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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<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>
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<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:

- ECON BC3062  Senior Thesis II (two semesters of the Senior Thesis are optional)  4
- ECON BC3063  SENIOR SEMINAR  4

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 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>
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</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 INTRO 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 BC3034 THEORETICAL FOUNDATIONS OF POLITICAL ECONOMY. 3 points.
Prerequisites: An introductory course in economics and a functioning knowledge of high school algebra and analytical geometry or permission of the instructor.

ECON BC3041 Theoretical Foundations of Political Economy. 3 points.
Prerequisites: ECON BC3033 or ECON BC3035, and ECON BC2411 or STAT W1111 or STAT W1211, 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. Exceptions to these prerequisites may be granted by the chair of the department only.

Tutorials and conferences on the research for and writing of the senior thesis. This is the 1st semester of a two-semester course sequence.

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. Exceptions to these prerequisites may be granted by the chair of the department only.

Tutorials and conferences on the research for and writing of the senior thesis. This is the 2nd semester of a two-semester course sequence.
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 instructors choice. See department for current topics and for senior requirement preference forms

Mathematics

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)

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)

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)

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

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

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)

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-Arzela theorem, Stone-Weierstrass theorem.

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