The systematic study of Mathematics begins with one of the following courses for first-year students:

**Advising Resources**

- Student Advising with links to advisor contact information can be found on our website along with a link to career resources.

**Student Learning Outcomes**

Students graduating with any of the majors offered by the Mathematics department should be able to attain the following outcomes:

- To acquire a basic body of mathematical knowledge that will provide them with a strong foundation for further study and/or for a career in mathematics or in other technical or scientific fields.
- To appreciate both the computational and the theoretical aspects of mathematics and to recognize its role in science, society, and history.
- To acquire precision and clarity in the oral and written communication of mathematical ideas and the ability to read and learn independently from mathematical textbooks/articles.
- To strengthen their problem solving ability via logical reasoning, rigorous proofs, and analytical thinking, and to be able to formulate precise mathematical statements from real-world problems.
- To value teamwork and collaboration with peers and the sharing of mathematical ideas.

**Programs of Study**


Math minors include Mathematics and Mathematical Sciences.

For more detailed information, please read the Requirements (p. 2) tab.

**Student Advising**

**Advising Resources**

- Students who have special placement problems, are unclear about their level, or would like to know more about course offerings should make an appointment with a faculty member or the Chair. Information about Student Advising with links to advisor contact information can be found on our website.
- Open House events are scheduled each semester for prospective and current math majors to meet faculty, ask questions, and get to know each other.
- A Students’ Guide to Studying Math at Barnard, available on our website, is a useful guide written by and for students. It answers many frequently asked questions and provides comments and opinions from math majors.

**Courses for First-Year Students**

The systematic study of Mathematics begins with one of the following alternative sequences:

<table>
<thead>
<tr>
<th>Calculus I, II, III, IV</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH UN1101</td>
<td>CALCULUS I</td>
</tr>
<tr>
<td>MATH UN1102</td>
<td>CALCULUS II</td>
</tr>
<tr>
<td>MATH UN1201</td>
<td>CALCULUS III</td>
</tr>
<tr>
<td>MATH UN1202</td>
<td>CALCULUS IV</td>
</tr>
</tbody>
</table>

**Honors Math A-B**

| MATH UN1207            | HONORS MATHEMATICS A |
| MATH UN1208            | HONORS MATHEMATICS B |

Credit is allowed for only one of the calculus sequences. The calculus sequence is a standard course in differential and integral calculus. Honors Mathematics A-B is for exceptionally well-qualified students who have strong advanced placement scores. It covers second-year Calculus (MATH UN1201 CALCULUS III–MATH UN1202 CALCULUS IV) and MATH UN2010 LINEAR ALGEBRA, with an emphasis on theory.

**Calculus II** is NOT a prerequisite for Calculus III, so students who plan to take only one year of calculus may choose between I and II or I and III. The latter requires a B or better in Calculus I and is a recommended option for some majors.

MATH UN2000 INTRO TO HIGHER MATHEMATICS is a course that can be taken in their first or second year by students with an aptitude for mathematics who would like to practice writing and understanding mathematical proofs.

An additional list of Courses Recommended for First-Year Students can be found on our website.

**Placement in the Calculus Sequence**

College Algebra and Analytical Geometry is a refresher course for students who intend to take Calculus but do not have adequate background for it.

**Advanced Placement:** Students who have passed the advanced placement test for Calculus AB with a grade of 4 or 5 or BC with a grade of 4 receive 3 points of credit. Those who passed Calculus BC with a grade of 5 will receive 4 points of credit or 6 points on placing into Calculus III or Honors Math A and completing with a grade of C or better.

**Calculus I, II, III:** Students who have not previously studied calculus should begin with Calculus I. Students with 4 or higher on the Calculus AB or BC advanced placement test may start with Calculus II. Students with 5 on the Calculus BC test should start with Calculus III.

**Honors Mathematics A:** Students who have passed the Calculus BC advanced placement test with a grade of 5, and who have strong mathematical talent and motivation, should start with Honors Mathematics A. This is the most attractive course available to well-prepared, mathematically talented first-year students, whether or not they intend to be mathematics majors. Students who contemplate taking this course should consult with the instructor. If this is not possible ahead of time, they should register and attend the first class.

**Math Tutoring**

Two help rooms, one in 404 Mathematics (on Columbia’s campus) and one in 502 Milstein Center (on Barnard’s campus), are available. Hours will be posted in the rooms and on https://math.barnard.edu/math-tutoring-schedules for students seeking individual help and counseling from Barnard tutors and Columbia teaching assistants. No appointments are necessary. Both Barnard and Columbia students are welcome. NOTE: Changes to tutoring schedules and remote tutoring can occur.
Preparation for Graduate Study, Business or Teaching
Please read the first paragraph of the Requirements (p. 2) tab.

Coursework taken outside of Barnard

Advanced Placement Credit
Please see AP Scores by Subject on Barnard’s website. Please note that Barnard does not grant major credit on the basis of exam scores; the college only permits course exemptions. Majors in the department must substitute another course for any exemption they receive on the basis of an exam score. Please speak to your major advisor or Chair about your situation.

Columbia College Courses
Please speak to your major advisor or Chair about which Columbia College courses are accepted toward your math major prior to registering for a course.

Transfer Credit
When students wish to transfer credit to Barnard from other institutions, their coursework is first evaluated for college elective credit by the Registrar’s Office. If they are approved, departments can consider these courses for credit toward the major or minor. Please speak with your major advisor or Chair.

