### Mathematics

**Note:** Text highlighted in red indicates that a change has been made to the course listing. The red text indicates the current, updated information.

#### MATH 110.105 (Q) INTRODUCTION TO CALCULUS (4) Macdonald
- **Limit:** 30 per section
- This course starts from scratch and provides students with all the background necessary for the study of calculus. It includes a review of algebra, trigonometry, exponential and logarithmic functions, coordinates and graphs. Each of these tools will be introduced in its cultural and historical context. The concept of the rate of change of a function will be introduced.
- Not open to students who have studied calculus in high school.
- **Lec. Sec.** 01 02
  - MTW 10:00 F 9
  - MTW 10:30 Th 10:30

#### MATH 110.106 (Q) CALCULUS I (For Biological and Social Science) (4)
- **Lec. I - Ha**
- **Lec. II - Consani**
- **Limit:** 25 per section
- Differential and integral calculus. Includes analytic geometry, functions, limits, integrals and derivatives, introduction to differential equations, functions of several variables, linear systems, applications for systems of linear differential equations, probability distributions. *Many applications to the biological and social sciences will be discussed.*
- **Lec. I Sec.** 01 02 03 04 05 06 07 08 09
  - MTW 10:00 Th 9
  - MTW 10:30 Th 10:30
  - Th 9
  - F 12
  - Th 9
  - F 12
  - Th 12

#### MATH 110.107 (Q) CALCULUS II (For Biological and Social Science) (4) Morava
- **Limit:** 30 per section
- Prereq: C- or better in Calculus I
- Differential and integral calculus. Includes analytic geometry, functions, limits, integrals and derivatives, introduction to differential equations, functions of several variables, linear systems, and applications for systems of linear differential equations, probability distributions.
- **Lec. I Sec.** 01 02 03 04
  - MTW 10:00 Th 9
  - MTW 10:30 Th 10:30
  - Th 12

#### MATH 110.108 (Q) CALCULUS I (For Physical Sciences and Engineering) (4) Spina
- **Limit:** 28 per section
- Differential and integral calculus. Includes analytic geometry, functions, limits, integrals and derivatives, polar coordinates, parametric equations, Taylor's theorem and applications, infinite sequences and series.
- **Lec. I Sec.** 01 02 03 04
  - MTW 10:00 Th 9
  - MTW 10:30 F 9
  - Th 12

#### MATH 110.109 (Q) CALCULUS II (For Physical Sciences and Engineering) (4) Brown
- **Limit:** 28 per section
- Prereq: C- or better in Calculus I
- Differential and integral calculus. Includes analytic geometry, functions, limits, integrals and derivatives, polar coordinates, parametric equations, Taylor's theorem and applications, infinite sequences and series. *Some applications to the physical sciences and engineering will be discussed, and the courses are designed to meet the needs of students in these disciplines.*
- **Lec. I Sec.** 01 02 03 04
  - MTW 10:00 F 9
  - MTW 10:30 F 12
  - F 9

#### MATH 110.113 (Q) HONORS ONE VARIABLE CALCULUS (4) Spruck
- **Limit:** 35
- **Lec. Sec.** 01
  - MTW 10

#### MATH 110.201 (Q) LINEAR ALGEBRA (4) Zucker Consani
- **Limit:** 25 per section
- Prereq: Calculus
- Vector spaces, matrices, and linear transformations. Solutions of systems of linear equations. Eigenvalues, eigenvectors, and diagonalization of matrices. Applications to differential equations. *Secs. 04, 05 & 06 added 04/16/07*
- **Lec. Sec.** 01 02 03 04 05 06
  - MTW 3
  - Th 10:30
  - Th 12
  - F 12
  - Th 10:30
  - Th 12

#### MATH 110.202 (Q) CALCULUS III (4) Wilson
- **Limit:** 28 per section
- Prereq: 110.107, 110.109 or 110.112.
- **Lec. I**
  - MTW 11
**Calculus of functions of more than one variable:** partial derivatives, and applications; multiple integrals, line and surface integrals; Green's Theorem, Stokes' Theorem, and Gauss' Divergence Theorem.

