Another requirement for majors is participation in an undergraduate seminar, usually in the junior or senior year. Applied math majors must take the undergraduate seminar in both the junior and senior year. In these seminars, students gain experience in learning an advanced topic and lecturing on it. In order to be eligible for departmental honors, majors must write a senior thesis.

Courses for First-Year Students

The systematic study of mathematics begins with one of the following three alternative calculus and linear algebra sequences:

<table>
<thead>
<tr>
<th>MATH UN1101</th>
<th>CALCULUS I</th>
</tr>
</thead>
<tbody>
<tr>
<td>- MATH UN1102 and CALCULUS II</td>
<td></td>
</tr>
<tr>
<td>- MATH UN1201 and CALCULUS III</td>
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<tr>
<td>- MATH UN1202 and CALCULUS IV</td>
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<tr>
<td>- MATH UN2010 and LINEAR ALGEBRA</td>
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<tr>
<td>OR</td>
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<tr>
<td>MATH UN1101</td>
<td>CALCULUS I</td>
</tr>
<tr>
<td>- MATH UN1102 and CALCULUS II</td>
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<tr>
<td>- MATH UN1205 and ACCELERATED MULTIVARIABLE</td>
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<tr>
<td>- MATH UN2010 and CALC</td>
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<tr>
<td>and LINEAR ALGEBRA</td>
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<td>OR</td>
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<tr>
<td>MATH UN1101</td>
<td>CALCULUS I</td>
</tr>
<tr>
<td>- MATH UN1102 and CALCULUS II</td>
<td></td>
</tr>
<tr>
<td>- MATH UN1207 and HONORS MATHEMATICS A</td>
<td></td>
</tr>
<tr>
<td>- MATH UN1208 and HONORS MATHEMATICS B</td>
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</tr>
</tbody>
</table>

Credit is allowed for only one calculus and linear algebra sequence.

*Calculus I, II* is a standard course in single-variable differential and integral calculus; *Calculus III, IV* is a standard course in multivariable differential and integral calculus; *Accelerated Multivariable Calculus* is an accelerated course in multivariable differential and integral calculus.

While *Calculus II* is no longer a prerequisite for *Calculus III*, students are strongly urged to take it before taking *Calculus III*. In particular, students thinking of majoring or concentrating in mathematics or one of the joint majors involving mathematics should take *Calculus II* before taking *Calculus III*. Note that *Calculus II* is a prerequisite for *Accelerated Multivariable Calculus*, and both *Calculus II* and *Calculus III* are prerequisites for *Calculus IV*.

The third sequence, *Honors Mathematics A-B*, is for exceptionally well-qualified students who have strong Advanced Placement scores. It covers multivariable calculus (MATH UN1201 CALCULUS III-MATH UN1202 CALCULUS IV) and linear algebra (MATH UN2010 LINEAR ALGEBRA), with an emphasis on theory.

Advanced Placement

The department grants 3 credits for a score of 4 or 5 on the AP Calculus AB exam provided students complete MATH UN1102 CALCULUS II or MATH UN1201 CALCULUS III with a grade of C or better. The department grants 3 credits for a score of 4 on the AP Calculus BC exam provided students complete MATH UN1102 CALCULUS II or MATH UN1201 CALCULUS III with a grade of C or better. The department grants 6 credits for a score of 5 on the AP Calculus BC exam provided students complete MATH UN1201 CALCULUS III or MATH UN1205 ACCELERATED MULTIVARIABLE CALC MATH UN1207 HONORS MATHEMATICS A with a grade of C or better. Students can receive credit for only one calculus sequence.
Placement in the Calculus Sequences

Calculus I
Students who have essentially mastered a precalculus course and those who have a score of 3 or less on an Advanced Placement (AP) exam (either AB or BC) should begin their study of calculus with MATH UN1101 CALCULUS I.

Calculus II and III
Students with a score of 4 or 5 on the AB exam, 4 on the BC exam, or those with no AP score but with a grade of A in a full year of high school calculus may begin with either MATH UN1102 CALCULUS II or MATH UN1201 CALCULUS III. Note that such students who decide to start with Calculus III may still need to take Calculus II since it is a requirement or prerequisite for other courses. In particular, they MUST take Calculus II before going on to MATH UN1202 CALCULUS IV. Students with a score of 5 on the BC exam may begin with Calculus III and do not need to take Calculus II.

Those with a score of 4 or 5 on the AB exam or 4 on the BC exam may receive 3 points of AP credit upon completion of Calculus II with a grade of C or higher. Those students with a score of 5 on the BC exam may receive 6 points of AP credit upon completion of Calculus III with a grade of C or higher.

Accelerated Multivariable Calculus
Students with a score of 5 on the AP BC exam or 7 on the IB HL exam may begin with MATH UN1205 ACCELERATED MULTIVARIABLE CALC. Upon completion of this course with a grade of C or higher, they may receive 6 points of AP credit.

Honors Mathematics A
Students who want a proof-oriented theoretical sequence and have a score of 5 on the BC exam may begin with MATH UN1207 HONORS MATHEMATICS A, which is especially designed for mathematics majors. Upon completion of this course with a grade of C or higher, they may receive 6 points of AP credit.

Transfers Inside the Calculus Sequences
Students who wish to transfer from one calculus course to another are allowed to do so beyond the date specified on the Academic Calendar. They are considered to be adjusting their level, not changing their program. However, students must obtain the approval of the new instructor and their advising dean prior to reporting to the Office of the Registrar.

Grading
No course with a grade of D or lower can count toward the major, interdepartmental major, or concentration. Students who are doing a double major cannot double count courses for their majors.

Senior Thesis and Departmental Honors
In order to be eligible for departmental honors, majors must write a senior thesis. Normally no more than 10% of graduating majors receive departmental honors in a given academic year.

A Senior Thesis in Mathematics is an original presentation of a subject in pure or applied mathematics from sources in the published literature. The thesis must demonstrate significant independent work of the author. A thesis is expected to be between 20 and 50 pages with complete

Professors
- Mohammed Abouzaid
- David A. Bayer (Barnard)
- Andrew Blumberg
- Simon Brendle
- Ivan Corwin
- Panagiota Daskalopoulos
- Aise Johan de Jong (Department Chair)
- Daniela De Silva (Barnard Chair)
- Julien Dubedat
- Robert Friedman
- Dorian Goldfeld
- Brian Greene
- Richard Hamilton
- Michael Harris
- Ioannis Karatzas
- Mikhail Khovanov
- Chiu-Chu Liu
- Dusa McDuff (Barnard)
- Andrei Okounkov
- D. H. Phong
- Henry Pinkham
- Ovidiu Savin
- Michael Thaddeus
- Eric Urban
- Mu-Tao Wang

Associate Professors
- Amol Aggarwal
- Chao Li
- Lindsay Piechnik (Barnard)
- Will Sawin

references and must have a substantial expository component to be well received.