Study Abroad Credit
• Classes taken abroad through Columbia-led programs (i.e., those administered by Columbia’s Center for Global Engagement) are treated as Columbia courses, equivalent to those taken on the Morningside Heights campus.
• Classes taken abroad through other institutions or programs are treated as transfer credit and are subject to the same policies as other transfer courses. Accordingly, there will be a limit on the number of study abroad courses taken at other institutions that can be counted toward the major or minor.
• To receive credit toward the major or minor for a study abroad course (whether taken through a Columbia program or another institution/program), students must submit a Study Abroad Approval form through Slate and obtain the approval of the Chair or departmental representative.

Summer Credit
• Summer courses at Barnard are equivalent to those taken during the academic year. Courses that have been approved for the fulfillment of departmental requirements will automatically count toward the major. For credits toward the minor, please speak to your advisor or Chair.
• Courses taken at other institutions (including Columbia) are considered transfer credit and are subject to the same policies governing other transfer courses. To receive major or minor credit for a summer course taken at another institution, students must submit a Summer Course form through Slate and have it approved by both the Registrar’s Office and the Chair or departmental representative.

Senior Capstone Project
The Capstone Experience can be fulfilled by a senior thesis written under the supervision of a faculty member in your major area, or by completing the course Undergraduate Seminars in Mathematics. To learn more about courses needed for the major, please read the Requirements (p. 2) tab.

Departmental Honors and Prizes
Prizes and Awards provided by individual donors for students are listed on the math website.

Other Important Information

Professional Organizations
• Barnard’s Mathematics Department is an Institutional Member of the Association for Women in Mathematics (AWM). All Barnard math majors receive a free student membership. They can participate in the AWM Columbia Chapter meetings and events.
• Women in Mathematics and Statistics, in association with the Mathematics and Statistics Departments at Barnard and Columbia, offer free presentations that you can attend throughout the year.

Chair
Daniela De Silva (Ann Whitney Olin Professor of Mathematics)

Professor
Dave Bayer, Dusa McDuff (Joan Lyttle Birman ’48 Chair of Mathematics)

Assistant Professor
Alisa Knizel

Term Associate Professors
Cristian Iovanov
Lindsay Piechnik

Professors Emeriti
Joan Birman
Walter Neumann

Links to other faculty of Columbia University offering courses in Mathematics:
Faculty by Rank: http://www.math.columbia.edu/people/faculty-by-rank/
Alphabetical Faculty Listing: http://www.math.columbia.edu/people/alphabetical-faculty-listing/

Requirements for the Major
The major programs in both Mathematics and Applied Mathematics are appropriate for students who plan to continue their training in graduate school. The major in Mathematical Sciences combines the elements of Mathematics, Computer Science and Statistics. It is designed to prepare students for employment in business, administration, and finance, and also give excellent background for someone planning graduate study in a social science field. Students who plan to obtain a teaching qualification in mathematics should plan their course of study carefully with an advisor, since courses that are too far from mathematics do not count towards certification.

For a major in Mathematics: 14 courses (a minimum of 35 credits) as follows:
• Four courses in calculus or Honors Mathematics A-B, including Advanced Placement Credit. A student who places out of Calc I/II with AP credits, will need to take a replacement course.
• Six courses in mathematics numbered at or above 2000.
• Four courses in any combination of mathematics and cognate courses.

The courses in mathematics must include:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH UN2010</td>
<td>LINEAR ALGEBRA (also satisfied by Honors Math A-B)</td>
</tr>
<tr>
<td>MATH GU4041</td>
<td>INTRO MODERN ALGEBRA I (I)</td>
</tr>
<tr>
<td>MATH GU4042</td>
<td>INTRO MODERN ALGEBRA II (II)</td>
</tr>
<tr>
<td>MATH GU4061</td>
<td>INTRO MODERN ANALYSIS I (I)</td>
</tr>
<tr>
<td>MATH GU4062</td>
<td>INTRO MODERN ANALYSIS II (II)</td>
</tr>
<tr>
<td>MATH UN3951</td>
<td>UNDERGRADUATE SEMINARS I (at least one term)</td>
</tr>
<tr>
<td>or MATH UN3952</td>
<td>UNDERGRADUATE SEMINARS II</td>
</tr>
</tbody>
</table>

* Note: It is strongly recommended that the sequences MATH GU4041 INTRO MODERN ALGEBRA I - MATH GU4062 INTRO MODERN ANALYSIS I - MATH GU4062 INTRO MODERN ANALYSIS II be taken in separate years.

However, students who are not contemplating graduate study in mathematics may replace one or both of the two terms of MATH GU4061 INTRO MODERN ANALYSIS I - MATH GU4062 INTRO MODERN ANALYSIS II with one or two of the following courses:

- MATH UN2500 ANALYSIS AND OPTIMIZATION,
- MATH UN3007 COMPLEX VARIABLES,
- or MATH GU4032 FOURIER ANALYSIS

and may replace MATH GU4042 INTRO MODERN ALGEBRA II with:

- MATH UN3020 NUMBER THEORY AND CRYPTOGRAPHY,
- or MATH UN3025 MAKING, BREAKING CODES

In exceptional cases, the chair will approve the substitution of certain more advanced courses for those mentioned above.

