

School of Arts and Sciences

MATHEMATICS JOINT MAJORS

The University of Pittsburgh Department of Mathematics offers two joint majors, one leading to a Bachelor of Science degree in mathematics–economics and the other in mathematics–philosophy.

The mathematics joint majors are ideal for students who would like to add a little something to their mathematics degree without double or triple majoring. The joint major provides not only a set of requirements but also suggested course sequences of mathematics and economics/philosophy courses that are compatible with each other and that prepare students for various specialties.

A degree in mathematics provides an excellent base on which to build a career in virtually any field and provides a particularly strong foundation for advanced study in science or engineering. A joint major in the mathematics department can provide you with the option of taking a quantitatively oriented job in industry or entering graduate school in applied mathematics, statistics, economics, business, or a related area such as operations research or management science.

Mathematics–Economics Joint Major

This joint major includes courses in all three areas of economics that are closely related to mathematics: economic theory, stat-econometrics, and mathematical economics.

1. Requirements in Mathematics: at least 31 credits, distributed as follows:

A. Basic Courses

MATH 0220, MATH 0230, and MATH 0240 Analytic Geometry and Calculus 1, 2, 3 (12 cr. total)

These courses are a sequence of three basic calculus courses. The topics covered are numerous and range from the derivative and integral of functions of one variable and their applications to vectors and surfaces in space, to the calculus of functions of several variables.

MATH 0413 Introduction to Theoretical Mathematics (4 cr.)

This course is an introduction to the theoretical treatment of sets, functions, relations, numbers, sequences, and limits.

MATH 0420 Introduction to Theory: 1–Variable Calculus (3 cr.)

You will be provided with a careful treatment of the theoretical concepts of limit, continuity, derivative, and integral, including the fundamental theorem of calculus during this course.

MATH 0430 Introduction to Abstract Algebraic Systems (3 cr.)

This course introduces the student to abstract algebraic concepts; rings; integral domains; fields; integers; rational, real, and complex numbers; and polynomials.

STAT 1151 Introduction to Probability 1 (3 cr.)

At both a theoretical and applied level, this course presents the basic probability concepts required for statistical inference.

STAT 1152 Introduction to Mathematical Statistics 1 (3 cr.)

This course introduces the elementary concepts of statistical inference.

MATH 1180 Linear Algebra 1 (3 cr.) or MATH 1185 Honors Linear Algebra (3 cr.)

During either of these courses, you will learn the theoretical and rigorous development of linear algebra.



B. Field Courses (Recommended, but not required)

MATH 1110 Industrial Mathematics (3 cr.)

This course is concerned with the approximate numerical solution of problems that arise in an industrial environment.

MATH 1250 Abstract Algebra (3 cr.)

The basic algebraic systems, groups, and rings are studied in some detail during this course. The emphasis is on theory with examples.

MATH 1270 Ordinary Differential Equations 1 (3 cr.)

This course covers the methods used in solving ordinary differential equations, which are frequently encountered in applications. Computer experimentation will be used to illustrate the behavior of solutions of various equations.

MATH 1700 Introduction to Topology (3 cr.)

The topology of \mathbb{R}^1 as well as that of general metric spaces will be studied during this class. The course will be run on a theorem-proving and problem-solving basis.

2. Requirements in Economics: 30 credits, distributed as follows:

A. Basic Courses

ECON 0100 Introduction to Microeconomic Theory (3 cr.)

An introduction to principles of economic analysis as applied to the study of prices and markets. The course builds a theoretical basis for understanding producer and consumer behavior, and prepares you to appreciate the importance of markets in our economic system.

ECON 1100 Intermediate Microeconomics (3 cr.)

An intermediate-level class in resource allocation theory emphasizing the origins and uses of theoretical reasoning in economic analysis.

ECON 1110 Intermediate Macroeconomics (3 cr.)

This course presents a systematic treatment of macroeconomic analysis including topics like policy analysis, inflation-unemployment tradeoffs, business cycles, budget deficits, and the balance of payments.

ECON 1150 Applied Econometrics 1 (3 cr.)

This course introduces the basic tools used in applied econometrics (the application of mathematical and statistical techniques to economics) that are commonly employed in government, business, and academic research. The main emphasis is on the application of various econometric methods.

or

ECON 2150 General Econometrics (3 cr.)

You will survey standard econometric models, their estimation, hypothesis testing, and other inferential problems.

ECON 1140 Economic Modeling and Forecasting (3 cr.)

This course introduces various models and forecasting methods utilized in practice.

or

ECON 1160 Applied Econometrics 2 (3 cr.)

You will cover important advanced techniques and models frequently used in quantitative economic research in government, business, and academic institutions during this class.

or

ECON 2160 Econometrics for Practitioners (3 cr.)

This is a learning-by-doing course on application techniques. You will learn how to apply all the major econometric methods through computer exercises, using real-world data.

B. Field Courses (9 cr. total)

Any economics course can be used to fulfill the field requirements with the exception of courses that are taken to satisfy requirements listed above and the following courses: ECON 0800 Introduction to Economics, ECON 0150 Introduction to Statistics, and ECON 1170 Mathematics for Economists.