A student who is interested in writing a senior thesis needs to identify a faculty member in the Department of Mathematics as an advisor, determine an appropriate topic, and receive the written approval from the faculty advisor and the DUS. The research of the thesis is conducted primarily during the fall term and the final paper is submitted to the DUS by the end of March.

Students must register for MATH UN3994 Senior Thesis in Mathematics I (4 credits) in the fall semester of their senior year. An optional continuation course MATH UN3995 Senior Thesis in Mathematics II (2 credits) is available during the spring. The second term of this sequence may not be taken without the first. Registration for the spring continuation course has no impact on the timeline or outcome of the final paper. Sections of Senior Thesis in Mathematics I and II do NOT count towards the major requirements, with the exception of an advanced written approval by the DUS.
Assistant Professors

- Elena Giorgi
- Francesco Lin
- Giulia Sacca

J.F. Ritt Assistant Professors

- Rostislav Akhmechet
- Konstantin Aleshkin
- Amadou Bah
- Marco Castronovo
- Sam Collingbourne
- Andres Fernandez-Herrero
- Florian Johne
- Inbar Klang
- S. Michael Miller Eismeier
- Gyujin Oh
- Tudor Padurariu
- Akash Sengupta
- Xi Sisi Shen

Senior Lecturers in Discipline

- Lars Nielsen
- Mikhail Smirnov
- Peter Woit

Lecturers in Discipline

- George Dragomir
- Gerhardt Hinkle

On Leave

- Profs. Aggarwal, Corwin, Giorgi, Klang, Krichever, Okounkov (Fall 2022)
- Profs. Abouzaid, Aggarwal, Brendle, Friedman, Goldfeld, Oh, Okounkov (Spring 2023)

Major in Mathematics

The major requires 40-42 points as follows:

Select one of the following three calculus and linear algebra sequences
(13-15 points including Advanced Placement Credit):

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Calculus and Linear Algebra Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH UN1101 - MATH UN1102 - MATH UN1103 - MATH UN1202 - MATH UN2010</td>
<td>and CALCULUS I and CALCULUS II and CALCULUS III and CALCULUS IV and LINEAR ALGEBRA</td>
</tr>
<tr>
<td>MATH UN1101 - MATH UN1102 - MATH UN1205 - MATH UN2010</td>
<td>and ACCELERATED MULTIVARIABLE CALC and LINEAR ALGEBRA</td>
</tr>
<tr>
<td>MATH UN1101 - MATH UN1102 - MATH UN1207 - MATH UN1208</td>
<td>and HONORS MATHEMATICS A and HONORS MATHEMATICS B</td>
</tr>
</tbody>
</table>

12 points in the following courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH GU4041</td>
<td>INTRO MODERN ALGEBRA I</td>
</tr>
<tr>
<td>MATH GU4042</td>
<td>INTRO MODERN ALGEBRA II</td>
</tr>
<tr>
<td>MATH GU4061</td>
<td>INTRO MODERN ANALYSIS I</td>
</tr>
<tr>
<td>MATH GU4062</td>
<td>INTRO MODERN ANALYSIS II</td>
</tr>
</tbody>
</table>

3 points in the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH UN3951</td>
<td>UNDERGRADUATE SEMINARS I</td>
</tr>
<tr>
<td>or MATH UN3952</td>
<td>UNDERGRADUATE SEMINARS II</td>
</tr>
</tbody>
</table>

12 points from the following:

1) Courses offered by the department numbered 2000 or higher

2) Courses from the list of approved cognate courses below. A maximum of 6 credits may be taken from courses outside the department.

1 UN2015 (Linear Algebra and Probability) does NOT replace UN2010 (Linear Algebra) as prerequisite requirements of math courses. Students will not receive full credit for both courses UN2010 and UN2015.

2 Students who are not contemplating graduate study in mathematics may replace one or both of the two terms of MATH GU4061- MATH GU4062 by one or two of the following courses: MATH UN2500 ANALYSIS AND OPTIMIZATION, MATH UN3007 COMPLEX VARIABLES, MATH UN3028 PARTIAL DIFFERENTIAL EQUATIONS, or MATH GU4032 FOURIER ANALYSIS.

3 Only one Undergraduate Seminar may count towards the major requirements.

4 Additional courses may be selected only with prior written approval from the Director of Undergraduate Studies.

The program of study should be planned with a departmental adviser before the end of the sophomore year. Majors who are planning on graduate studies in mathematics are urged to obtain a reading knowledge of one of the following languages: French, German, or Russian.

Majors are offered the opportunity to write an honors senior thesis under the guidance of a faculty member. Interested students should contact the director of undergraduate studies.
The major requires 37-41 points as follows:

Select one of the following three calculus and linear algebra sequences (3-4 points including Advanced Placement Credit):

1. **MATH UN1101** and **MATH UN1102** and **MATH UN2010** and **LINEAR ALGEBRA 1**
   OR
   **MATH UN1101** and **MATH UN1102** and **MATH UN1205** and **ACCELERATED MULTIVARIABLE**
   OR
   **MATH UN2010** and **CALC** and **LINEAR ALGEBRA 1**

Select one of the following three courses. The selected course may not count as an elective.

1. **MATH UN2500** and **ANALYSIS AND OPTIMIZATION**
   OR
   **MATH GU4061** and **INTRO MODERN ANALYSIS I**
   OR
   **APMA E4901** and **SEM-PROBLEMS IN APPLIED MATH** (junior year)
   OR
   **APMA E4903** and **SEM-PROBLEMS IN APPLIED MATH** (senior year)

18 points in electives, with at least 9 points from the following courses.
A maximum of 9 points may be selected from courses outside this list, with prior written approval from the Director of Undergraduate Studies.
Students will not receive full credit for both courses UN2010 and UN2015.

Major in Computer Science–Mathematics

The goal of this interdepartmental major is to provide substantial background in each of these two disciplines, focusing on some of the parts of each which are closest to the other. Students intending to pursue a Ph.D. program in either discipline are urged to take additional courses, in consultation with their advisers.

The major requires 20 points in computer science, 19-21 points in mathematics, and two 3-point electives in either computer science or mathematics.