**For a major in Applied Mathematics: 14 courses (a minimum of 35 credits)**

Four courses in calculus or Honors Mathematics A-B, including Advanced Placement Credit. A student that places out of Calc I/II with AP credits, will need to take a replacement course.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH UN2010</td>
<td>LINEAR ALGEBRA (also satisfied by Honors Math A-B)</td>
</tr>
<tr>
<td>MATH GU4061</td>
<td>INTRO MODERN ANALYSIS I</td>
</tr>
<tr>
<td>APMA E4901</td>
<td>SEM-PROBLEMS IN APPLIED MATH</td>
</tr>
<tr>
<td>APMA E4903</td>
<td>SEM-PROBLEMS IN APPLIED MATH</td>
</tr>
<tr>
<td>APMA E3900</td>
<td>UNDERGRAD RES IN APPLIED MATH (APMA E3900 may be replaced, with approval, by another technical elective for seniors that involves an undergraduate thesis or creative research report)</td>
</tr>
</tbody>
</table>

**Additional electives, to be approved by the Applied Math Committee, e.g.**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH UN2500</td>
<td>ANALYSIS AND OPTIMIZATION</td>
</tr>
<tr>
<td>MATH UN3007</td>
<td>COMPLEX VARIABLES</td>
</tr>
<tr>
<td>or MATH GU4065</td>
<td>HONORS COMPLEX VARIABLES</td>
</tr>
<tr>
<td>or APMA E4204</td>
<td>FUNCTNS OF A COMPLEX VARIABLE</td>
</tr>
<tr>
<td>MATH UN3027</td>
<td>ORDINARY DIFFERENTIAL EQUATIONS</td>
</tr>
<tr>
<td>or MATH UN2030</td>
<td>ORDINARY DIFFERENTIAL EQUATIONS</td>
</tr>
<tr>
<td>MATH UN3028</td>
<td>PARTIAL DIFFERENTIAL EQUATIONS</td>
</tr>
<tr>
<td>or APMA E4200</td>
<td>PARTIAL DIFFERENTIAL EQUATIONS</td>
</tr>
<tr>
<td>MATH GU4032</td>
<td>FOURIER ANALYSIS</td>
</tr>
<tr>
<td>APMA E4300</td>
<td>COMPUT MATH:INTRO-NUMERCL METH</td>
</tr>
<tr>
<td>APMA E4101</td>
<td>APPL MATH III:DYNAMICAL SYSTMS</td>
</tr>
<tr>
<td>APMA E4150</td>
<td>APPLIED FUNCTIONAL ANALYSIS</td>
</tr>
</tbody>
</table>

**For a major in Mathematical Sciences: 14 courses (a minimum of 38 credits):**

6 from Mathematics, 5 from a combination of Statistics and Computer Science and 3 electives from a combination of Mathematics, Statistics, Computer Science.

**Mathematics**

Six required courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH UN1101</td>
<td>CALCULUS I</td>
</tr>
<tr>
<td>MATH UN1102</td>
<td>CALCULUS II</td>
</tr>
<tr>
<td>MATH UN1201</td>
<td>CALCULUS III</td>
</tr>
<tr>
<td>MATH UN2010</td>
<td>LINEAR ALGEBRA (also satisfied by Honors Math A-B)</td>
</tr>
<tr>
<td>MATH UN2000</td>
<td>INTRO TO HIGHER MATHEMATICS</td>
</tr>
<tr>
<td>MATH UN2030</td>
<td>ORDINARY DIFFERENTIAL EQUATIONS</td>
</tr>
<tr>
<td>or MATH UN3027</td>
<td>ORDINARY DIFFERENTIAL EQUATIONS</td>
</tr>
</tbody>
</table>

Possible further courses selected from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH UN1202</td>
<td>CALCULUS IV</td>
</tr>
<tr>
<td>MATH UN2500</td>
<td>ANALYSIS AND OPTIMIZATION</td>
</tr>
<tr>
<td>MATH UN3020</td>
<td>NUMBER THEORY AND CRYPTOGRAPHY</td>
</tr>
<tr>
<td>MATH UN3025</td>
<td>MAKING, BREAKING CODES</td>
</tr>
<tr>
<td>Any 3 credit MATH course numbered 2000 or above</td>
<td></td>
</tr>
</tbody>
</table>

**Statistics**

Select at least one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT UN1101</td>
<td>INTRODUCTION TO STATISTICS</td>
</tr>
<tr>
<td>STAT UN1201</td>
<td>CALC-BASED INTRO TO STATISTICS</td>
</tr>
<tr>
<td>or equivalent</td>
<td></td>
</tr>
</tbody>
</table>

Other courses from the Statistics list (eg, STAT UN2102, STAT UN2103, STAT UN2104, STAT UN3105, STAT UN3106)

**Computer Science**

Select at least one of the following programming courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMS W1002</td>
<td>COMPUTING IN CONTEXT</td>
</tr>
<tr>
<td>COMS W1004</td>
<td>Introduction to Computer Science and Programming in Java (preferred)</td>
</tr>
<tr>
<td>COMS W1005</td>
<td>Introduction to Computer Science and Programming in MATLAB</td>
</tr>
<tr>
<td>COMS W3107</td>
<td>Clean Object-Oriented Design</td>
</tr>
</tbody>
</table>

Possible further courses selected from the following:

Other classes from the Computer Science Core

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMS W3203</td>
<td>DISCRETE MATHEMATICS</td>
</tr>
<tr>
<td>COMS W3210</td>
<td>Scientific Computation</td>
</tr>
<tr>
<td>ENGI E1006</td>
<td>INTRO TO COMP FOR ENG/APP SCI</td>
</tr>
</tbody>
</table>

More generally, electives may be any course with a prerequisite of at least one semester of Calculus, Statistics or Computer Science with the prior approval of the Mathematics Chair.
The Capstone Experience can be fulfilled by a significant thesis written under the supervision of faculty of any one of the three departments or by the Undergraduate Seminar in Mathematics.

NOTE: A student that places out of Calc I/II with AP credits, will need to take a replacement course.

NOTE: Students may not take for credit COMS W3107 if they already received credit for COMS W1007.

For a major in Mathematics-Statistics: 14 courses (a minimum of 38 credits):

Mathematics
Select one of the following sequences:

MATH UN1101 and MATH UN1102 and MATH UN1201 and MATH UN2010 and MATH UN2500 and MATH UN1207 and MATH UN1208 and MATH UN2500

Statistics
Statistics required courses

STAT UN1201 and STAT GU4203 and STAT GU4204 and STAT GU4205 and STAT GU4207 and STAT GU4262 and STAT GU4264 and STAT GU4265

Computer Science
Select one of the following courses:

COMS W1004 and COMS W3107 and ENGI E1006

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.