3. Departmental Honors in Mathematics–Economics

You must take all the required economics courses with the added stipulations that either ECON 1180 Mathematical Economics or ECON 2080 History of Economic Thought 2 must be chosen and a pro-seminar must be one of the field courses chosen. You also must take the following 27 credits of mathematics courses in place of the mathematics courses previously listed for the joint major in mathematics–economics:

MATH 0220 Analytic Geometry and Calculus 1

MATH 0230 (honors) Analytic Geometry and Calculus 2

MATH 0240 (honors) Analytic Geometry and Calculus 3

STAT 1151 Introduction to Probability
STAT 1152 Introduction to Mathematical Statistics
MATH 1180 Linear Algebra 1
MATH 1530 Advanced Calculus 1
One additional junior-senior level course

For more information on the mathematics–economics joint major, please contact:

University of Pittsburgh	or	University of Pittsburgh
School of Arts and Sciences		School of Arts and Sciences
Department of Mathematics		Department of Economics
Frank Beatrous Jr., undergraduate director		Undergraduate Advisor
427 Thackeray Hall		4901 Wesley W. Posvar Hall
Pittsburgh, PA 15260		Pittsburgh, PA 15260
412-624-8349		412-648-1740

* Students are encouraged to consult with advisors in both departments, although the Department of Mathematics generally certifies for graduation.

Mathematics–Philosophy Joint Major

1. Basic Courses (normally completed by the end of the sophomore year)

MATH 0220 Analytic Geometry and Calculus 1
MATH 0230 Analytic Geometry and Calculus 2
MATH 0240 Analytic Geometry and Calculus 3
MATH 0413 Introduction to Theoretical Mathematics
MATH 0420 Introduction Theory 1: Variable Calculus
MATH 0430 Introduction to Abstract Algebraic Systems
PHIL 0200 History of Ancient Philosophy

The aim of this course is to introduce students to some of the main achievements and leading ideas of ancient Greek philosophy up to classical times. The emphasis will be on understanding and evaluating the arguments and ideas of the Greek philosophical tradition.

PHIL 0210 History of Modern Philosophy

An introduction to the philosophical period from Descartes through Kant is presented during this course. Special attention is given to at least one rationalist, one empiricist, and Kant.

Note: Some other introductory philosophy course may be substituted for PHIL 0200 or PHIL 0210 with the consent of the student's advisor.

2. Field Courses (at least 30 credits of mathematics and philosophy courses at the upper level)

These courses will normally be distributed as follows:

(1) Mathematics and Statistics (9 cr.):

MATH 1530 Advanced Calculus 1
MATH 1180 or 1185 Linear Algebra

One course from at least two of the following groups:

- Advanced calculus or analysis (MATH 1540 Advanced Calculus 2)
- Algebra (e.g., MATH 1180 Linear Algebra 1 or 1250 Abstract Algebra)
- Topology or geometry (e.g., MATH 1290 Topics in Geometry or 1700 Introduction to Topology)

One foundation course (MATH 1410, PHIL 1530, or PHIL 1540)

(2) Philosophy (21 cr. total) distributed as follows:

Three upper-level philosophy courses (9 cr.), including at least one of the following topics: philosophy of mathematics, philosophy of logic, philosophy of science or semantics, and at least one course that is not concerned with any of these topics.

By the end of the junior year, students in the joint major are expected to have completed PHIL 1510. By the end of the senior year, students are expected to have completed PHIL 1520 Logical Metatheory and MATH 1410/1420 Foundations of Mathematics 1, 2, or equivalent (12 cr. total).

3. Departmental Honors in Mathematics–Philosophy

The Departments of Mathematics and Philosophy offer a program leading to graduation with departmental honors in the joint major. Students seeking departmental honors will be asked to prepare an oral presentation on some topic to be selected

in consultation with members of the faculty. Candidates for departmental honors will be examined by a committee of three faculty members from the Departments of Mathematics and Philosophy on their knowledge of logic and the foundations of mathematics.

Foreign Language

The prospective candidate for an advanced degree in mathematics or statistics should keep in mind that many graduate programs require a reading knowledge of one or two foreign languages selected from French, German, and Russian.

For more information about the mathematics–philosophy joint major, please contact:

University of Pittsburgh	<i>or</i>	University of Pittsburgh
School of Arts and Sciences		School of Arts and Sciences
Department of Mathematics		Department of Philosophy
Frank Beatrous Jr., undergraduate director		Michael Perloff, undergraduate director
427 Thackeray Hall		1028-C Cathedral of Learning
Pittsburgh, PA 15260		Pittsburgh, PA 15260
412-624-8349		412-624-5781

For more information about other programs, please contact:

University of Pittsburgh
Office of Admissions and Financial Aid
Alumni Hall, 4227 Fifth Avenue
Pittsburgh, PA 15260
412-624-PITT
E-mail: oafa@pitt.edu
www.oafa.pitt.edu

Special Programs and Opportunities

Internships

Mathematics majors have the opportunity to participate in internships related to their studies, such as with Wolfram Research Inc., creator of Mathematica software, and the Carnegie Science Center.

Study Abroad

Studying abroad is an exciting way to add an international perspective to your undergraduate education and strengthen your credentials as a graduate. Since only 4 percent of American students have studied abroad, this experience distinguishes you when you enter the job market or pursue graduate study. It allows you to broaden your personal experience and gain an appreciation of other cultures while earning credits toward your degree. Scholarships are available, and financial aid is applicable.

Undergraduate Teaching

Undergraduate students can apply for positions as undergraduate teaching assistants in entry-level mathematics courses. Peer tutoring opportunities are also available in the Math Assistance Center.