ECONOMICS & MATHEMATICS

1019 Milstein Learning Center
212-854-3454
Department Administrator: Robert O’Connor

Mission

The Economics and Mathematics major provides the student with a grounding in economic theory comparable to that provided by the general economics major and exposes the student to rigorous and extensive training in mathematics. The program will be particularly useful for students planning to do graduate work in economics, which frequently demands greater mathematical training than that acquired through the minimum requirements of the basic economics degree.

Economics Department Representative: Sharon Harrison
Mathematics Department Representative: David Bayer

Requirements for the Major

The Economics & Mathematics track requires a minimum of 15 courses (48 minimum credits).

Economics (8 courses)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ECON BC1003</td>
<td>Introduction to Economic Reasoning</td>
<td>3</td>
</tr>
<tr>
<td>ECON BC3018</td>
<td>ECONOMETRICS</td>
<td>4</td>
</tr>
<tr>
<td>ECON BC3033</td>
<td>Intermediate Macroeconomic Theory</td>
<td>4</td>
</tr>
<tr>
<td>ECON BC3035</td>
<td>Intermediate Microeconomic Theory</td>
<td>4</td>
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<tr>
<td>ECON BC3041</td>
<td>Theoretical Foundations of Political Economy</td>
<td>3</td>
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Select one of the following: 4

- ECON BC3062 Senior Thesis II (two semesters of the Senior Thesis are optional)
- ECON BC3063 SENIOR SEMINAR *

Two economics electives with an intermediate micro- or macroeconomic theory course as prerequisite

Mathematics (7 courses)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH UN1102</td>
<td>Calculus II and Calculus III</td>
<td>6</td>
</tr>
<tr>
<td>- MATH UN1201</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH UN2010</td>
<td>Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH UN2500</td>
<td>Analysis and Optimization **</td>
<td>3</td>
</tr>
<tr>
<td>SIEO W3600</td>
<td>INTRO PROBABILITY/STATISTICS (or STAT GU4001)</td>
<td>4</td>
</tr>
</tbody>
</table>

Two electives at or above the 2000 level ***

* MATH UN3951 Undergraduate Seminars in Mathematics I, or an equivalent approved by the Chairs of the Mathematics and Economic departments is an acceptable alternative to ECON BC3063 SENIOR SEMINAR.

** MATH GU4061 Introduction To Modern Analysis I is an acceptable alternative to MATH UN2500 Analysis and Optimization.

*** MATH UN2030 Ordinary Differential Equations is an approved Mathematics elective. Also approved is MATH UN3951 Undergraduate Seminars in Mathematics I.

Students must obtain approval from each department representative before selecting electives. In exceptional cases, these may be from related fields; other courses can be taken with prior approval.

Cross-Listed Courses

Economics (Barnard)

ECON BC3018 ECONOMETRICS. 4.00 points.
Prerequisites: ECON BC3033 or ECON BC3035, and ECON BC2411 or STAT W1111 or STAT W1211, or permission of the instructor.

ECON BC3033 Intermediate Macroeconomic Theory. 4 points.
Prerequisites: An introductory course in economics and a functioning knowledge of high school algebra and analytical geometry or permission of the instructor.

ECON BC3035 Intermediate Microeconomic Theory. 4 points.
Prerequisites: An introductory course in microeconomics or a combined macro/micro principles course (ECON BC1003 or ECON W1105, or the equivalent) and one semester of calculus or ECON BC1007, or permission of the instructor.

ECON BC3041 Theoretical Foundations of Political Economy. 3 points.

Prerequisites: An introductory course in economics or permission of the instructor.

ECON BC3061 Senior Thesis I. 4 points.
Prerequisites: Permission of the instructor and completion of all courses (except for the senior requirement) required for the economics track, political economy track, or economics and mathematics majors.

ECON BC3062 Senior Thesis II. 4 points.
Prerequisites: Permission of the instructor and completion of all courses (except for the senior requirement) required for the economics track, political economy track, or economics and mathematics majors.
ECON BC3063 SENIOR SEMINAR. 4.00 points.
Prerequisites: Permission of the instructor and the completion of all courses (except for the senior requirement) required for the economics track, political economy track, or economics and mathematics majors. Exceptions to these prerequisites may be granted by the chair of the department only. Seminar sections are limited to 15 students. A topic in economic theory or policy of the instructor's choice. See department for current topics and for senior requirement preference forms.

Mathematics

MATH UN1101 Calculus I. 3 points.
Prerequisites: see Courses for First-Year Students. Functions, limits, derivatives, introduction to integrals. The Help Room in 333 Milbank Hall (Barnard College) is open during the day, Monday through Friday, to students seeking individual help from the teaching assistants. (SC)

MATH UN1102 Calculus II. 3 points.
Prerequisites: MATH V1101 or the equivalent. Methods of integration, applications of the integral, Taylor's theorem, infinite series. (SC)

MATH UN1201 Calculus III. 3 points.
Prerequisites: MATH V1101 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)

MATH UN2010 Linear Algebra. 3 points.
Prerequisites: MATH V1201, or the equivalent. Matrices, vector spaces, linear transformations, eigenvalues and eigenvectors, canonical forms, applications. (SC)

MATH UN2030 Ordinary Differential Equations. 3 points.
Prerequisites: MATH V1102-MATH V1201 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.

MATH UN2500 Analysis and Optimization. 3 points.

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.

MATH GU4061 Introduction To Modern Analysis I. 3 points.
Prerequisites: MATH V1202 or the equivalent, and MATH V2010. The second term of this course may not be taken without the first. Real numbers, metric spaces, elements of general topology. Continuous and differential functions. Implicit functions. Integration; change of variables. Function spaces.

Statistics

SIEO W3600 INTRO PROBABILITY/STATISTICS. 4.00 points.

STAT GU4001 INTRODUCTION TO PROBABILITY AND STATISTICS. 3.00 points.
Prerequisites: Calculus through multiple integration and infinite sums. A calculus-based tour of the fundamentals of probability theory and statistical inference. Probability models, random variables, useful distributions, conditioning, expectations, law of large numbers, central limit theorem, point and confidence interval estimation, hypothesis tests, linear regression. This course replaces SIEO 4150