Students should plan to include a senior thesis or the Undergraduate Seminar in Mathematics in their program, in consultation with their advisors.

NOTE: Students must obtain approval from an adviser in each of the two departments before selecting electives.

NOTE: A student that places out of Calc I/II with AP credits, will need to take a replacement course.

NOTE: Students may not take for credit COMS W3107 if they already received credit for COMS W1007.

For a major in Mathematics-Computer Science 15 courses (a minimum of 38 credits):

Mathematics
Four courses in calculus or Honors Mathematics A-B, including Advanced Placement Credit. A student that places out of Calc I/II with AP credits, will need to take a replacement course; and the 3 following courses:

MATH UN2010 and MATH GU4041 and MATH UN3951 and MATH UN3952

Computer Science
COMS W1004 and COMS W3134 and COMS W3157 and COMS W3203 and COMS W3261 and CSEE W3827

Note A: AP Computer Science with a grade of 4 or 5 or similar experience is a prerequisite for COMS W1007.

Electives: Two additional electives from computer science or math should be included. At least one should be level 3000 or higher; the second should be level 2000 or higher. With adviser approval, appropriate electives from other departments can be considered, such as Statistics or Applied Math.

Requirements for the Minor in Mathematics

For a minor in Mathematics or Applied Mathematics: Six courses from any of the courses offered by the department except MATH UN1003 COLLEGE ALGEBRA-ANLYTC GEOMTRY, MATH UN1101 CALCULUS I / MATH UN1102 CALCULUS II. Some cognate courses are also acceptable with prior approval from the department chair.

Requirements for the Minor in Mathematical Sciences

The minor in Mathematical Sciences comprises 6 courses, at least two from Mathematics and one from each of Statistics and Computer Science. There should be a minimum of three courses in Statistics and Computer Science. Eligible courses are any listed in the Mathematical Sciences Major with the exception of Calculus I and II.
MATH UN1003 COLLEGE ALGEBRA-ANLYTC GEOMETRY. 3.00 points.
Prerequisites: score of 550 on the mathematics portion of the SAT completed within the last year, or the appropriate grade on the General Studies Mathematics Placement Examination. For students who wish to study calculus but do not know analytic geometry. Algebra review, graphs and functions, polynomial functions, rational functions, conic sections, systems of equations in two variables, exponential and logarithmic functions, trigonometric functions and trigonometric identities, applications of trigonometry, sequences, series, and limits.

Spring 2024: MATH UN1003

<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 1003</td>
<td>001/12296</td>
<td>M W 11:40am - 12:55pm 407 Mathematics Building</td>
<td>Taeseok Lee</td>
<td>3.00</td>
<td>19/30</td>
</tr>
<tr>
<td></td>
<td>002/12298</td>
<td>T Th 6:10pm - 7:25pm 407 Mathematics Building</td>
<td>Baiqing Zhu</td>
<td>3.00</td>
<td>16/30</td>
</tr>
</tbody>
</table>

Fall 2024: MATH UN1003

<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 1003</td>
<td>001/00010</td>
<td>M W 6:10pm - 7:25pm 304 Barnard Hall</td>
<td>Lindsay Piechnik</td>
<td>3.00</td>
<td>16/56</td>
</tr>
</tbody>
</table>

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)

Spring 2024: 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>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1101</td>
<td>001/00226</td>
<td>M W 6:10pm - 7:25pm LI002 Milstein Center</td>
<td>Lindsay Piechnik</td>
<td>3.00</td>
<td>95/100</td>
</tr>
<tr>
<td></td>
<td>002/12300</td>
<td>T Th 10:10am - 11:25am 413 Kent Hall</td>
<td>Mruul Thatte</td>
<td>3.00</td>
<td>42/100</td>
</tr>
<tr>
<td></td>
<td>003/12301</td>
<td>T Th 2:40pm - 3:55pm 703 Hamilton Hall</td>
<td>Alex Xu</td>
<td>3.00</td>
<td>25/30</td>
</tr>
<tr>
<td></td>
<td>004/12302</td>
<td>T Th 6:10pm - 7:25pm 312 Mathematics Building</td>
<td>Amal Mattoo</td>
<td>3.00</td>
<td>16/30</td>
</tr>
<tr>
<td></td>
<td>005/12303</td>
<td>M W 2:40pm - 3:55pm 203 Mathematics Building</td>
<td>Mruul Thatte</td>
<td>3.00</td>
<td>48/100</td>
</tr>
<tr>
<td></td>
<td>006/12304</td>
<td>M W 4:10pm - 5:25pm 203 Mathematics Building</td>
<td>Jorge Pineiro Barcelo</td>
<td>3.00</td>
<td>44/100</td>
</tr>
</tbody>
</table>