### Computer Science

- COMS W1004 Introduction to Computer Science and Programming in Java
- or COMS W1007 Honors Introduction to Computer Science
- COMS W3134 Data Structures in Java
- or COMS W3137 HONORS DATA STRUCTURES # ALGOL
- COMS W3157 ADVANCED PROGRAMMING
- COMS W3203 DISCRETE MATHEMATICS
- COMS W3261 COMPUTER SCIENCE THEORY
- CSEE W3827 FUNDAMENTALS OF COMPUTER SYSTS

### Mathematics

Select one of the following three calculus and linear algebra sequences (13-15 points including Advanced Placement Credit):

1. MATH UN1101 - MATH UN1102 - MATH UN1201 - MATH UN2010 - MATH UN2500
   - CALCULUS I
   - and CALCULUS II
   - and CALCULUS III
   - and CALCULUS IV
   - and LINEAR ALGEBRA

2. MATH UN1101 - MATH UN1102 - MATH UN1205 - MATH UN2010 - MATH UN2500
   - CALCULUS I
   - and CALCULUS II
   - and ACCELERATED MULTIVARIABLE
   - and LINEAR ALGEBRA

3. MATH UN1207 - MATH UN1208 - MATH UN2500
   - HONORS MATHEMATICS A
   - and HONORS MATHEMATICS B
   - and ANALYSIS AND OPTIMIZATION (with approval from the adviser)

### Electives

Select two of the following courses:

- CSOR W4231 ANALYSIS OF ALGORITHMS I
- COMS W4241 Numerical Algorithms and Complexity
- MATH BC2006 COMBINATORICS
- MATH UN2500 ANALYSIS AND OPTIMIZATION
- MATH UN3001 COMPLEX VARIABLES
- MATH UN3202 NUMBER THEORY AND CRYPTOGRAPHY
- MATH UN3386 DIFFERENTIAL GEOMETRY
- MATH GU4051 TOPOLOGY
- MATH GU4061 INTRO MODERN ANALYSIS I

1. UN2015 (Linear Algebra and Probability) does NOT replace UN2010 (Linear Algebra) as prerequisite requirements of math courses. Students will not receive full credit for both courses UN2010 and UN2015.

Major in Economics-Mathematics

For a description of the joint major in economics-mathematics, see the Economics section of this bulletin.

Major in Mathematics-Statistics

The program is designed to prepare the student for: (1) a career in industries such as finance and insurance that require a high level of mathematical sophistication and a substantial knowledge of probability and statistics, and (2) graduate study in quantitative disciplines. Students choose electives in finance, actuarial science, operations research, or other quantitative fields to complement requirements in mathematics, statistics, and computer science.

### Mathematics

Select one of the following sequences:

1. MATH UN1101 - MATH UN1102 - MATH UN1201 - MATH UN2010 - MATH UN2500
   - CALCULUS I
   - and CALCULUS II
   - and CALCULUS III
   - and CALCULUS IV
   - and LINEAR ALGEBRA
   - and ANALYSIS AND OPTIMIZATION

2. MATH UN1101 - MATH UN1102 - MATH UN1205 - MATH UN2010 - MATH UN2500
   - CALCULUS I
   - and CALCULUS II
   - and ACCELERATED MULTIVARIABLE
   - and LINEAR ALGEBRA
   - and ANALYSIS AND OPTIMIZATION

### Statistics

- STAT UN1201 CALC-BASED INTRO TO STATISTICS
- STAT GU4203 PROBABILITY THEORY
- STAT GU4204 STATISTICAL INFERENCE
- STAT GU4205 LINEAR REGRESSION MODELS

Select one of the following courses:

- STAT GU4207 ELEMENTARY STOCHASTIC PROCESS
- STAT GU4262 Stochastic Processes for Finance
- STAT GU4264 STOCHASTIC PROCESSES-APPLICTNS I
- STAT GU4265 STOCHASTIC METHODS IN FINANCE

### Computer Science

Select one of the following courses:

- COMS W1004 Introduction to Computer Science and Programming in Java
- COMS W1005 Introduction to Computer Science and Programming in MATLAB
ENGI E1006 INTRO TO COMP FOR ENG/APP SCI
COMS W1007 Honors Introduction to Computer Science

or an advanced computer science offering in programming

Electives
An approved selection of three advanced courses in mathematics, statistics, applied mathematics, industrial engineering and operations research, computer science, or approved mathematical methods courses in a quantitative discipline. At least one elective must be a Mathematics Department course numbered 3000 or above.

\[ \text{1 UN2015 (Linear Algebra and Probability) does NOT replace UN2010 (Linear Algebra) as prerequisite requirements of math courses. Students will not receive full credit for both courses UN2010 and UN2015.} \]

Students interested in modeling applications are recommended to take MATH UN2030 ORDINARY DIFFERENTIAL EQUATIONS and MATH UN3028 PARTIAL DIFFERENTIAL EQUATIONS.

Students interested in finance are recommended to take MATH GR5010 INTRO TO THE MATH OF FINANCE, STAT GU4261 STATISTICAL METHODS IN FINANCE, and STAT GU4221 TIME SERIES ANALYSIS.

Students interested in graduate study in mathematics or in statistics are recommended to take MATH GU4061 INTRO MODERN ANALYSIS I and MATH GU4062 INTRO MODERN ANALYSIS II.

Students preparing for a career in actuarial science are encouraged to replace STAT GU4205 LINEAR REGRESSION MODELS with STAT GU4282 Linear Regression and Time Series Methods, and to take among their electives STAT GU4281 Theory of Interest.

### Concentration in Mathematics

The concentration requires the following:

**Mathematics**

Select one of the following three multivariable calculus and linear algebra sequences:

- MATH UN1201 - MATH UN1202 - MATH UN2010
  - CALCULUS III
  - and CALCULUS IV
  - and LINEAR ALGEBRA \(^1\)

OR

- MATH UN1205 - MATH UN2010
  - ACCELERATED MULTIVARIABLE CALC
  - and LINEAR ALGEBRA \(^1\)

OR

- MATH UN1207 - MATH UN1208
  - HONORS MATHEMATICS A
  - and HONORS MATHEMATICS B

**Additional Courses**

Select at least 12 additional points from any of the courses offered by the department numbered 2000 or higher. A maximum of 3 credits may be taken from courses outside the department. \(^2\)

\[ \text{1 UN2015 (Linear Algebra and Probability) does NOT replace UN2010 (Linear Algebra) as prerequisite requirements of math courses. Students will not receive full credit for both courses UN2010 and UN2015.} \]

\[ \text{2 For mathematics courses taken in other departments, consult with the director of undergraduate studies.} \]
MATH UN1101 CALCULUS I. 3.00 points.
Prerequisites: (see Courses for First-Year Students). Functions, limits, derivatives, introduction to integrals, or an understanding of pre-calculus will be assumed. (SC)

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Section/Call Number</th>
<th>Times/Location</th>
<th>Instructor</th>
<th>Points</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1101</td>
<td>001/00020</td>
<td>M W 6:10pm - 7:25pm</td>
<td>Lindsay Piechnik</td>
<td>3.00</td>
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<tr>
<td></td>
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<tr>
<td>MATH 1101</td>
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<td>M W 10:10am - 11:25am</td>
<td>Marco Castronovo</td>
<td>3.00</td>
<td>43/110</td>
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<tr>
<td></td>
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<td>402 Chandler</td>
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<tr>
<td>MATH 1101</td>
<td>003/12020</td>
<td>M W 2:40pm - 3:55pm</td>
<td>Kuan-Wen Chen</td>
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<td>407 Mathematics Building</td>
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<tr>
<td>MATH 1101</td>
<td>004/12021</td>
<td>T Th 11:40am - 12:55pm</td>
<td>Rostislav Akhmechet</td>
<td>3.00</td>
<td>58/110</td>
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<td></td>
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<td>MATH 1101</td>
<td>005/12022</td>
<td>T Th 2:40pm - 3:55pm</td>
<td>Luis Fernandez</td>
<td>3.00</td>
<td>43/110</td>
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<tr>
<td>MATH 1101</td>
<td>006/12023</td>
<td>T Th 4:10pm - 5:25pm</td>
<td>Chilin Zhang</td>
<td>3.00</td>
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Fall 2023: MATH UN1101

