

COMPUTER SCIENCE - MATHEMATICS

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The major in mathematics is an introduction to some of the highlights of the development of theoretical mathematics over the past four hundred years from a modern perspective. This study is also applied to many problems, both internal to mathematics and arising in other disciplines such as physics, cryptography, and finance.

Majors begin by taking either Honors mathematics or the calculus sequence. Students who do not take MATH UN1207 Honors Mathematics A and MATH UN1208 HONORS MATHEMATICS B normally take MATH UN2010 LINEAR ALGEBRA in the second year. Following this, majors begin to learn some aspects of the main branches of modern mathematics: algebra, analysis, and geometry; as well as some of their subdivisions and hybrids (e.g., number theory, differential geometry, and complex analysis). As the courses become more advanced, they also become more theoretical and proof-oriented and less computational.

Aside from the courses offered by the Mathematics Department, cognate courses in areas such as astronomy, chemistry, physics, probability, logic, economics, and computer science can be used toward the major. A cognate course must be a 2000-level (or higher) course and must be approved by the director of undergraduate studies. In general, a course not taught by the Mathematics Department is a cognate course for the mathematics major if either (a) it has at least two semesters of calculus as a stated prerequisite, or (b) the subject matter in the course is mathematics beyond an elementary level, such as PHIL UN3411 SYMBOLIC LOGIC, in the Philosophy Department, or COMS W3203 DISCRETE MATHEMATICS, in the Computer Science Department.

Another requirement for majors is participation in an undergraduate seminar, usually in the junior or 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:

MATH UN1101	CALCULUS I
- MATH UN1102	and CALCULUS II
- MATH UN1201	and Calculus III
- MATH UN1202	and CALCULUS IV
- MATH UN2010	and LINEAR ALGEBRA
MATH UN1101	CALCULUS I
- MATH UN1102	and CALCULUS II
- MATH UN1205	and Accelerated Multivariable Calculus
- MATH UN2010	and LINEAR ALGEBRA
MATH UN1101	CALCULUS I
- MATH UN1102	and CALCULUS II
- MATH UN1207	and Honors Mathematics A
- MATH UN1208	and HONORS MATHEMATICS B

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.

MATH UN1003 COLLEGE ALGEBRA-ANLYTC GEOMETRY does not count toward the degree. Students who take this course do not receive college credit.

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 Calculus 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 Calculus. 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.

Departmental Honors

In order to be eligible for departmental honors, majors must write a senior thesis. To write a senior thesis, students must register for MATH UN3999 Senior Thesis in Mathematics in the fall semester of their senior year. Normally no more than 10% of graduating majors receive departmental honors in a given academic year.

Professors

- Mohammed Abouzaid
- David A. Bayer (Barnard)
- Simon Brendle
- Ivan Corwin
- Panagiota Daskalopoulos

- Aise Johan de Jong
- Robert Friedman (Department Chair)
- Dorian Goldfeld
- Brian Greene
- Richard Hamilton
- Michael Harris
- Ioannis Karatzas
- Mikhail Khovanov
- Igor Krichever
- Chiu-Chu Liu
- Dusa McDuff (Barnard)
- Walter Neumann (Barnard)
- Andrei Okounkov
- D. H. Phong
- Henry Pinkham
- Ovidiu Savin
- Michael Thaddeus
- Eric Urban
- Mu-Tao Wang

Associate Professors

- Daniela De Silva (Barnard Chair)
- Julien Dubedat

Assistant Professors

- Amol Aggarwal
- Chao Li
- Francesco Lin
- Giulia Sacca
- Will Sawin

J.F. Ritt Assistant Professors

- Andrew Ahn
- Konstantin Aleshkin
- Evgeni Dimitrov
- Alexandra Florea
- Florian Johne
- Yash Jhaveri
- Inbar Klang
- Shotaro Makisumi
- Konstantin Matetski
- S. Michael Miller
- Henri Roesch
- Nicholas Salter
- Gus Schrader
- Akash Sengupta
- Evan Warner
- Hui Yu
- Zachary Sylvan

Senior Lecturers in Discipline

- Lars Nielsen
- Mikhail Smirnov
- Peter Voit

Lecturers in Discipline

- George Dragomir

On Leave

- Profs. Corwin, de Jong, Florea, Karatzas, Krichever, Makisumi, Sawin, Thaddeus (*Fall 2020*)
- Profs. de Jong, Florea, Harris, Khovanov, Savin, Sawin, Thaddeus (*Spring 2021*)