Fall 2024: 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>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1101</td>
<td>001/00081</td>
<td>T Th 1:10pm - 2:25pm 263 Macy Hall</td>
<td>Lindsay Piechnik</td>
<td>3.00</td>
<td>56/80</td>
</tr>
<tr>
<td></td>
<td>002/00082</td>
<td>T Th 2:40pm - 3:55pm 405 Milbank Hall</td>
<td>Lindsay Piechnik</td>
<td>3.00</td>
<td>39/80</td>
</tr>
<tr>
<td></td>
<td>003/11833</td>
<td>M W 10:10am - 11:25am Room TBA</td>
<td>Marco Castronovo</td>
<td>3.00</td>
<td>13/100</td>
</tr>
<tr>
<td></td>
<td>004/11835</td>
<td>M W 11:40am - 12:55pm Room TBA</td>
<td>Marco Castronovo</td>
<td>3.00</td>
<td>12/100</td>
</tr>
<tr>
<td></td>
<td>005/11837</td>
<td>M W 2:40pm - 3:55pm Room TBA</td>
<td>George Dragomir</td>
<td>3.00</td>
<td>26/100</td>
</tr>
<tr>
<td></td>
<td>006/11838</td>
<td>M W 4:10pm - 5:25pm Room TBA</td>
<td>0. FACULTY</td>
<td>3.00</td>
<td>5/30</td>
</tr>
<tr>
<td></td>
<td>007/11840</td>
<td>M W 6:10pm - 7:25pm Room TBA</td>
<td>Marco Sangiovanni Vincentelli</td>
<td>3.00</td>
<td>7/100</td>
</tr>
<tr>
<td></td>
<td>008/11841</td>
<td>T Th 10:10am - 11:25am Room TBA</td>
<td>Soren Galatius</td>
<td>3.00</td>
<td>8/45</td>
</tr>
<tr>
<td></td>
<td>009/11842</td>
<td>T Th 11:40am - 12:55pm Room TBA</td>
<td>George Dragomir</td>
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<td></td>
<td>010/11844</td>
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<td>Marco Sangiovanni Vincentelli</td>
<td>3.00</td>
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<tr>
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<td>011/11845</td>
<td>T Th 6:10pm - 7:25pm Room TBA</td>
<td>0. FACULTY</td>
<td>3.00</td>
<td>2/30</td>
</tr>
</tbody>
</table>
**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)

Prerequisites: MATH UN1101 or the equivalent.

**Spring 2024: MATH UN1102**

<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 1102</td>
<td>001/00027</td>
<td>T Th 2:40pm - 3:55pm Li03 Diana Center</td>
<td>Lindsay Piechok</td>
<td>3.00</td>
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<tr>
<td>MATH 1102</td>
<td>002/12305</td>
<td>T Th 10:10am - 11:25am 203 Mathematics Building</td>
<td>Lucy Yang</td>
<td>3.00</td>
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<tr>
<td>MATH 1102</td>
<td>003/12306</td>
<td>T Th 1:10pm - 2:25pm 417 Mathematics Building</td>
<td>Tomasz Owsiak</td>
<td>3.00</td>
<td>61/64</td>
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<tr>
<td>MATH 1102</td>
<td>004/12307</td>
<td>T Th 6:10pm - 7:25pm 520 Mathematics Building</td>
<td>Fan Zhou</td>
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<tr>
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<td>M W 11:40am - 12:55pm 520 Mathematics Building</td>
<td>Davis Lazowski</td>
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<td>M W 2:40pm - 3:55pm 312 Mathematics Building</td>
<td>Andres Fernandez Herrero</td>
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<tr>
<td>MATH 1102</td>
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<td>M W 4:10pm - 5:25pm 312 Mathematics Building</td>
<td>Andres Fernandez Herrero</td>
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**Fall 2024: MATH UN1102**

<table>
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<th>Course Number</th>
<th>Section/Call Number</th>
<th>Times/Location</th>
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<td>T Th 6:10pm - 7:25pm Room TBA</td>
<td>Elliott Stein</td>
<td>3.00</td>
<td>22/64</td>
</tr>
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</table>

**MATH UN1201 CALCULUS III. 3.00 points.**

Prerequisites: MATH UN1101 or the equivalent

Prerequisites: MATH UN1101 or the equivalent

Vectors in dimensions 2 and 3, complex numbers and the complex exponential function with applications to differential equations, Cramers rule, vector-valued functions of one variable, scalar-valued functions of several variables, partial derivatives, gradients, surfaces, optimization, the method of Lagrange multipliers. (SC)

**Spring 2024: MATH UN1201**

<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 1201</td>
<td>001/00228</td>
<td>M W 10:10am - 11:25am 405 Milbank Hall</td>
<td>Cristian Iovanov</td>
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<tr>
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<td>M W 11:40am - 12:55pm 323 Milbank Hall</td>
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<tr>
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<td>M W 1:10pm - 2:25pm 207 Mathematics Building</td>
<td>Ivan Horozov</td>
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<tr>
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<td>004/12318</td>
<td>T Th 11:40am - 12:55pm 312 Mathematics Building</td>
<td>Shaojun Bai</td>
<td>3.00</td>
<td>42/100</td>
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<tr>
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<td>005/12320</td>
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<td>Jeanne Boursier</td>
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<tr>
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<td>T Th 4:10pm - 5:25pm 207 Mathematics Building</td>
<td>Jeanne Boursier</td>
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**Fall 2024: MATH UN1201**

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<td>Deeparaj Bhat</td>
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<td>Gyujin Oh</td>
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**MATH UN1202 CALCULUS IV. 3.00 points.**

Prerequisites: MATH UN1102 and MATH UN1201 or the equivalent

Prerequisites: MATH UN1102 and MATH UN1201 or the equivalent

Multiple integrals, Taylor’s formula in several variables, line and surface integrals, calculus of vector fields, Fourier series. (SC)

**Spring 2024: MATH UN1202**

<table>
<thead>
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<th>Course Number</th>
<th>Section/Call Number</th>
<th>Times/Location</th>
<th>Instructor</th>
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**Fall 2024: MATH UN1202**