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Section/Call Number</th>
<th>Times/Location</th>
<th>Instructor</th>
<th>Points</th>
<th>Enrollment</th>
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<tr>
<td>MATH 1101</td>
<td>001/10629</td>
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<td>Mrudul Thatte</td>
<td>3.00</td>
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<tr>
<td>MATH 1101</td>
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<td>Nathan Chen</td>
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<td>006/10634</td>
<td>M W 6:10pm - 7:25pm</td>
<td>Qiao He</td>
<td>3.00</td>
<td>7/30</td>
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<tr>
<td>MATH 1101</td>
<td>007/10635</td>
<td>T Th 10:10am - 11:25am</td>
<td>James Hotchkiss</td>
<td>3.00</td>
<td>11/100</td>
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<tr>
<td>MATH 1101</td>
<td>008/10636</td>
<td>T Th 11:40am - 12:55pm</td>
<td>James Hotchkiss</td>
<td>3.00</td>
<td>11/100</td>
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<tr>
<td>MATH 1101</td>
<td>009/10637</td>
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<td>James Hotchkiss</td>
<td>3.00</td>
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<tr>
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<tr>
<td>MATH 1101</td>
<td>011/10639</td>
<td>T Th 6:10pm - 7:25pm</td>
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MATH UN1102 CALCULUS II. 3.00 points.
Prerequisites: MATH UN1101 or the equivalent. Methods of integration, applications of the integral, Taylor's theorem, infinite series. (SC)

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Section/Call Number</th>
<th>Times/Location</th>
<th>Instructor</th>
<th>Points</th>
<th>Enrollment</th>
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<tr>
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<td>Lindsay Piechnik</td>
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<tr>
<td>MATH 1102</td>
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<td>M W 1:10pm - 2:25pm</td>
<td>Ryuichi Haney</td>
<td>3.00</td>
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<td>Richard Hamilton</td>
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<td>Elliott Stein</td>
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<td>Allen Yuan</td>
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<td>Andres Fernandez Herrero</td>
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<tr>
<td>MATH 1102</td>
<td>007/12029</td>
<td>T Th 6:10pm - 7:25pm</td>
<td>Patrick Lei</td>
<td>3.00</td>
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Fall 2023: MATH UN1102

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<td>Yoonjoo Kim</td>
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<tr>
<td>MATH 1102</td>
<td>002/10641</td>
<td>M W 2:40pm - 3:55pm</td>
<td>Yoonjoo Kim</td>
<td>3.00</td>
<td>7/100</td>
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<tr>
<td>MATH 1102</td>
<td>003/10642</td>
<td>M W 4:10pm - 5:25pm</td>
<td>O. FACULTY</td>
<td>3.00</td>
<td>5/64</td>
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<td>3.00</td>
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</table>
MATH UN1205 ACCELERATED MULTIVARIABLE CALC. 4.00 points.
Prerequisites: (MATH UN1101 and MATH UN1102)
Prerequisites: (MATH UN1101 and MATH UN1102) Vectors in dimensions 2 and 3, vector-valued functions of one variable, scalar-valued functions of several variables, partial derivatives, gradients, optimization, Lagrange multipliers, double and triple integrals, line and surface integrals, vector calculus. This course is an accelerated version of MATH UN1201 - MATH UN1202. Students taking this course may not receive credit for MATH UN1201 and MATH UN1202

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Section/Call Number</th>
<th>Times/Location</th>
<th>Instructor</th>
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<tr>
<td>MATH 1205</td>
<td>001/12492</td>
<td>T Th 1:10pm - 2:25pm 141 Uris Hall</td>
<td>Sam Collingbourne</td>
<td>4.00</td>
<td>29/50</td>
</tr>
<tr>
<td>MATH 1205</td>
<td>001/10653</td>
<td>M W 1:10pm - 2:25pm Room TBA</td>
<td>Mu-Tao Wang</td>
<td>4.00</td>
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MATH UN1207 HONORS MATHEMATICS A. 4.00 points.
Prerequisites: (see Courses for First-Year Students). The second term of this course may not be taken without the first. Multivariable calculus and linear algebra from a rigorous point of view. Recommended for mathematics majors. Fulfills the linear algebra requirement for the major. (SC)

<table>
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<tr>
<th>Course Number</th>
<th>Section/Call Number</th>
<th>Times/Location</th>
<th>Instructor</th>
<th>Points</th>
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<td>MATH 1207</td>
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<td>T Th 11:40am - 12:55pm Room TBA</td>
<td>George Dragomir</td>
<td>4.00</td>
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<tr>
<td>MATH 1208</td>
<td>001/12494</td>
<td>T Th 1:10pm - 2:25pm 407 Mathematics Building</td>
<td>Stephen Miller</td>
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MATH UN1200 INTRO TO HIGHER MATHEMATICS. 3.00 points.
Introduction to understanding and writing mathematical proofs. Emphasis on precise thinking and the presentation of mathematical results, both in oral and in written form. Intended for students who are considering majoring in mathematics but wish additional training. CC/GS: Partial Fulfillment of Science Requirement. BC: Fulfillment of General Education Requirement: Quantitative and Deductive Reasoning (QUA)

<table>
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<tr>
<th>Course Number</th>
<th>Section/Call Number</th>
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<tr>
<td>MATH 2000</td>
<td>001/12498</td>
<td>T Th 1:10pm - 2:25pm 520 Mathematics Building</td>
<td>Francesco Lin</td>
<td>3.00</td>
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<tr>
<td>MATH 2000</td>
<td>001/00084</td>
<td>M W 10:10am - 11:25am 4104 Diana Center</td>
<td>Dusa McDuff</td>
<td>3.00</td>
<td>20/55</td>
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</table>
MATH UN2005 INTRODUCTION TO MATHEMATICS PROOFS. 0.00 points.
This is a seminar course that covers the basics of mathematical proofs and in particular the epsilon-delta argument in single variable calculus. Students who have little experience with mathematical proofs are strongly encouraged to take this course concurrently with Honors Math, Intro to Modern Algebra, or Intro to Modern Analysis.

Spring 2023: MATH UN2005

<table>
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<th>Course Number</th>
<th>Section/Call Number</th>
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<th>Instructor</th>
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<tr>
<td>MATH 2005</td>
<td>001/19598</td>
<td>F 11:00am - 1:00pm</td>
<td>Mu-Tao Wang</td>
<td>0.00</td>
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MATH BC2006 COMBINATORICS. 3.00 points.