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):

MATH UN1101	CALCULUS I
- MATH UN1102	and CALCULUS II
- MATH UN1201	and Calculus III
- MATH UN1202	and CALCULUS IV
- MATH UN2010	and LINEAR ALGEBRA

MATH UN1101	CALCULUS I
- MATH UN1102	and CALCULUS II
- MATH UN1205	and Accelerated Multivariable Calculus
- MATH UN2010	and LINEAR ALGEBRA

MATH UN1101	CALCULUS I
- MATH UN1102	and CALCULUS II
- MATH UN1207	and Honors Mathematics A
- MATH UN1208	and HONORS MATHEMATICS B

15 points in the following required courses:

MATH UN3951	Undergraduate Seminars in Mathematics I
- MATH UN3952	and Undergraduate Seminars in Mathematics II (at least one term)

MATH GU4041	INTRO MODERN ALGEBRA I
- MATH GU4042	and INTRO MODERN ALGEBRA II

MATH GU4061	INTRO MODERN ANALYSIS I
- MATH GU4062	and INTRO MODERN ANALYSIS II

12 points in any combination of mathematics and cognate courses. **

* 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.

** A course not taught by the Mathematics Department is a cognate course for the mathematics major if either (a) it has at least two semesters of calculus as a stated prerequisite and is a 2000-level (or higher) course, or (b) the subject matter in the course is mathematics beyond an elementary level, such as PHIL UN3411 SYMBOLIC LOGIC, in the Philosophy Department, or COMS W3203 DISCRETE MATHEMATICS, in the Computer Science Department. In exceptional cases, the director of undergraduate studies may approve the substitution of certain more advanced courses for those mentioned above.

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.

Major in Applied Mathematics

The major requires 38-40 points as follows:

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

MATH UN1101	CALCULUS I
- MATH UN1102	and CALCULUS II
- MATH UN1201	and Calculus III
- MATH UN1202	and CALCULUS IV
- MATH UN2010	and LINEAR ALGEBRA

MATH UN1101	CALCULUS I
- MATH UN1102	and CALCULUS II
- MATH UN1205	and Accelerated Multivariable Calculus
- MATH UN2010	and LINEAR ALGEBRA

MATH UN1101	CALCULUS I
- MATH UN1102	and CALCULUS II
- MATH UN1207	and Honors Mathematics A
- MATH UN1208	and HONORS MATHEMATICS B

Select one of the following three courses:

MATH UN2500	ANALYSIS AND OPTIMIZATION
MATH GU4032	Fourier Analysis
MATH GU4061	INTRO MODERN ANALYSIS I

APMA E4901	Seminar: Problem in Applied Mathematics (junior year)
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APMA E4903	Seminar: Problems in Applied Mathematics (senior year)
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18 points in electives, selected from the following (other courses may be used with the approval of the Applied Mathematics Committee):

MATH UN2500	ANALYSIS AND OPTIMIZATION
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MATH UN3007	Complex Variables
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or MATH GU4065	Honors Complex Variables
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or APMA E4204	Functions of a Complex Variable
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MATH UN3027	Ordinary Differential Equations
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MATH UN3028	PARTIAL DIFFERENTIAL EQUATIONS
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or APMA E4200	Partial Differential Equations
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or APMA E6301	Analytic methods for partial differential equations
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MATH GU4032	Fourier Analysis
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APMA E4300	Computational Math: Introduction to Numerical Methods
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APMA E4101	Introduction to Dynamical Systems
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APMA E4150	Applied Functional Analysis
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APMA E4400	Introduction to Biophysical Modeling
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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 and Algorithms
COMS W3157	Advanced Programming
COMS W3203	DISCRETE MATHEMATICS
COMS W3261	Computer Science Theory
CSEE W3827	Fundamentals of Computer Systems