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<td>MATH 1202</td>
<td>001/00012</td>
<td>M W 10:10am - 11:25am 504 Diana Center</td>
<td>Daniela De Silva</td>
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<td>MATH 1202</td>
<td>002/11863</td>
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<td>Mikhail Siminov</td>
<td>3.00</td>
<td>51/100</td>
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</table>
MATH BC2006 COMBINATORICS. 3.00 points.
Prerequisites: some calculus or the instructor's permission. Intended as an enrichment to the mathematics curriculum of the first years, this course introduces a variety of mathematical topics (such as three dimensional geometry, probability, number theory) that are often not discussed until later, and explains some current applications of mathematics in the sciences, technology and economics

Spring 2024: MATH BC2006
Course Number | Section/Call Number | Times/Location | Instructor | Points | Enrollment
--- | --- | --- | --- | --- | ---
MATH 2006 | 001/00254 | T Th 10:10am - 11:25am 328 Milbank Hall | Alisa Knizel | 3.00 | 42/56

MATH UN2010 LINEAR ALGEBRA. 3.00 points.
Matrices, vector spaces, linear transformations, eigenvalues and eigenvectors, canonical forms, applications. (SC)

Spring 2024: MATH UN2010
Course Number | Section/Call Number | Times/Location | Instructor | Points | Enrollment
--- | --- | --- | --- | --- | ---
MATH 2010 | 001/12334 | M W 10:10am - 11:25am 312 Mathematics Building | Amadou Bah | 3.00 | 84/110
MATH 2010 | 002/12335 | M W 11:40am - 12:55pm 312 Mathematics Building | Amadou Bah | 3.00 | 85/110
MATH 2010 | 003/12336 | T Th 11:40am - 12:55pm 203 Mathematics Building | Rostislav | 3.00 | 105/110
MATH 2010 | 004/12337 | T Th 1:10pm - 2:25pm 203 Mathematics Building | Rostislav | 3.00 | 108/110
MATH 2010 | 005/12339 | T Th 6:10pm - 7:25pm 417 Mathematics Building | Elliott Stein | 3.00 | 41/64

MATH UN2020 Honors Linear Algebra. 3 points.
Not offered during 2023-2024 academic year.

Prerequisites: MATH UN1201. A more extensive treatment of the material in MATH UN2010, with increased emphasis on proof. Not to be taken in addition to MATH UN2010 or MATH UN1207-MATH UN1208.

MATH UN2030 ORDINARY DIFFERENTIAL EQUATIONS. 3.00 points.
Prerequisites: MATH UN1102 and MATH UN1201 or the equivalent. Prerequisites: MATH UN1102 and MATH UN1201 or the equivalent. Special differential equations of order one. Linear differential equations with constant and variable coefficients. Systems of such equations. Transform and series solution techniques. Emphasis on applications

Spring 2024: MATH UN2030
Course Number | Section/Call Number | Times/Location | Instructor | Points | Enrollment
--- | --- | --- | --- | --- | ---
MATH 2030 | 001/12341 | M W 10:10am - 11:25am 203 Mathematics Building | Ovidiu Savin | 3.00 | 93/100
MATH 2030 | 002/12346 | T Th 11:40am - 12:25pm 142 Uris Hall | Yin Li | 3.00 | 53/100

Fall 2024: MATH UN2030
Course Number | Section/Call Number | Times/Location | Instructor | Points | Enrollment
--- | --- | --- | --- | --- | ---
MATH 2030 | 001/11872 | M W 1:10pm - 2:25pm Room TBA | Panagiota | 3.00 | 100/100
MATH 2030 | 002/11873 | T Th 10:10am - 11:25am Room TBA | Jeanne | 3.00 | 34/100
MATH 2030 | 003/11874 | T Th 1:10pm - 2:25pm Room TBA | Jeanne | 3.00 | 48/49
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)

<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 2500</td>
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<td>T Th 11:40am - 12:55pm 207 Mathematics Building</td>
<td>Wenjian Liu</td>
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Spring 2024: MATH UN2500

Fall 2024: MATH UN2500

MATH UN3007 COMPLEX VARIABLES. 3.00 points.
Prerequisites: MATH UN1202 An elementary course in functions of a complex variable.
Prerequisites: MATH UN1202 An elementary course in functions of a complex variable. Fundamental properties of the complex numbers, differentiability, Cauchy-Riemann equations. Cauchy integral theorem. Taylor and Laurent series, poles, and essential singularities. Residue theorem and conformal mapping. (SC)

<table>
<thead>
<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>Ovidiu Savin</td>
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Spring 2024: MATH UN3007

Fall 2024: MATH UN3007

MATH UN3020 NUMBER THEORY AND CRYPTOGRAPHY. 3.00 points.
Prerequisites: one year of calculus.
Prerequisites: one year of calculus. Prerequisite: One year of Calculus. Congruences. Primitive roots. Quadratic residues. Contemporary applications

<table>
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<th>Course Number</th>
<th>Section/Call Number</th>
<th>Times/Location</th>
<th>Instructor</th>
<th>Points</th>
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<td>Yoonjoo Kim</td>
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Spring 2024: MATH UN3020

Fall 2024: MATH UN3020

MATH UN3025 MAKING, BREAKING CODES. 3.00 points.
Prerequisites: (MATH UN1101 and MATH UN1102 and MATH UN1201) and MATH UN2010.
Prerequisites: (MATH UN1101 and MATH UN1102 and MATH UN1201) and MATH UN2010. A concrete introduction to abstract algebra. Topics in abstract algebra used in cryptography and coding theory

<table>
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<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 3025</td>
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<td>Dorian Goldfeld</td>
<td>3.00</td>
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Fall 2024: MATH UN3025

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

<table>
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<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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<td>T Th 1:10pm - 2:25pm 312 Mathematics Building</td>
<td>Simon Brendle</td>
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Spring 2024: MATH UN3028

MATH UN3050 DISCRETE TIME MODELS IN FINANC. 3.00 points.
Prerequisites: (MATH UN1102 and MATH UN1201) or (MATH UN1101 and MATH UN1102 and MATH UN2010) 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 UN2010) 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

<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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<td>Mikhail Smirnov</td>
<td>3.00</td>
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Spring 2024: MATH UN3050

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.

