

Mathematics



Department of Mathematics and Statistics College of Arts, Sciences, and Letters

The Field

Mathematics is perhaps the most precise of human languages. With it, scientists and engineers have been able to describe and understand complex physical and social phenomena. As a language, together with its axiomatic underpinnings, it is a much-explored structure in itself. These two views of Mathematics, its application to things external and to things internal, represent a distinction between Applied and Pure Mathematics.

Career Opportunities

The application of mathematics to problems in science, business, and industry has always been and continues to be an on-going activity. Increasingly, concentrators in mathematics are broadening their training to encompass other disciplines, most notably Computer Science and Statistics. Likewise, students in other disciplines are acquiring more mathematical skills, to strengthen their understanding of their subject and to enhance their marketability in the workplace.

Pure mathematics research persists in universities and laboratories nationwide. The excitement generated by new discoveries (e.g. wavelets) and by the settling of old conjectures (e.g. Fermat's Last Theorem) underscores the historical importance and the continued desirability of pure research.

The teaching profession straddles both pure and applied mathematics. It is here that we are introduced formally to the subject of mathematics, here that we add to our tools and sharpen our skills. The need for excellent mathematics instruction at all levels has never been greater.

Finally, mathematics is training in the discipline of thinking. The applicability of sharp insightful analysis in law or business cannot be overstated. To quote mathematicians Polya and Szego, "For the schooling of one's power of thought only the practice of thinking is really useful."

The Major

Degree-seeking students are required to fulfill the required courses in effect at the time admitted or readmitted to the program. Since these are subject to change, students should see an advisor for current requirements.

The prerequisites include three semesters of calculus, introductory differential equations, and matrix/linear algebra. This sequence of courses is shared by many disciplines, including engineering and the natural sciences. These courses, while filled with many new ideas and concepts, are sometimes characterized by computations. In many respects this is natural since these courses serve not just potential theoreticians, but also future practitioners.

The core courses involve greater rigor and spend more time on concepts and proofs. To facilitate the transition from the prerequisites to the upper-level courses (300-level or higher), the department provides a bridge course, called Mathematical Proof and Structures.

From the core courses, eight upper-level courses are required: two algebra, two analysis, two applied mathematics, and two electives. Everyone is required to have abstract algebra, while there is a bit more flexibility between linear algebra and matrix computations. Likewise, everyone is required to have one semester of advanced calculus. In addition, a second semester is recommended, but topology or complex variables are alternatives. The applied mathematics courses can be of a traditional sort, including Fourier Series and complex variables, or the less classical mathematical modeling and mathematical statistics.

Finally, there is the flexibility to choose from a host of other courses, including geometry, history of mathematics, and number theory.

There are two auxiliary requirements: a programming language course and two upper-level cognate courses. The introductory programming language for most students is likely to be C++. A cognate course of study is an area in which mathematics is used extensively, but the area is not itself mathematics. Examples of cognate areas include physics, chemistry, and statistics.

Minors/Areas of Focus

The Department of Mathematics and Statistics supports two minors/ areas of focus: applied statistics, and computer and computational mathematics. These minors each require the completion of a minimum of 12 upper level hours in their respective discipline (a student must also fulfill all prerequisite courses).

The Courses

Lower Level Courses

080	Introductory Algebra
090	Intermediate Algebra
104	Pre-Calculus for Management, Life & Social Sciences
105	Pre-Calculus
113-114	Calculus for Management/Life/Social Sciences I and II
115-116	Calculus I and II
131	Conceptual Mathematics
200	Mathematical Proof and Structures
205/215	Calculus III (Engineering/Non-engineering)
216	Introduction to Differential Equations
217	Introduction to Matrix Algebra
227	Introduction to Linear Algebra
276	Discrete Mathematical Methods
297	The Nature of Mathematics (Honors Program)

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Upper Level Courses

315	Applied Combinatorics
325	Mathematical Statistics I
331	Survey of Geometry
363	Introduction to Statistics (course does not count toward math major)
372	Computing with Mathematica
390	Topics in Mathematics
395	Elementary Number Theory
404	Dynamical Systems
405	Integral Equations
412	First Course in Modern Algebra
413	Linear Algebra
420	Stochastic Processes
425	Mathematical Statistics II
451-452	Advanced Calculus I and II
454	Fourier Series and Boundary Value Problems
455	Functions of a Complex Variable with Applications
458	Introduction to Wavelets
462	Mathematical Modeling
472	Introduction to Numerical Analysis
473	Matrix Computation
480	History of Mathematics
492	Introduction to Topology
499	Independent Studies in Mathematics