Mathematics

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

MATH UN1101 - MATH UN1102 - MATH UN1201 - MATH UN1202 - MATH UN2010	CALCULUS I and CALCULUS II and Calculus III and CALCULUS IV and LINEAR ALGEBRA
MATH UN1101 - MATH UN1102 - MATH UN1205 - MATH UN2010	CALCULUS I and CALCULUS II and Accelerated Multivariable Calculus and LINEAR ALGEBRA
MATH UN1101 - MATH UN1102 - MATH UN1207 - MATH UN1208	CALCULUS I and CALCULUS II and Honors Mathematics A and HONORS MATHEMATICS B
MATH UN3951 or MATH UN3952	Undergraduate Seminars in Mathematics I Undergraduate Seminars in Mathematics II
MATH GU4041	INTRO MODERN ALGEBRA I

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 UN3007	Complex Variables
MATH UN3020	Number Theory and Cryptography
MATH UN3386	Differential Geometry
MATH GU4051	Topology
MATH GU4061	INTRO MODERN ANALYSIS I

Major in Economics-Mathematics

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:

MATH UN1101 - MATH UN1102 - MATH UN1201 - MATH UN2010 - MATH UN2500	CALCULUS I and CALCULUS II and Calculus III and LINEAR ALGEBRA and ANALYSIS AND OPTIMIZATION
MATH UN1101 - MATH UN1102 - MATH UN1205 - MATH UN2010 - MATH UN2500	CALCULUS I and CALCULUS II and Accelerated Multivariable Calculus and LINEAR ALGEBRA and ANALYSIS AND OPTIMIZATION
MATH UN1207 - MATH UN1208 - MATH UN2500	Honors Mathematics A and HONORS MATHEMATICS B and ANALYSIS AND OPTIMIZATION (with approval from the adviser)

Statistics

Introductory Course

STAT UN1201	Calculus-Based Introduction to Statistics
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Required Courses

STAT GU4203	PROBABILITY THEORY
STAT GU4204	Statistical Inference
STAT GU4205	Linear Regression Models
Select one of the following courses:	
STAT GU4207	Elementary Stochastic Processes
STAT GU4262	Stochastic Processes for Finance
STAT GU4264	STOCHASTIC PROCESSES-APPLIC
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	Introduction to Computing for Engineers and Applied Scientists
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.

Students interested in modeling applications are recommended to take MATH UN3027 Ordinary Differential Equations and MATH UN3028 PARTIAL DIFFERENTIAL EQUATIONS.

Students interested in finance are recommended to take MATH GR5010 Introduction to the Mathematics 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 Calculus III
- MATH UN1202 and CALCULUS IV
- MATH UN2010 and LINEAR ALGEBRA

MATH UN1205 Accelerated Multivariable Calculus
- MATH UN2010 and LINEAR ALGEBRA

MATH UN1207 Honors Mathematics A
- MATH UN1208 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.

For mathematics courses taken in other departments, consult with the director of undergraduate studies.

Any course given by the Mathematics department fulfills the General Studies quantitative reasoning requirement when passed with a satisfactory letter grade.

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 2021: MATH UN1003

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 1003	001/12309	M W 1:10pm - 2:25pm Online Only	Nguyen Dung	3.00	15/35
MATH 1003	002/12310	T Th 6:10pm - 7:25pm Online Only	Shalin Parekh	3.00	20/35
MATH 1003	AU1/19220		Nguyen Dung	3.00	1/5

Fall 2021: MATH UN1003

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 1003	001/10617	M W 6:10pm - 7:25pm Room TBA		3.00	3/30
MATH 1003	002/10618	T Th 2:40pm - 3:55pm Room TBA		3.00	4/30

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 2021: MATH UN1101

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 1101	001/12308	M W 2:40pm - 3:55pm Online Only	Sayan Das	3.00	14/35
MATH 1101	002/12307	M W 4:10pm - 5:25pm Online Only	Kevin Smith	3.00	31/35
MATH 1101	003/12306	T Th 10:10am - 11:25am Online Only	Panagiota Daskalopoulos	3.00	61/100
MATH 1101	004/12305	T Th 11:40am - 12:55pm Online Only	George Dragomir	3.00	82/100
MATH 1101	005/12304	T Th 4:10pm - 5:25pm Online Only	Tobias Schaefer	3.00	20/40
MATH 1101	AU1/19222		Sayan Das	3.00	1/5