Spring 2023: MATH BC2006

<table>
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<th>Course Number</th>
<th>Section/Call Number</th>
<th>Times/Location</th>
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<th>Enrollment</th>
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<tr>
<td>MATH 2006</td>
<td>001/00024</td>
<td>T Th 10:10am - 11:25am 328 Milbank Hall</td>
<td>David Bayer</td>
<td>3.00</td>
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</table>

MATH UN2010 LINEAR ALGEBRA. 3.00 points.
Prerequisites: MATH UN1201 or the equivalent.
Matrices, vector spaces, linear transformations, eigenvalues and eigenvectors, canonical forms, applications. (SC)

Spring 2023: MATH UN2010

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Section/Call Number</th>
<th>Times/Location</th>
<th>Instructor</th>
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<th>Enrollment</th>
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<tr>
<td>MATH 2010</td>
<td>001/12504</td>
<td>M W 10:10am - 11:25am 203 Mathematics Building</td>
<td>Amadou Bah</td>
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<tr>
<td>MATH 2010</td>
<td>002/12541</td>
<td>M W 11:40am - 12:55pm 203 Mathematics Building</td>
<td>Amadou Bah</td>
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<tr>
<td>MATH 2010</td>
<td>003/12543</td>
<td>T Th 1:10pm - 2:25pm 312 Mathematics Building</td>
<td>Jie Jun Morris Ang</td>
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<tr>
<td>MATH 2010</td>
<td>004/12546</td>
<td>T Th 4:10pm - 5:25pm 203 Mathematics Building</td>
<td>Konstantin Aleshkin</td>
<td>3.00</td>
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<tr>
<td>MATH 2010</td>
<td>005/12563</td>
<td>T Th 6:10pm - 7:25pm 203 Mathematics Building</td>
<td>Konstantin Aleshkin</td>
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<td>Fall 2023: MATH UN2010</td>
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<td>Times/Location</td>
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<td>Points</td>
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<td>MATH 2010</td>
<td>002/00086</td>
<td>M W 11:40am - 12:55pm 328 Milbank Hall</td>
<td>0. FACULTY</td>
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<tr>
<td>MATH 2010</td>
<td>003/10962</td>
<td>M W 2:40pm - 3:55pm Room TBA</td>
<td>Siddhi Krishna</td>
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<tr>
<td>MATH 2010</td>
<td>004/10963</td>
<td>T Th 8:40am - 9:55am Room TBA</td>
<td>Andrew Blumberg Marco Castronovo</td>
<td>3.00</td>
<td>20/100</td>
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<tr>
<td>MATH 2010</td>
<td>005/10964</td>
<td>T Th 10:10am - 11:25am Room TBA</td>
<td>Andrew Blumberg Marco Castronovo</td>
<td>3.00</td>
<td>100/100</td>
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</table>

MATH UN2015 Linear Algebra and Probability. 3.00 points.
Linear algebra with a focus on probability and statistics. The course covers the standard linear algebra topics: systems of linear equations, matrices, determinants, vector spaces, bases, dimension, eigenvalues and eigenvectors, the Spectral Theorem and singular value decompositions. It also teaches applications of linear algebra to probability, statistics and dynamical systems giving a background sufficient for higher level courses in probability and statistics. The topics covered in the probability theory part include conditional probability, discrete and continuous random variables, probability distributions and the limit theorems, as well as Markov chains, curve fitting, regression, and pattern analysis. The course contains applications to life sciences, chemistry, and environmental life sciences. No a priori background in the life sciences is assumed. This course is best suited for students who wish to focus on applications and practical approaches to problem solving. It is recommended to students majoring in engineering, technology, life sciences, social sciences, and economics. Math majors, joint majors, and math concentrators must take MATH UN2010 Linear Algebra, which focuses on linear algebra concepts and foundations that are needed for upper-level math courses. MATH UN2015 (Linear Algebra and Probability) does NOT replace MATH UN2010 (Linear Algebra) as prerequisite requirements of math courses. Students may not receive full credit for both courses MATH UN2010 and MATH UN2015.

Spring 2023: MATH UN2015

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<th>Section/Call Number</th>
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<tr>
<td>MATH 2015</td>
<td>001/12568</td>
<td>T Th 11:40am - 12:55pm 207 Mathematics Building</td>
<td>George Dragomir</td>
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Fall 2023: MATH UN2015

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MATH UN2030 ORDINARY DIFFERENTIAL EQUATIONS. 3.00 points.
Prerequisites: MATH UN1102 and MATH UN1201 or the equivalent.

Spring 2023: MATH UN2030

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<td>MATH 2030</td>
<td>001/12573</td>
<td>T Th 10:10am - 11:25am 312 Mathematics Building</td>
<td>Timothy Large</td>
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<td>MATH 2030</td>
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<td>T Th 11:40am - 12:55pm 614 Schermerhorn Hall</td>
<td>Florian Johne</td>
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Fall 2023: MATH UN2030

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<td>Elena Giorgi</td>
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<td>Konstantin Aleshkin</td>
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<td>Jeanne Boursier</td>
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MATH UN2500 ANALYSIS AND OPTIMIZATION. 3.00 points.
Prerequisites: MATH UN1102 and MATH UN1201 or the equivalent and MATH UN2010.
Prerequisites: MATH UN1102 and MATH UN1201 or the equivalent and MATH UN2010. Mathematical methods for economics. Quadratic forms, Hessian, implicit functions. Convex sets, convex functions. Optimization, constrained optimization, Kuhn-Tucker conditions. Elements of the calculus of variations and optimal control. (SC)
Spring 2023: MATH UN2500
Course Number Section/Call Number Times/Location Instructor Points Enrollment
MATH 2500 001/12587 M W 1:10pm - 2:25pm 207 Mathematics Building Julien Dubedat 3.00 20/100
MATH 2500 002/12594 M W 2:40pm - 3:55pm 207 Mathematics Building Ivan Horozov 3.00 66/100

MATH UN3025 MAKING, BREAKING CODES. 3.00 points.
Prerequisites: (MATH UN1101 and MATH UN1102 and MATH UN1201) and and MATH UN2010.
Prerequisites: (MATH UN1101 and MATH UN1102 and MATH UN1201) and and MATH UN2010. A concrete introduction to abstract algebra. Topics in abstract algebra used in cryptography and coding theory.
Fall 2023: MATH UN3025
Course Number Section/Call Number Times/Location Instructor Points Enrollment
MATH 3025 001/10972 T Th 1:10pm - 2:25pm Room TBA Dorian Goldfeld 3.00 100/100

MATH UN3028 PARTIAL DIFFERENTIAL EQUATIONS. 3.00 points.
Prerequisites: MATH UN3027 and MATH UN2010 or the equivalent
Prerequisites: (MATH UN2010 and MATH UN2030) or the equivalent introduction to partial differential equations. First-order equations. Linear second-order equations; separation of variables, solution by series expansions. Boundary value problems
Spring 2023: MATH UN3028
Course Number Section/Call Number Times/Location Instructor Points Enrollment
MATH 3028 001/12600 T Th 1:10pm - 2:25pm 203 Mathematics Building Elena Giorgi 3.00 78/110

