

Applied Mathematics Specializations

In addition to the general B.S. degree in Applied Mathematics, the department offers six special five-course sequences that may be used as a guide for the selection of **mathematics electives** and will prepare the student for a career in

- business/finance,
- education,
- industrial research, or
- graduate school.

Choosing any of the following specializations is **optional**.

Specialization in Mathematical Finance

Program advisor: T. Bielecki

Students who choose this specialization may qualify for admission to the Master of Mathematical Finance program – a collaborative program between the Stuart School of Business and the Applied Mathematics Department. The objective of the MMF program is to provide individuals interested in pursuing careers in the finance industry with advanced education in theoretical, computational and business aspects of relevant quantitative methodologies.

Students are required to do a **business minor** or **entrepreneurship minor** (see the IIT Undergraduate Bulletin for details).

Students need to take

- MATH 475 (Probability),
- MATH 476 (Statistics),
- MATH 478 (Numerical Methods for Differential Equations),
- MATH 481 (Introduction to Stochastic Processes),
- MATH 485 (Introduction to Mathematical Finance).

MATH 475 is required for all applied mathematics majors, the other four courses count toward MATH electives.

Closely related courses which are recommended as additional electives include

- MATH 461 (Fourier Series and Boundary Value Problems)
- MATH 477 (Numerical Linear Algebra)
- MATH 483 (Design and Analysis of Experiments)
- MATH 486 (Mathematical Modeling)
- MATH 489 (Partial Differential Equations)

Specialization in Math Education

Program advisor: G. Fasshauer

Completion of the following 24 credit hour **education minor** will prepare students for the Illinois State Certification in Secondary Mathematics (grades 6-12) and Secondary Science: Biology, Chemistry, Physics (grades 6-12).

MSED 200 (Analysis of Classrooms)
MSED 250 Curriculum/Foundations
MSED 300 Instructional Methods /Strategies I
MSED 320 Inquiry and Problem Solving
MSED 350 Informal Education Practicum and Seminar
MSED 400 Instructional Methods /Strategies II
MSED 450 Professional Internship

Students need to take

MATH 420 (Geometry) or MATH 453 (Combinatorics),
MATH 430 (Applied Algebra),
MATH 454 (Graph Theory),
MATH 475 (Probability),
MATH 476 (Statistics).

MATH 430 or 454, and 475 are required for all applied mathematics majors. The other three courses count toward MATH electives.

Closely related courses which are recommended as additional electives include

MATH 300 (Perspectives in Analysis)
MATH 420* (Geometry)
MATH 453* (Combinatorics)
MATH 486 (Mathematical Modeling)

* Only if not already counted as a required course.

Specialization in Applied Analysis

Program advisor: J. Duan

Applied analysis is one of the foundations for interdisciplinary applied mathematics. The principles of analysis are applied to such areas as partial differential equations, dynamical systems and numerical analysis. The basic framework, concepts and techniques of modern mathematical analysis are essential for modeling, analysis and simulation of complicated phenomena in engineering and science.

Students need to take

MATH 400 (Real Analysis),
MATH 402 (Complex Analysis),
MATH 461 (Fourier Series and Boundary Value Problems),
MATH 488 (Ordinary Differential Equations and Dynamical Systems),
MATH 489 (Partial Differential Equations).

MATH 400 and 402 are required for all applied mathematics majors. The other three courses count toward MATH electives.

Closely related courses which are recommended as additional electives include

MATH 405 (Iteration and Chaos)

MATH 478 (Numerical Methods for Differential Equations)
MATH 486 (Mathematical Modeling)

Recommended minors include: physics, or one of the engineering minors.

Specialization in Computational Mathematics

Program advisor: X. Li

The use of computation/simulation as a third alternative to theory and experimentation is now common practice in many branches of science and engineering. Many scientific problems that were previously inaccessible have seen tremendous progress from the use of computation (e.g., many-body simulations in physics and chemistry, simulation of semi-conductors, etc.). Researchers and scientists in these areas must have a sound training in the fundamentals of computational mathematics and become proficient in the use and development of new algorithms and analytical techniques as they apply to modern computational environments.

Students need to take

MATH 350 (Introduction to Computational Mathematics),
MATH 435 (Linear Optimization) or MATH 461 (Fourier Series and Boundary Value Problems),
MATH 476 (Statistics),
MATH 477 (Numerical Linear Algebra),
MATH 478 (Numerical Methods for Differential Equations).

MATH 350 is required for all applied mathematics majors. The other four courses count toward MATH electives.

Closely related courses which are recommended as additional electives include

MATH 405 (Iteration and Chaos)
MATH 435* (Linear Optimization)
MATH 461* (Fourier Series and Boundary Value Problems)
MATH 486 (Mathematical Modeling)
MATH 488 (Ordinary Differential Equations and Dynamical Systems)
MATH 489 (Partial Differential Equations)

* Only if not already counted as a required course.

Recommended minors include: artificial intelligence, computational structures, or software engineering.

Specialization in Discrete Applied Mathematics

Program advisor: M. Pelsmajer

Discrete applied mathematics is a fairly young branch of mathematics and is concerned with using combinatorics, graph theory, optimization, and portions of theoretical computer science to attack problems in engineering as well as the hard and soft sciences.

Students need to take

MATH 332 (Matrices),
MATH 430 (Applied Algebra),
MATH 435 (Linear Optimization),
MATH 453 (Combinatorics),
MATH 454 (Graph Theory).

MATH 332 and MATH 430 or 454 are required for all applied mathematics majors. The other three courses count toward MATH electives.

Closely related courses which are recommended as additional electives include

MATH 405 (Iteration and Chaos)
MATH 410 (Number Theory)

Recommended minors include: artificial intelligence, computational structures, or computer networking.

Specialization in Stochastics

Program advisor: I. Cialenco

Stochastics at IIT includes traditional statistics (the methods of data analysis and inference) and probability (the modeling of uncertainty and randomness). However, also included are other areas where stochastic methods have been becoming more important in recent years such as stochastic processes, stochastic integration, stochastic dynamics, stochastic partial differential equations, probabilistic methods for analysis, mathematical finance, discrete mathematics, and computational methods for stochastic systems.

Students need to take

MATH 475 (Probability),
MATH 476 (Statistics),
MATH 481 (Introduction to Stochastic Process),
MATH 485 (Introduction to Mathematical Finance),
MATH 488 (Ordinary Differential Equations and Dynamical Systems).

MATH 475 is required for all applied mathematics majors, the other four courses count toward MATH electives.

Closely related courses which are recommended as additional electives include

MATH 453 (Combinatorics)
MATH 483 (Design and Analysis of Experiments)
MATH 486 (Mathematical Modeling)