Fall 2021: MATH UN1101

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 1101	001/10622	M W 10:10am - 11:25am Room TBA	Daniele Alessandrini	3.00	2/50
MATH 1101	002/10623	M W 1:10pm - 2:25pm Room TBA		3.00	4/30
MATH 1101	003/10624	M W 2:40pm - 3:55pm Room TBA	Akash Sengupta	3.00	9/50
MATH 1101	004/10625	M W 4:10pm - 5:25pm Room TBA	Akash Sengupta	3.00	4/50
MATH 1101	005/10626	T Th 10:10am - 11:25am Room TBA	George Dragomir	3.00	11/50
MATH 1101	006/10628	T Th 11:40am - 12:55pm Room TBA	George Dragomir	3.00	13/50
MATH 1101	007/00170	M W 6:10pm - 7:25pm Room TBA	Lindsay Piechnik	3.00	18/100
MATH 1101	008/10629	T Th 1:10pm - 2:25pm Room TBA		3.00	1/50
MATH 1101	009/10630	T Th 4:10pm - 5:25pm Room TBA		3.00	4/30
MATH 1101	011/00171	T Th 2:40pm - 3:55pm Room TBA	Lindsay Piechnik	3.00	16/100

MATH UN1102 CALCULUS II. 3.00 points.

Prerequisites: MATH UN1101 or the equivalent.

Prerequisites: MATH UN1101 or the equivalent. Methods of integration, applications of the integral, Taylors theorem, infinite series. (SC)

Spring 2021: MATH UN1102

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 1102	001/12303	M W 11:40am - 12:55pm Online Only	Maithreya Sitaraman	3.00	12/35
MATH 1102	002/12302	M W 4:10pm - 5:25pm Online Only	Yier Lin	3.00	14/35
MATH 1102	003/12301	T Th 11:40am - 12:55pm Online Only	Evgeni Dimitrov	3.00	73/100
MATH 1102	004/12300	T Th 1:10pm - 2:25pm Online Only	Evgeni Dimitrov	3.00	53/100
MATH 1102	AU1/19280		Maithreya Sitaraman	3.00	1/5

Fall 2021: MATH UN1102

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 1102	001/10631	M W 1:10pm - 2:25pm Room TBA		3.00	10/30
MATH 1102	002/10632	M W 2:40pm - 3:55pm Room TBA		3.00	4/30
MATH 1102	003/10634	M W 4:10pm - 5:25pm Room TBA	Francesco Lin	3.00	8/50
MATH 1102	004/10635	T Th 10:10am - 11:25am Room TBA	Elena Giorgi	3.00	10/50
MATH 1102	005/10636	T Th 11:40am - 12:55pm Room TBA		3.00	5/50
MATH 1102	006/10638	T Th 6:10pm - 7:25pm Room TBA	Elliott Stein	3.00	12/50

MATH UN1201 Calculus III. 3 points.

Prerequisites: MATH UN1101 or the equivalent

Vectors in dimensions 2 and 3, complex numbers and the complex exponential function with applications to differential equations, Cramer's 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 2021: MATH UN1201

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 1201	001/12299	M W 10:10am - 11:25am Online Only	Nicholas Salter	3	59/100
MATH 1201	002/12298	M W 11:40am - 12:55pm Online Only	Nicholas Salter	3	80/100
MATH 1201	003/12297	M W 1:10pm - 2:25pm Online Only	Mu-Tao Wang	3	13/100
MATH 1201	004/12296	T Th 2:40pm - 3:55pm Online Only	Andrew Ahn	3	52/100
MATH 1201	005/00082	T Th 4:10pm - 5:25pm Room TBA	Lindsay Piechnik	3	94/100
MATH 1201	006/00083	T Th 6:10pm - 7:25pm Room TBA	Lindsay Piechnik	3	82/100
MATH 1201	AU4/19228		Andrew Ahn	3	1/5

Fall 2021: MATH UN1201

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 1201	001/10640	M W 10:10am - 11:25am Room TBA	Konstantin Aleshkin	3	22/50
MATH 1201	002/10641	M W 11:40am - 12:55pm Room TBA	Konstantin Aleshkin	3	18/50
MATH 1201	003/10642	M W 1:10pm - 2:25pm Room TBA		3	6/50
MATH 1201	004/10645	M W 2:40pm - 3:55pm Room TBA		3	4/50
MATH 1201	005/10646	T Th 11:40am - 12:55pm Room TBA		3	50/50
MATH 1201	006/10647	T Th 1:10pm - 2:25pm Room TBA	Stephen Miller	3	25/50
MATH 1201	007/10648	T Th 2:40pm - 3:55pm Room TBA	Inbar Klang	3	5/50
MATH 1201	008/10649	T Th 4:10pm - 5:25pm Room TBA	Inbar Klang	3	6/50