Mathematics Education

385	Mathematics for Elementary Teachers I
386	Mathematics for Elementary Teachers II
387	Mathematics for Elementary Teachers III
391	Topics in Mathematics Education
442	Geometry for Teachers
443	Algebra for Teachers
444	Data Analysis, Probability, and Statistics for Teachers
445	Number and Proportional Reasoning for Teachers
446	Discrete Math/Mathematical Modeling for Teachers
447	Microcomputers in Mathematics for Teachers
449	Concepts of Calculus for Teachers
486	Secondary School Mathematics for Teachers

Statistics (minor/area of focus)

325/363	Applied Statistics I/Introduction to Statistics
390	Topics in Applied Statistics
425	Applied Statistics II
430	Applied Regression Analysis
440	Design and Analysis of Experiments

Computer and Computational Mathematics (minor/ area of focus)

150	Computer Science I (CIS 150)
305	Theory of Computation (CIS 305)
315	Applied Combinatorics
372	Computing with Mathematica
390	Topics in Computational Mathematics
399	Independent Studies
404	Dynamical Systems (Math 404)
451	Computer Graphics (CIS 451)
472	Introduction to Numerical Analysis (Math 472)
473	Matrix Computation (Math 473)

The Faculty

The faculty has a wide variety of teaching and research interests. Their office hours are posted outside their offices. Further information regarding their availability for counseling may be obtained from the Department of Mathematics and Statistics.

- Mahesh Agarwal, Ph.D.** (University of Michigan), Assistant Professor
- James Ward Brown, Ph.D.** (University of Michigan), Professor
- Nesrin Cengiz, Ph.D.** (Western Michigan University), Ass't. Professor
- John Clifford, Ph.D.** (Michigan State University), Assoc. Professor
- John Fink, Ph.D.** (Western Michigan University), Professor
- Thomas Fiore, Ph.D.** (University of Michigan), Assistant Professor
- Judith Flowers, Ed.D.** (University of Michigan), Research Scientist
- John Gillespie, Ph.D.** (Temple University), Professor and Department Chair
- Margret Höft, Ph.D.** (University of Houston), Professor
- Yangjin Kim, Ph.D.** (University of Minnesota), Assistant Professor
- David James, Ph.D.** (University of Wisconsin), Professor
- Angela Krebs, Ph.D.** (Michigan State University), Assoc. Professor
- Michael Lachance, Ph.D.** (University of South Florida), Professor
- Paul Lin, Ph.D.** (Wayne State University), Assoc. Professor
- Montaha Macany, Ph.D.** (University of Manchester, England), Lecturer
- Frank Massey, Ph.D.** (University of California-Berkeley), Assoc. Professor
- Barbara Matthei, M.A.** (Indiana University), Lecturer
- Timothy McKenna, M.S.** (Oakland University), Lecturer
- Ronald Morash, Ph.D.** (University of Massachusetts), Professor
- Christopher Novak, Ph.D.** (Northwestern University), Assistant Professor
- Margaret Rathouz, Ph.D.** (University of California-San Diego), Assistant Professor
- Joan Remski, Ph.D.** (Michigan State University), Assoc. Professor
- Rheta Rubenstein, Ph.D.** (Wayne State University) Professor
- Michael Shelly, Ed.D.** (Wayne State University), Lecturer
- Thomas Snabb, Ph.D.** (Wayne State University), Assoc. Professor
- Andrew Strowe, M.A.** (University of Nebraska), Lecturer
- Roger Verhey, Ph.D.** (University of Michigan), Professor Emeritus and Director of the Center for Mathematics Education
- Alan Wiggins, Ph.D.** (Texas A&M University) Assistant Professor
- Jennifer Zhao, Ph.D.** (Indiana University), Professor

For More Information

For more information about the mathematics program:
Department of Mathematics and Statistics
University of Michigan-Dearborn
4901 Evergreen Road
Dearborn, MI 48128-2406
313-593-5414
www.umd.umich.edu/cas/math

To request an application or information about admission:

Office of Admissions and Orientation
University of Michigan-Dearborn
4901 Evergreen Road
Dearborn, MI 48128-2406
313-593-5100
admissions@umd.umich.edu
www.umd.umich.edu