MATH UN3050 DISCRETE TIME MODELS IN FINANC. 3.00 points.
Prerequisites: (MATH UN1101 and MATH UN1201) or (MATH UN1101 and MATH UN1102 and MATH UN1201) and MATH UN2010
Recommended: MATH UN3027 (or MATH UN2030 and SIEO W3600).
Prerequisites: (MATH UN1102 and MATH UN1201) or (MATH UN1101 and MATH UN1102 and MATH UN1201) and MATH UN2010
Recommended: MATH UN3027 (or MATH UN2030 and SIEO W3600).
Elementary discrete time methods for pricing financial instruments, such as options. Notions of arbitrage, risk-neutral valuation, hedging, term-structure of interest rates
Spring 2023: MATH UN3050
Course Number Section/Call Number Times/Location Instructor Points Enrollment
MATH 3050 001/12604 M W 6:10pm - 7:25pm 312 Mathematics Building Mikhail Smirnov 3.00 56/64

MATH UN3386 DIFFERENTIAL GEOMETRY. 3.00 points.
Prerequisites: MATH UN1202 or the equivalent.
Local and global differential geometry of submanifolds of Euclidean 3-space. Frenet formulas for curves. Various types of curvatures for curves and surfaces and their relations. The Gauss-Bonnet theorem.
Fall 2023: MATH UN3386
Course Number Section/Call Number Times/Location Instructor Points Enrollment
MATH 3386 001/10973 M W 2:40pm - 3:55pm Room TBA Richard Hamilton 3.00 32/50

MATH UN3901 SUPERVISED READINGS I. 1.00-3.00 points.
Prerequisites: The written permission of the faculty member who agrees to act as sponsor (sponsorship limited to full-time instructors on the staff list), as well as the permission of the Director of Undergraduate Studies. The written permission must be deposited with the Director of Undergraduate Studies before registration is completed. Guided reading and study in mathematics. A student who wishes to undertake individual study under this program must present a specific project to a member of the staff and secure his or her willingness to act as sponsor. Written reports and periodic conferences with the instructor. Supervising Readings do NOT count towards major requirements, with the exception of an advanced written approval by the DUS
Fall 2023: MATH UN3901
Course Number Section/Call Number Times/Location Instructor Points Enrollment
MATH 3901 001/15172 T Th 1:10pm - 2:25pm 203 Mathematics Building Peter Woit 1.00-3.00 2/4
MATH UN3902 SUPERVISED READINGS II. 1.00-3.00 points.
Prerequisites: The written permission of the faculty member who agrees to act as sponsor (sponsorship limited to full-time instructors on the staff list), as well as the permission of the Director of Undergraduate Studies. The written permission must be deposited with the Director of Undergraduate Studies before registration is completed. Guided reading and study in mathematics. A student who wishes to undertake individual study under this program must present a specific project to a member of the staff and secure his or her willingness to act as sponsor. Written reports and periodic conferences with the instructor. Supervising Readings do NOT count towards major requirements, with the exception of an advanced written approval by the DUS.

Spring 2023: MATH UN3902

<table>
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<td>1.00-3.00 6/3</td>
<td>Ioannis</td>
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<td>MATH 3902</td>
<td>002/18614</td>
<td>1.00-3.00 1/1</td>
<td>Karatzas</td>
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MATH UN3951 UNDERGRADUATE SEMINARS I. 3.00 points.
Prerequisites: Two years of calculus, at least one year of additional mathematics courses, and the director of undergraduate studies’ permission.
Prerequisites: Two years of calculus, at least one year of additional mathematics courses, and the director of undergraduate studies permission. The subject matter is announced at the start of registration and is different in each section. Each student prepares talks to be given to the seminar, under the supervision of a faculty member or senior teaching fellow.

Fall 2023: MATH UN3951

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<tr>
<th>Course Number</th>
<th>Section/Call Number</th>
<th>Times/Location</th>
<th>Instructor</th>
<th>Points</th>
<th>Enrollment</th>
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<tr>
<td>MATH 3951</td>
<td>001/00757</td>
<td>3.00</td>
<td>Lindsay Piechock</td>
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MATH UN3952 UNDERGRADUATE SEMINARS II. 3.00 points.
Prerequisites: Two years of calculus, at least one year of additional mathematics courses, and the director of undergraduate studies’ permission.
Prerequisites: Two years of calculus, at least one year of additional mathematics courses, and the director of undergraduate studies’ permission. The subject matter is announced at the start of registration and is different in each section. Each student prepares talks to be given to the seminar, under the supervision of a faculty member or senior teaching fellow. Prerequisite: Two years of calculus, at least one year of additional mathematics courses, and the director of undergraduate studies’ permission.

Spring 2023: MATH UN3952

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<th>Course Number</th>
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<th>Times/Location</th>
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MATH UN3994 SENIOR THESIS IN MATHEMATICS I. 4.00 points.
Majors in Mathematics are offered the opportunity to write an honors senior thesis under the guidance of a faculty member. Interested students should contact a faculty member to determine an appropriate topic, and receive written approval from the faculty advisor and the Director of Undergraduate Studies (faculty sponsorship is limited to full-time instructors on the staff list). Research is conducted primarily during the fall term; the final paper is submitted to the Director of Undergraduate Studies during the subsequent spring term. MATH UN3994 SENIOR THESIS IN MATHEMATICS I must be taken in the fall term, during which period the student conducts primary research on the agreed topic. An optional continuation course MATH UN3995 SENIOR THESIS IN MATHEMATICS II is available during the spring. The second term of this sequence may not be taken without the first. Registration for the spring continuation course has no impact on the timeline or outcome of the final paper. Sections of SENIOR THESIS IN MATHEMATICS I and II do NOT count towards the major requirements, with the exception of an advanced written approval by the DUS.

Fall 2023: MATH UN3994

<table>
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<th>Course Number</th>
<th>Section/Call Number</th>
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MATH UN3995 SENIOR THESIS IN MATHEMATICS II. 2.00 points.
Majors in Mathematics are offered the opportunity to write an honors senior thesis under the guidance of a faculty member. Interested students should contact a faculty member to determine an appropriate topic, and receive written approval from the faculty advisor and the Director of Undergraduate Studies (faculty sponsorship is limited to full-time instructors on the staff list). Research is conducted primarily during the fall term; the final paper is submitted to the Director of Undergraduate Studies during the subsequent spring term. MATH UN3994 SENIOR THESIS IN MATHEMATICS I must be taken in the fall term, during which period the student conducts primary research on the agreed topic. An optional continuation course MATH UN3995 SENIOR THESIS IN MATHEMATICS II is available during the spring. The second term of this sequence may not be taken without the first. Registration for the spring continuation course has no impact on the timeline or outcome of the final paper. Sections of SENIOR THESIS IN MATHEMATICS I and II do NOT count towards the major requirements, with the exception of an advanced written approval by the DUS.