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 2021: MATH UN1202**

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 1202	001/00084	T Th 10:10am - 11:25am Room TBA	Daniela De Silva	3.00	41/100
MATH 1202	002/00085	T Th 1:10pm - 2:25pm Room TBA	Daniela De Silva	3.00	46/100
MATH 1202	AU2/19283		Daniela De Silva	3.00	1/5

Fall 2021: MATH UN1202

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 1202	001/10650	M W 1:10pm - 2:25pm Room TBA	Mu-Tao Wang	3.00	25/50
MATH 1202	002/10651	M W 6:10pm - 7:25pm Room TBA	Mikhail Smirnov	3.00	50/50

MATH UN1205 Accelerated Multivariable Calculus. 4 points.

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.

Spring 2021: MATH UN1205

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 1205	001/12295	T Th 1:10pm - 2:25pm Online Only	Kanstantsin Matetski	4	17/50

Fall 2021: MATH UN1205

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 1205	001/10652	M W 8:40am - 9:55am Room TBA	Guillaume Remy	4	11/50

MATH UN1207 Honors Mathematics A. 4 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)

Fall 2021: MATH UN1207

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 1207	001/10656	T Th 1:10pm - 2:25pm Room TBA		4	4/50

MATH UN1208 HONORS MATHEMATICS B. 4.00 points.

Prerequisites: (see Courses for First-Year Students).

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)

Spring 2021: MATH UN1208

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 1208	001/12294	T Th 1:10pm - 2:25pm Online Only	Evan Warner	4.00	41/100

MATH UN2000 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)

Spring 2021: MATH UN2000

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 2000	001/12293	M W 10:10am - 11:25am Online Only	Gus Schrader	3.00	28/100

Fall 2021: MATH UN2000

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 2000	001/00172	M W 10:10am - 11:25am Room TBA	Dusa McDuff	3.00	30/55

MATH UN2010 LINEAR ALGEBRA. 3.00 points.

Prerequisites: MATH UN1201 or the equivalent.

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

Spring 2021: MATH UN2010

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 2010	001/12292	M W 10:10am - 11:25am Online Only	Konstantin Aleshkin	3.00	22/100
MATH 2010	002/12291	M W 1:10pm - 2:25pm Online Only	Gus Schrader	3.00	83/120
MATH 2010	003/12290	T Th 11:40am - 12:55pm Online Only	Stephen Miller	3.00	73/100
MATH 2010	004/12289	T Th 1:10pm - 2:25pm Online Only	Andrew Ahn	3.00	19/100
MATH 2010	005/12288	T Th 6:10pm - 7:25pm Online Only	Elliott Stein	3.00	29/45
MATH 2010	AU4/19231		Andrew Ahn	3.00	1/5

Fall 2021: MATH UN2010

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 2010	001/00173	T Th 8:40am - 9:55am Room TBA	David Bayer	3.00	23/100
MATH 2010	002/00174	T Th 10:10am - 11:25am Room TBA	David Bayer	3.00	43/100
MATH 2010	003/10679	M W 10:10am - 11:25am Room TBA		3.00	32/50
MATH 2010	004/10693	M W 11:40am - 12:55pm Room TBA		3.00	24/50
MATH 2010	005/10698	T Th 4:10pm - 5:25pm Room TBA	Henry Pinkham	3.00	8/50

MATH UN2020 Honors Linear Algebra. 3 points.