<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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<td>Simon Brendle</td>
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Fall 2024: MATH UN3901

MATH UN3901 SUPERVISED READINGS 1. 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

<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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<td>Dusa McDuff</td>
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<td>Richard Hamilton</td>
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Fall 2024: MATH UN3901

MATH UN3027 Ordinary Differential Equations. 3 points.
Prerequisites: MATH UN1102 and MATH UN1201 or the equivalent.
Corequisites: MATH UN2010
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 2024: MATH UN3902
Course Number  | Section/Call  | Times/Location | Instructor | Points | Enrollment |
--- | --- | --- | --- | --- | --- |
MATH 3902  | 001/18557 | T Th 10:10am - 11:25am | Alisa Knizel | 3.00 | 61/80 |
MATH 3902  | 002/20706 | T Th 2:40pm - 3:55pm | Simon Brendle | 3.00 | 8/19 |
MATH 3902  | 003/20734 | T Th 11:30am - 12:45pm | Blumberg | 3.00 | 47/49 |
MATH 3902  | 004/20960 | T Th 1:10pm - 2:25pm | Francesca Lin | 3.00 | 48/64 |
MATH 3902  | 005/20967 | T Th 10:10am - 11:25am | Mu-Tao Wang | 3.00 | 1/1 |
MATH 3902  | 006/20991 | T Th 10:10am - 11:25am | Iovanov | 3.00 | 1/1 |

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 2024: MATH UN3951
Course Number  | Section/Call  | Times/Location | Instructor | Points | Enrollment |
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MATH 3951  | 001/00078 | T Th 10:10am - 11:25am | Iovanov | 3.00 | 48/64 |

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 2024: MATH UN3952
Course Number  | Section/Call  | Times/Location | Instructor | Points | Enrollment |
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MATH 3952  | 001/00233 | T Th 10:10am - 11:25am | Knizel | 3.00 | 61/80 |

MATH UN3997 SUPERVISED INDIVIDUAL RESEARCH. 1.00-4.00 points.
Prerequisites: The written permission of the faculty member who agrees to act as a supervisor, and the director of undergraduate studies permission. For specially selected mathematics majors, the opportunity to write a senior thesis on a problem in contemporary mathematics under the supervision of a faculty member.

Spring 2024: MATH UN3997
Course Number  | Section/Call  | Times/Location | Instructor | Points | Enrollment |
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MATH 3997  | 001/00910 | T Th 10:10am - 11:25am | De Silva | 1.00-4.00 | 1/5 |

MATH UN3998 SUPERVISED INDIVIDUAL RESEARCH. 3.00 points.
Prerequisites: The written permission of the faculty member who agrees to act as a supervisor, and the permission of the Director of Undergraduate Studies. For specially selected mathematics majors, the opportunity to write a senior thesis on a problem in contemporary mathematics under the supervision of a faculty member.

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.

Spring 2024: MATH GU4007
Course Number  | Section/Call  | Times/Location | Instructor | Points | Enrollment |
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MATH 4007  | 001/12361 | T Th 2:40pm - 3:55pm | Goldfeld | 3.00 | 8/19 |

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. Prerequisite: 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 2024: MATH GU4032
Course Number  | Section/Call  | Times/Location | Instructor | Points | Enrollment |
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MATH 4032  | 001/11879 | T Th 10:10am - 11:25am | Brendle | 3.00 | 47/49 |
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. Groups, homomorphisms, normal subgroups, the isomorphism theorems, symmetric groups, group actions, the Sylow theorems, finitely generated abelian groups.

Spring 2024: MATH GU4041
Course | Section/Call Number | Times/Location | Instructor | Points | Enrollment
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MATH 4041 | 001/12362 | M W 10:10am - 11:25am | Yujie Xu | 3.00 | 55/64
417 Mathematics Building

Fall 2024: MATH GU4041
Course | Section/Call Number | Times/Location | Instructor | Points | Enrollment
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MATH 4041 | 001/11904 | M W 11:30am - 12:45pm | Robert Friedman | 3.00 | 93/100
Room TBA

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 2024: MATH GU4042
Course | Section/Call Number | Times/Location | Instructor | Points | Enrollment
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MATH 4042 | 001/12363 | M W 2:40pm - 3:55pm | Konstantin Aleshkin | 3.00 | 43/64
417 Mathematics Building

Fall 2024: MATH GU4042
Course | Section/Call Number | Times/Location | Instructor | Points | Enrollment
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MATH 4042 | 001/11846 | M W 10:10am - 11:25am | Michael Thaddeus | 3.00 | 30/49
Room TBA

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 2024: MATH GU4043
Course | Section/Call Number | Times/Location | Instructor | Points | Enrollment
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MATH 4043 | 001/12364 | T Th 4:10pm - 5:25pm | Gyujin Oh | 3.00 | 8/20
307 Mathematics Building

MATH GU4044 REPRESENTATNS 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 2024: MATH GU4044
Course | Section/Call Number | Times/Location | Instructor | Points | Enrollment
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MATH 4044 | 001/11880 | T Th 1:10pm - 2:25pm | Andrei Olshanskii | 3.00 | 27/30
Room TBA

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 2024: MATH GU4045
Course | Section/Call Number | Times/Location | Instructor | Points | Enrollment
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MATH 4045 | 001/12366 | M W 2:40pm - 3:55pm | Nathan Chen | 3.00 | 5/20
307 Mathematics Building

MATH W4046 Introduction to Category Theory. 3 points.
CC/GS: Partial Fulfillment of Science Requirement
Not offered during 2023-2024 academic year.