**Sec. 01 canceled 8/28/07**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Instructor</th>
<th>Limit</th>
<th>Prerequisite(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>110.211 (Q)</td>
<td>HONORS MULTIVARIABLE CALCULUS (4)</td>
<td>Zhang</td>
<td>35 per section</td>
<td>Calculus II or III or equivalent, preferably honors</td>
</tr>
<tr>
<td>110.212 (Q)</td>
<td>HONORS LINEAR ALGEBRA (4)</td>
<td>Zucker</td>
<td>30</td>
<td>Calculus II or III or equivalent, preferably honors</td>
</tr>
<tr>
<td>110.302 (E.Q)</td>
<td>DIFFERENTIAL EQUATIONS WITH APPLICATIONS (4)</td>
<td>Zelditch</td>
<td>35 per section</td>
<td>Calculus II</td>
</tr>
<tr>
<td>110.304 (Q)</td>
<td>ELEMENTARY NUMBER THEORY (4)</td>
<td>Ono</td>
<td>25</td>
<td>Calculus II or III</td>
</tr>
<tr>
<td>110.311 (Q)</td>
<td>METHODS OF COMPLEX ANALYSIS (4.5)</td>
<td>Kong</td>
<td>35</td>
<td>Calculus III</td>
</tr>
<tr>
<td>110.401 (Q)</td>
<td>ADVANCED ALGEBRA I (4.5)</td>
<td>Ching</td>
<td>40</td>
<td>Linear Algebra</td>
</tr>
<tr>
<td>110.405 (Q)</td>
<td>ANALYSIS I (4.5)</td>
<td>Wilkin Goldberg</td>
<td>55</td>
<td>Calculus III and Linear Algebra</td>
</tr>
<tr>
<td>110.415 (Q)</td>
<td>HONORS ANALYSIS I (4.5)</td>
<td>Sogge Goldberg</td>
<td>25</td>
<td>B+ or higher in Calculus III and Linear Algebra</td>
</tr>
<tr>
<td>110.427 (Q)</td>
<td>INTRODUCTION TO THE CALCULUS OF VARIATIONS (4)</td>
<td>Khosravi</td>
<td>25</td>
<td>Calculus I, II and III</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lecture Schedule</th>
<th>Days/Time</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lec. I</td>
<td>MTW</td>
<td>12</td>
</tr>
<tr>
<td>Lec. II</td>
<td>Sec. 05</td>
<td>MTW 1</td>
</tr>
<tr>
<td>Lec. III</td>
<td>Sec. 06</td>
<td>MTW 9</td>
</tr>
<tr>
<td>Lec. IV</td>
<td>Sec. 07</td>
<td>MTW 12</td>
</tr>
</tbody>
</table>

**Prereq:** Calculus I, II and III
functional (usually an integral involving the unknown functions) possibly with constraints. This introductory (self-contained) course will cover one dimensional problems (often geometric): brachistochrone, geodesics, minimum surface area of revolution, isoperimetric problem, curvature flows. Additional material as required (some differential geometry of curves and surfaces) holding prerequisites to a minimum.

**110.439 (Q)** **INTRODUCTION TO DIFFERENTIAL GEOMETRY (4.5)** Wilkin  Limit 35
Prereq: Calculus III, Linear Algebra Theory of curves and surfaces in Euclidean space: Frenet equations, fundamental forms, curvatures of a surface, theorems of Gauss and Mainardi-Codazzi, curves on a surface; introduction to tensor analysis and Riemannian geometry; theorema egregium; elementary global theorems. Sec. 01 MTW 2

**110.443 (E,Q)** **FOURIER ANALYSIS (4.5)** Zhang  Limit 25

**110.462 (Q)** **PRIME NUMBERS AND RIEMANN’S ZETA FUNCTION (4)** Ha  Limit 25 Course canceled 01/22/08
Sec. 01 MTW 12

**110.601** **ALGEBRA** Shokurov  Limit 25 Sec. 01 MTW 3 4 10 11 12

**110.605** **REAL VARIABLES** Sogge  Limit 25 Prereq: 110.405, 110.413 or equivalent. Sec. 01 MTW 2

**110.611** **COMPLEX GEOMETRY** Shiffman  Limit 25 Sec. 01 MTW 11 12

**110.615** **ALGEBRAIC TOPOLOGY** Boardman  Limit 25 Prereq: 110.401, 110.413 Sec. 01 ThF 2-3:15

**110.617** **NUMBER THEORY** Consani  Limit 25 Sec. 01 MTW 12

**110.619** **LIE, GROUPS & LIE ALGEBRAS** Shalika  Limit 25 Sec. 01 MTW 1

**110.631** **PARTIAL DIFFERENTIAL EQUATIONS** Spruck  Limit 25 Prereq: 110.605-606 Sec. 01 MW 2-3:30

**110.645** **RIEMANNIAN GEOMETRY** Minicozzi  Limit 25 Sec. 01 MW 9:30-11

**110.665** **REPRESENTATION THEORY** Boardman  Limit 25 Sec. 01 MTW 2

**110.723** **TOPICS IN AUTOMORPHIC FUNCTIONS (MODULAR FORMS)** Faber  Limit 25 Course canceled 8/24/07 Sec. 01 TBA

**110.726** **TOPICS IN SEVERAL COMPLEX VARIABLES** Staff  Limit 25 Sec. 01 TBA

**110.733** **TOPICS IN ALGEBRAIC NUMBER THEORY** Ono  Limit 25 Sec. 01 MW 3:30-5

**110.737** **TOPICS IN ALGEBRAIC GEOMETRY (LOG ADJUNCTION)** Shokurov  Limit 25 Sec. 01 TBA

**110.739** **TOPICS IN ANALYTICAL NUMBER THEORY** Ha  Limit 25 Course added 8/28/07 Sec. 01 TBA

**110.799** **THESIS RESEARCH** Sec. 01 TBA

**110.800** **INDEPENDENT STUDY -GRADUATES** Sec. 01 TBA