Not offered during 2021-22 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 EQUATION. 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 2021: MATH UN2030

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 2030	001/12287	M W 2:40pm - 3:55pm Online Only	Igor Krichever	3.00	63/100
MATH 2030	002/12286	T Th 10:10am - 11:25am Online Only	Aleksander Doan	3.00	47/100

Fall 2021: MATH UN2030

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 2030	001/10718	M W 1:10pm - 2:25pm Room TBA	Florian Johnhe	3.00	35/50
MATH 2030	002/10719	T Th 2:40pm - 3:55pm Room TBA	Evgeni Dimitrov	3.00	50/50

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 2021: MATH UN2500

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 2500	001/12285	M W 1:10pm - 2:25pm Online Only	Yash Jhaveri	3.00	52/100
MATH 2500	002/12284	M W 2:40pm - 3:55pm Online Only	Yash Jhaveri	3.00	40/100

Fall 2021: MATH UN2500

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 2500	001/10720	T Th 10:10am - 11:25am Room TBA	Kanstantsin Matetski	3.00	35/50
MATH 2500	002/10721	T Th 11:40am - 12:55pm Room TBA	Kanstantsin Matetski	3.00	39/50

MATH UN3007 Complex Variables. 3 points.

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)

Fall 2021: MATH UN3007

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 3007	001/10722	M W 2:40pm - 3:55pm Room TBA	Ovidiu Savin	3	34/50

MATH UN3020 Number Theory and Cryptography. 3 points.

Prerequisites: one year of calculus.

Prerequisite: One year of Calculus. Congruences. Primitive roots. Quadratic residues. Contemporary applications.

MATH UN3025 Making, Breaking Codes. 3 points.

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 2021: MATH UN3025

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 3025	001/10723	T Th 1:10pm - 2:25pm Room TBA	Dorian Goldfeld	3	50/50

MATH UN3027 Ordinary Differential Equations. 3 points.

Prerequisites: MATH UN1102 and MATH UN1201 or the equivalent.

Corequisites: MATH UN2010

Equations of order one; systems of linear equations. Second-order equations. Series solutions at regular and singular points. Boundary value problems. Selected applications.

Fall 2021: MATH UN3027

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 3027	001/10735	T Th 11:40am - 12:55pm Room TBA	Panagiota Daskalopoulos	3	40/50

MATH UN3028 PARTIAL DIFFERENTIAL EQUATIONS. 3.00 points.

Prerequisites: MATH UN3027 and MATH UN2010 or the equivalent

Prerequisites: MATH UN3027 and MATH UN2010 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 2021: MATH UN3028

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 3028	001/12282	M W 1:10pm - 2:25pm Online Only	Florian Johne	3.00	45/100

MATH UN3050 Discrete Time Models in Finance. 3 points.

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 2021: MATH UN3050

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 3050	001/13870	M W 6:10pm - 7:25pm 312 Mathematics Building	Mikhail Smirnov	3	55/60

MATH UN3386 Differential Geometry. 3 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 2021: MATH UN3386

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 3386	001/10751	T Th 11:40am - 12:55pm Room TBA	Richard Hamilton	3	26/50

MATH UN3951 Undergraduate Seminars in Mathematics I. 3 points.

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 2021: MATH UN3951

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 3951	001/00175		Daniela De Silva	3	53/64

MATH UN3952 Undergraduate Seminars in Mathematics II. 3 points.

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 2021: MATH UN3952

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 3952	001/00688		David Bayer	3	41/60

MATH GU4007 Analytic Number Theory. 3 points.

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 2021: MATH GU4007

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 4007	001/12281	T Th 11:40am - 12:55pm Online Only	Dorian Goldfeld	3	13/50

MATH GU4032 Fourier Analysis. 3 points.

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 2021: MATH GU4032

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 4032	001/10764	M W 10:10am - 11:25am Room TBA	Simon Brendle	3	35/50

MATH GU4041 INTRO MODERN ALGEBRA I. 3 points.

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, rings, ideals, fields, polynomials, field extensions, Galois theory.

Spring 2021: MATH GU4041

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 4041	001/12280	M W 10:10am - 11:25am Online Only	Daniele Alessandrini	3	34/100
MATH 4041	AU1/19290		Daniele Alessandrini	3	2/5

Fall 2021: MATH GU4041

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 4041	001/12812	M W 2:40pm - 3:55pm Room TBA	Robert Friedman	3	50/50

MATH GU4042 INTRO MODERN ALGEBRA II. 3 points.

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 2021: MATH GU4042

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 4042	001/12279	M W 2:40pm - 3:55pm Online Only	Inbar Klang	3	42/100
MATH 4042	AU1/19291		Inbar Klang	3	1/5

Fall 2021: MATH GU4042

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 4042	001/10765	T Th 2:40pm - 3:55pm Room TBA		3	13/50

MATH GU4043 Algebraic Number Theory. 3 points.