Spring 2023: MATH UN3995

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<th>Course Number</th>
<th>Section/Call Number</th>
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<td>MATH 3995</td>
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<td>Dusa McDuff</td>
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</table>
MATH GU4007 ANALYTIC NUMBER THEORY. 3.00 points.
Prerequisites: MATH UN3007
Prerequisites: MATH UN3007 A one semester course covering the theory of modular forms, zeta functions, L -functions, and the Riemann hypothesis. Particular topics covered include the Riemann zeta function, the prime number theorem, Dirichlet characters, Dirichlet L-functions, Siegel zeros, prime number theorem for arithmetic progressions, SL (2, Z) and subgroups, quotients of the upper half-plane and cusps, modular forms, Fourier expansions of modular forms, Hecke operators, L-functions of modular forms

Fall 2023: MATH GU4007
Course Number Section/Call Number Times/Location Instructor Points Enrollment
MATH 4007 001/12608 T Th 11:40am - 12:55pm 520 Mathematics Building William Sawin 3.00 4/30

MATH GU4032 FOURIER ANALYSIS. 3.00 points.
Prerequisites: three terms of calculus and linear algebra or four terms of calculus.
Prerequisites: three terms of calculus and linear algebra or four terms of calculus. Fourier series and integrals, discrete analogues, inversion and Poisson summation formulae, convolution. Heisenberg uncertainty principle. Stress on the application of Fourier analysis to a wide range of disciplines

Fall 2023: MATH GU4032
Course Number Section/Call Number Times/Location Instructor Points Enrollment
MATH 4032 001/10974 M W 10:10am - 11:25am Room TBA Simon Brendle 3.00 50/50

MATH GU4041 INTRO MODERN ALGEBRA I. 3.00 points.
Prerequisites: MATH UN1102 and MATH UN1202 and MATH UN2010 or the equivalent
Prerequisites: MATH UN1102 and MATH UN1202 and MATH UN2010 or the equivalent. The second term of this course may not be taken without the first. Rings, homomorphisms, ideals, integral and Euclidean domains, the division algorithm, principal ideal and unique factorization domains, fields, algebraic and transcendental extensions, splitting fields, finite fields, Galois theory

Fall 2023: MATH GU4041
Course Number Section/Call Number Times/Location Instructor Points Enrollment
MATH 4041 001/12610 T Th 10:10am - 11:25am 417 Mathematics Building Nathan Chen 3.00 52/64

Spring 2023: MATH GU4041
Course Number Section/Call Number Times/Location Instructor Points Enrollment
MATH 4041 001/12610 T Th 10:10am - 11:25am 417 Mathematics Building Nathan Chen 3.00 52/64

MATH GU4042 INTRO MODERN ALGEBRA II. 3.00 points.
Prerequisites: MATH UN1102 and MATH UN1202 and MATH UN2010 or the equivalent.
Prerequisites: MATH UN1102 and MATH UN1202 and MATH UN2010 or the equivalent. The second term of this course may not be taken without the first. Rings, homomorphisms, ideals, integral and Euclidean domains, the division algorithm, principal ideal and unique factorization domains, fields, algebraic and transcendental extensions, splitting fields, finite fields, Galois theory

Spring 2023: MATH GU4042
Course Number Section/Call Number Times/Location Instructor Points Enrollment
MATH 4042 001/12613 M W 2:40pm - 3:55pm 602 Hamilton Hall Tudor Paduraru 3.00 34/100

Fall 2023: MATH GU4042
Course Number Section/Call Number Times/Location Instructor Points Enrollment
MATH 4042 001/10976 T Th 10:10am - 11:25am Room TBA Amadou Bah 3.00 22/50

MATH GU4043 ALGEBRAIC NUMBER THEORY. 3.00 points.
Prerequisites: MATH GU4041 and MATH GU4042 or the equivalent
Prerequisites: MATH GU4041 and MATH GU4042 or the equivalent Algebraic number fields, unique factorization of ideals in the ring of algebraic integers in the field into prime ideals. Dirichlet unit theorem, finiteness of the class number, ramification. If time permits, p-adic numbers and Dedekind zeta function

Spring 2023: MATH GU4043
Course Number Section/Call Number Times/Location Instructor Points Enrollment
MATH 4043 001/12618 T Th 1:10pm - 2:25pm 307 Mathematics Building Aise Johan de Jong 3.00 13/19

MATH GU4044 REPRESENTATINS OF FINITE GROUPS. 3.00 points.
Prerequisites: MATH UN2010 and MATH GU4041 or the equivalent
Prerequisites: MATH UN2010 and MATH GU4041 or the equivalent. Finite groups acting on finite sets and finite dimensional vector spaces. Group characters. Relations with subgroups and factor groups. Arithmetic properties of character values. Applications to the theory of finite groups: Frobenius groups, Hall subgroups and solvable groups. Characters of the symmetric groups. Spherical functions on finite groups

Fall 2023: MATH GU4044
Course Number Section/Call Number Times/Location Instructor Points Enrollment
MATH 4044 001/10977 T Th 1:10pm - 2:25pm Room TBA Aise Johan de Jong 3.00 19/19

MATH GU4045 ALGEBRAIC CURVES. 3.00 points.
Prerequisites: (MATH GU4041 and MATH GU4042) and MATH UN3007
Prerequisites: (MATH GU4041 and MATH GU4042) and MATH UN3007 Plane curves, affine and projective varieties, singularities, normalization, Riemann surfaces, divisors, linear systems, Riemann-Roch theorem

Spring 2023: MATH GU4045
Course Number Section/Call Number Times/Location Instructor Points Enrollment
MATH 4045 001/12621 M W 4:10pm - 5:25pm 507 Mathematics Building Akash Sengupta 3.00 13/19
MATH GU4051 TOPOLOGY. 3.00 points.
Prerequisites: (MATH UN1202 and MATH UN2010) and rudiments of group theory (e.g., MATH GU4041). MATH UN1208 or MATH GU4061 is recommended, but not required.
Prerequisites: (MATH UN1202 and MATH UN2010) and rudiments of group theory (e.g., MATH GU4041). MATH UN1208 or MATH GU4061 is recommended, but not required. Metric spaces, continuity, compactness, quotient spaces. The fundamental group of topological space. Examples from knot theory and surfaces. Covering spaces

MATH GU4052 INTRODUCTION TO KNOT THEORY. 3.00 points.
CC/GS: Partial Fulfillment of Science Requirement
Prerequisites: MATH GU4051 Topology and / or MATH GU4061 Introduction To Modern Analysis I (or equivalents). Recommended (can be taken concurrently): MATH UN2010 linear algebra, or equivalent.
Prerequisites: MATH GU4051 Topology and / or MATH GU4061 Introduction To Modern Analysis I (or equivalents). Recommended (can be taken concurrently): MATH UN2010 linear algebra, or equivalent. The study of algebraic and geometric properties of knots in R^3, including but not limited to knot projections and Reidemeisters theorem, Seifert surfaces, braids, tangles, knot polynomials, fundamental group of knot complements. Depending on time and student interest, we will discuss more advanced topics like knot concordance, relationship to 3-manifold topology, other algebraic knot invariants

