credit |
| MTH 3912 | Financial Mathematics Internship | 1 hour; 1 credit |
| MTH 4000 | Bridge to Higher Mathematics | 4 hours; 3 credits |
| MTH 4005 | Problem-Solving Seminar | 3 hours; 3 credits |
| MTH 4009 | Proof Writing for Advanced Calculus | 1 hour; 1 credit |
| MTH 4010 | Advanced Calculus I <i>effective spring 2018: course title changes to Mathematical Analysis I</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 |

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| 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 |

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|-----------|---------------------------|----------------------------------|
| MTH 6003H | Honors in Mathematics III | Hours and credits to be arranged |
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