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.

MATH GU4044 Representations of Finite Groups. 3 points.

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 2021: MATH GU4044

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 4044	001/10766	T Th 1:10pm - 2:25pm Room TBA	Chao Li	3	14/50

MATH GU4045 Algebraic Curves. 3 points.

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.

MATH GU4051 Topology. 3 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. Metric spaces, continuity, compactness, quotient spaces. The fundamental group of topological space. Examples from knot theory and surfaces. Covering spaces.

Fall 2021: MATH GU4051

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 4051	001/10767	T Th 2:40pm - 3:55pm Room TBA	Stephen Miller	3	26/50

MATH GU4053 Introduction to Algebraic Topology. 3 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.

MATH GU4061 INTRO MODERN ANALYSIS I. 3 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.

Spring 2021: MATH GU4061

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 4061	001/12278	M W 1:10pm - 2:25pm Online Only	Hui Yu	3	39/100
MATH 4061	002/12277	M W 4:10pm - 5:25pm Online Only	Hui Yu	3	31/100

Fall 2021: MATH GU4061

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 4061	001/10769	T Th 2:40pm - 3:55pm Room TBA	Henri Roesch	3	39/50
MATH 4061	002/10770	T Th 4:10pm - 5:25pm Room TBA	Henri Roesch	3	18/50

MATH GU4052 Introduction to Knot Theory. 3 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 study of algebraic and geometric properties of knots in R^3 , including but not limited to knot projections and Reidemeister's 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 2021: MATH GU4052

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 4052	001/10768	M W 1:10pm - 2:25pm Room TBA	Kyle Hayden	3	13/50

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 2021: MATH GU4062

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 4062	001/12276	T Th 4:10pm - 5:25pm Online Only	Henri Roesch	3.00	20/100

Fall 2021: MATH GU4062

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 4062	001/10771	M W 4:10pm - 5:25pm Room TBA		3.00	21/50

MATH GU4065 Honors Complex Variables. 3 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 2021: MATH GU4065

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 4065	001/10772	T Th 10:10am - 11:25am Room TBA	Julien Dubédat	3	14/50

MATH GU4081 Introduction to Differentiable Manifolds. 3 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 Sard's theorem. Intersection theory. Orientations. Poincaré-Hopf theorem. Differential forms and Stokes' theorem.

Spring 2021: MATH GU4081

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 4081	001/00088	M W 10:10am - 11:25am Room TBA	Dusa McDuff	3	15/40

MATH GU4155 Probability Theory. 3 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 2021: MATH GU4155

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 4155	001/12275	T Th 2:40pm - 3:55pm Online Only	Ioannis Karatzas	3	13/55

MATH GU4391 INTRO TO QUANTUM MECHANICS. 3 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.

Not offered during 2021-22 academic year.

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

Spring 2021: MATH GU4392

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 4392	001/12274	T Th 4:10pm - 5:25pm Online Only	Peter Woit	3.00	4/40

MATH GR5010 Introduction to the Mathematics of Finance. 3 points.

Prerequisites: MATH UN1102 and MATH UN1201 , or their equivalents.
 Introduction to mathematical methods in pricing of options, futures and other derivative securities, risk management, portfolio management and investment strategies with an emphasis of both theoretical and practical aspects. Topics include: Arithmetic and Geometric Brownian motion processes, Black-Scholes partial differential equation, Black-Scholes option pricing formula, Ornstein-Uhlenbeck processes, volatility models, risk models, value-at-risk and conditional value-at-risk, portfolio construction and optimization methods.

Spring 2021: MATH GR5010

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 5010	001/12273	M W 7:40pm - 8:55pm 312 Mathematics Building	Mikhail Smirnov	3	53/150

Fall 2021: MATH GR5010

Course Number	Section/Call Number	Times/Location	Instructor	Points	Enrollment
MATH 5010	001/10773	M W 7:40pm - 8:55pm Room TBA	Mikhail Smirnov	3	30/120

Of Related Interest

Computer Science

COMS W3203	DISCRETE MATHEMATICS
COMS W3251	COMPUTATIONAL LINEAR ALGEBRA
COMS W4203	Graph Theory

Industrial Engineering and Operations Research

CSOR E4010	Graph Theory: A Combinatorial View
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