Prerequisites: MATH W4041.
Categories, functors, natural transformations, adjoint functors, limits and colimits, introduction to higher categories and diagrammatic methods in algebra.

MATH GU4051 TOPOLOGY. 3.00 points.
Prerequisites: (MATH UN1202 and MATH UN2010) and rudiments of group theory (e.g., MATH GU4041). MATH UN2010 is recommended, but not required.
Prerequisites: (MATH UN1202 and MATH UN2010) and rudiments of group theory (e.g., MATH GU4041). MATH UN2010 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.

The second term of this course may not be taken without the first. 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

Fall 2024: MATH GU4052
Course Number  Section/Call Number  Times/Location  Instructor  Points  Enrollment
MATH 4052  001/11882  M 11:40am - 12:55pm  Siddhi Krishna  3.00  12/20
Room TBA

MATH GU4053 INTRO TO ALGEBRAIC TOPOLOGY. 3.00 points.

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

Spring 2024: MATH GU4053
Course Number  Section/Call Number  Times/Location  Instructor  Points  Enrollment
MATH 4053  001/12368  T 11:40am - 12:55pm  407 Mathematics Building  Lucy Yang  3.00  14/30

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.

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-Arzela theorem, Stone-Weierstrass theorem

Spring 2024: MATH GU4061
Course Number  Section/Call Number  Times/Location  Instructor  Points  Enrollment
MATH 4061  001/12541  M 11:10am - 2:25pm  203 Mathematics Building  Ivan Corwin  3.00  55/110

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.

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 2024: MATH GU4062
Course Number  Section/Call Number  Times/Location  Instructor  Points  Enrollment
MATH 4062  001/12540  T 4:10pm - 5:25pm  417 Mathematics Building  Nikolaos Apostolakis  3.00  14/50

Fall 2024: MATH GU4062
Course Number  Section/Call Number  Times/Location  Instructor  Points  Enrollment
MATH 4062  001/11883  M 11:40am - 12:55pm  Room TBA  Milind Hegde  3.00  23/49

MATH GU4065 HONORS COMPLEX VARIABLES. 3.00 points.

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 2024: MATH GU4065
Course Number  Section/Call Number  Times/Location  Instructor  Points  Enrollment
MATH 4065  001/11884  T 11:40am - 12:55pm  Room TBA  Francesco Lin  3.00  39/45

MATH GU4071 Introduction to the Mathematics of Finance. 3 points.
CC/GS: Partial Fulfillment of Science Requirement

Prerequisites: MATH UN1202 and MATH UN3027 and STAT W4150 and SEIO W4150, or their equivalents.

The mathematics of finance, principally the problem of pricing of derivative securities, developed using only calculus and basic probability. Topics include mathematical models for financial instruments, Brownian motion, normal and lognormal distributions, the Black-Scholes formula, and binomial models.

MATH GU4081 INTRO-DIFFERENTIABLE MANIFOLDS. 3.00 points.

Prerequisites: (MATH GU4051 or MATH GU4061) and MATH UN2010


Spring 2024: MATH GU4081
Course Number  Section/Call Number  Times/Location  Instructor  Points  Enrollment
MATH 4081  001/00234  M 10:10am - 11:25am  Room L103 Diana Center  Dusa McDuff  3.00  17/40
MATH GU4155 PROBABILITY THEORY. 3.00 points.
Prerequisites: MATH GU4061 or MATH UN3007
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 2024: MATH GU4155
Course Number | Section/Call Number | Times/Location | Instructor | Points | Enrollment
---|---|---|---|---|---
MATH 4155 | 001/12373 | T Th 2:40pm - 3:55pm 520 Mathematics Building | Ioannis Karatzas | 3.00 | 27/49

Fall 2024: MATH GU4155
Course Number | Section/Call Number | Times/Location | Instructor | Points | Enrollment
---|---|---|---|---|---
MATH 4155 | 001/11860 | T Th 2:40pm - 3:55pm Room TBA | Ivan Corwin | 3.00 | 33/75

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.

SIEO W3600 INTRO PROBABILITY/STATISTICS. 4.00 points.
SIEO W4150 INTRO-PROBABILITY # STATISTICS. 3.00 points.

Cross-Listed Courses
Computer Science
COMS S3251 Computational Linear Algebra. 3 points.
Not offered during 2023-2024 academic year.
Prerequisites: two terms of calculus.
Computational linear algebra, solution of linear systems, sparse linear systems, least squares, eigenvalue problems, and numerical solution of other multivariate problems as time permits.

COMS W4203 Graph Theory. 3 points.
Lect: 3.
Prerequisites: (COMS W3203)
General introduction to graph theory. Isomorphism testing, algebraic specification, symmetries, spanning trees, traversability, planarity, drawings on higher-order surfaces, colorings, extremal graphs, random graphs, graphical measurement, directed graphs, Burnside-Polya counting, voltage graph theory.

Spring 2024: COMS W4203
Course Number | Section/Call Number | Times/Location | Instructor | Points | Enrollment
---|---|---|---|---|---
COMS 4203 | 001/20497 | W 7:00pm - 9:30pm 451 Computer Science Bldg | Yihao Zhang | 3 | 24/60

Industrial Engineering and Operations Research
CSOR E4010 GRAPH THEORY: COMBINATL VIEW. 3.00 points.
Lect: 3. Not offered during 2023-2024 academic year.
Prerequisites: Linear Algebra, or instructor’s permission.
An introductory course in graph theory with emphasis on its combinatorial aspects. Basic definitions, and some fundamental topics in graph theory and its applications. Topics include trees and forests graph coloring, connectivity, matching theory and others.