MATH GU4053 INTRO TO ALGEBRAIC TOPOLOGY. 3.00 points.
Prerequisites: MATH UN2010 and MATH GU4041 and MATH GU4051
Prerequisites: MATH UN2010 and MATH GU4041 and MATH GU4051
The study of topological spaces from algebraic properties, including the essentials of homology and the fundamental group. The Brouwer fixed point theorem. The homology of surfaces. Covering spaces

MATH GU4061 INTRO MODERN ANALYSIS I. 3.00 points.
Prerequisites: MATH UN1202 or the equivalent, and MATH UN2010. The second term of this course may not be taken without the first.
Prerequisites: MATH UN1202 or the equivalent, and MATH UN2010. The second term of this course may not be taken without the first. Real numbers, metric spaces, elements of general topology, sequences and series, continuity, differentiation, integration, uniform convergence, Ascoli-Arzelà theorem, Stone-Weierstrass theorem

Fall 2023: MATH GU4051
Course Number: Section/Call Number
Times/Location: Instructor Points Enrollment
MATH 4051 001/10978 M W 4:10pm - 5:25pm Michael Thaddeus 3.00 43/50

MATH GU4052 INTRODUCTION TO KNOT THEORY. 3.00 points.

Fall 2023: MATH GU4052
Course Number: Section/Call Number
Times/Location: Instructor Points Enrollment
MATH 4052 001/10979 M W 4:10pm - 5:25pm Rostislav Akhmechet 3.00 3/19

MATH GU4053 INTRO TO ALGEBRAIC TOPOLOGY. 3.00 points.

Spring 2023: MATH GU4053
Course Number: Section/Call Number
Times/Location: Instructor Points Enrollment
MATH 4053 001/12625 T Th 2:40pm - 3:55pm Mikhail Khovanov 3.00 14/35

Spring 2023: MATH GU4061
Course Number: Section/Call Number
Times/Location: Instructor Points Enrollment
MATH 4061 001/12628 M W 2:40pm - 3:55pm Pfeffer Joshua 3.00 61/100

Fall 2023: MATH GU4061
Course Number: Section/Call Number
Times/Location: Instructor Points Enrollment
MATH 4061 001/10980 T Th 11:40am - 12:55pm Sam Collingbourne 3.00 62/64
MATH 4061 002/10981 T Th 1:10pm - 2:25pm Sam Collingbourne 3.00 34/64

Fall 2023: MATH GU4065
Course Number: Section/Call Number
Times/Location: Instructor Points Enrollment
MATH 4065 001/10986 M W 6:10pm - 7:25pm Pfeffer Joshua 3.00 61/100

Spring 2023: MATH GU4061
Course Number: Section/Call Number
Times/Location: Instructor Points Enrollment
MATH 4061 001/12628 M W 2:40pm - 3:55pm Pfeffer Joshua 3.00 61/100

MATH GU4062 INTRO MODERN ANALYSIS II. 3.00 points.
Prerequisites: MATH UN1202 or the equivalent, and MATH UN2010. The second term of this course may not be taken without the first.
Prerequisites: MATH UN1202 or the equivalent, and MATH UN2010. The second term of this course may not be taken without the first. Power series, analytic functions, Implicit function theorem, Fubini theorem, change of variables formula, Lebesgue measure and integration, function spaces

Spring 2023: MATH GU4062
Course Number: Section/Call Number
Times/Location: Instructor Points Enrollment
MATH 4062 001/12629 T Th 4:10pm - 5:25pm Jorge Pineiro Barceló 3.00 25/110

Fall 2023: MATH GU4062
Course Number: Section/Call Number
Times/Location: Instructor Points Enrollment
MATH 4062 001/10982 M W 6:10pm - 7:25pm Milind Hegde 3.00 25/50

MATH GU4065 HONORS COMPLEX VARIABLES. 3.00 points.
Prerequisites: (MATH UN1207 and MATH UN1208) or MATH GU4061
Prerequisites: (MATH UN1207 and MATH UN1208) or MATH GU4061
A theoretical introduction to analytic functions. Holomorphic functions, harmonic functions, power series, Cauchy-Riemann equations, Cauchy's integral formula, poles, Laurent series, residue theorem. Other topics as time permits: elliptic functions, the gamma and zeta function, the Riemann mapping theorem, Riemann surfaces, Nevanlinna theory

Fall 2023: MATH GU4065
Course Number: Section/Call Number
Times/Location: Instructor Points Enrollment
MATH 4065 001/10983 T Th 11:40am - 12:55pm Eric Urban 3.00 18/35
MATH GU4081 INTRO-DIFFERENTIABLE MANIFOLDS. 3.00 points.
Prerequisites: (MATH GU4051 or MATH GU4061) and MATH UN2010
Concept of a differentiable manifold. Tangent spaces and vector fields.
The inverse function theorem. Transversality and Sards theorem.
forms and Stokes theorem

Spring 2023: MATH GU4081
Course Number  Section/Call Number  Times/Location  Instructor  Points  Enrollment
MATH 4081  001/00026  M W 10:10am - 11:25am  207 Milbank Hall  Dusa McDuff  3.00  19/40

MATH GU4155 PROBABILITY THEORY. 3.00 points.
Prerequisites: MATH GU4061 or MATH UN3007
A rigorous introduction to the concepts and methods of mathematical probability starting with
basic notions and making use of combinatorial and analytic techniques.
Generating functions. Convergence in probability and in distribution.
Discrete probability spaces, recurrence and transience of random walks.
Infinite models, proof of the law of large numbers and the central limit
theorem. Markov chains

Spring 2023: MATH GU4155
Course Number  Section/Call Number  Times/Location  Instructor  Points  Enrollment
MATH 4155  001/12633  T Th 1:10pm - 2:25pm  417 Mathematics Building  Ioannis Karatzas  3.00  25/64

MATH GU4156 ADVANCED PROBABILITY THEORY. 3.00 points.
This course will cover advance topics in probability, including: the theory
of martingales in discrete and in continuous time; Brownian motion and
its properties, stochastic integration, ordinary and partial stochastic
differential equations; Applications to optimal filtering, stopping, control,
and finance; Continuous-time Markov chains, systems of interacting
particles, relative entropy dissipation, notions of information theory;
Electrical networks, random walks on graphs and groups, percolation

Fall 2023: MATH GU4156
Course Number  Section/Call Number  Times/Location  Instructor  Points  Enrollment
MATH 4156  001/10984  T Th 2:40pm - 3:55pm  Room TBA  Ioannis Karatzas  3.00  44/50

MATH GU4391 INTRO TO QUANTUM MECHANICS. 3.00 points.
This course will focus on quantum mechanics, paying attention to
both the underlying mathematical structures as well as their physical
motivations and consequences. It is meant to be accessible to students
with no previous formal training in quantum theory. The role of symmetry,
groups and representations will be stressed

MATH GU4392 INTRO TO QUANTUM MECHANICS II. 3.00 points.
Continuation of GU4391. This course will focus on quantum mechanics,
paying attention to both the underlying mathematical structures as
well as their physical motivations and consequences. It is meant to
be accessible to students with no previous formal training in quantum
theory. The role of symmetry, groups and representations will be stressed.