

Undergraduate Mathematics



The work of mathematicians falls into two broad classes – theoretical (pure) mathematics and applied mathematics. These classes, however, are not sharply defined and often overlap.

At Ottawa University

The Mathematics program at Ottawa University provides training in logic and critical thinking and helps students gain mastery of calculus, algebra, geometry, statistics, and computer programming.

Careers

Graduates are prepared for a wide range of careers, including computer science, business, investments, and research. Mathematicians use mathematical theory, computational techniques, algorithms, and the latest computer technology to solve economic, scientific, engineering, physics, and business problems. Other occupations that require extensive knowledge of mathematics or, in some cases, a degree in mathematics include statisticians, computer programmers and computer software engineers. A strong background in mathematics also facilitates employment as teachers, economists, physicists, and astronomers.

Education and Qualifications

Most mathematics-related careers require a minimum of a bachelor's degree, with a graduate degree or other specialized training highly preferred. Mathematicians need to have good reasoning skills to identify, analyze and apply basic principles to technical problems. Communication skills also are important, as mathematicians must be able to interact and discuss proposed solutions with people who may not have extensive knowledge of mathematics.

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Required Major Courses

MAT 20043 Discrete Mathematics

Discrete Mathematics is an introductory course into mathematical structures that are primarily discrete as opposed to continuous. Topics to be covered include logic, relations, basic set theory, graph theory, languages, and finite state machines.

Prerequisite: Score of 16 on math placement exam non-math track, or Score of 7 on math placement exam math track, or MAT 10443 Intermediate Algebra.

MAT 21044 Calculus I

First in a series of three courses that offers an intuitive approach to the major concepts and techniques of single-variable calculus. Topics include limits, continuity, derivatives of elementary functions and their application, extrema, optimization, elementary integration applications, the Fundamental Theorem of Calculus, and l'Hospital's rule. Prerequisite: A "C" or better in MAT 11143 Precalculus or consent of instructor.

MAT 21144 Calculus II

Second course in a series of three courses that offers an intuitive approach to the major concepts and techniques of single-variable calculus. Topics covered include techniques of integration, integration applications, first-order linear and first-order separable differential equations, sequences, series, convergence tests, power series, and the calculus of parametric and polar equations. Prerequisite: A "C" or better in MAT 21044 Calculus I or consent of instructor.

MAT 22043 Linear Algebra

Linear Algebra is a developmental course on the abstraction of vector spaces and linear transformations. Topics to be covered include vector spaces, linear transformations, systems of linear equations, matrices and their properties, determinants, quadratic forms, eigenvalues and eigenvectors, the Gram-Schmidt process, and the Jordan canonical form.

Prerequisite: Grade of "C" or better in MAT 21044 Calculus I or consent of instructor.

MAT 30243 Transition to Higher Mathematics

Transition to Higher Mathematics emphasizes the enhancement of the student's ability to write and comprehend mathematical proof. The course takes a rigorous look at standard methods of proof and their validity. Prerequisite: Grade of "C" or better in both MAT 20043 Discrete Mathematics and MAT 21144 Calculus II.

MAT 31044 Calculus III

Third course in a series of three courses that offers an intuitive approach to major concepts and techniques of multi-variable calculus. Topics to be covered include differential and integral calculus of functions of several variables, partial differentiation, LaGrange multipliers, vector fields, line integrals, linear second-order differential equations and associated applications. Prerequisite: A "C" or better in MAT 21144 Calculus II or consent of instructor.

MAT 31143 Probability

An intuitive study of calculus based probability and its application to inferential statistics. Topics covered include discrete, continuous, and bivariate random variables and their distributions, expectations, conditional expectation, Bayes' Rule, moment generating functions, covariance, variance, distributions for functions of random variables, order statistics and their distribution, correlation, and least squares regression modeling. Prerequisite: A "C" or better in MAT 21144 Calculus II or consent of the instructor.

MAT 32044 Inferential Statistics

Course offers a calculus based intuitive treatment of inferential statistics structure. Applications include point estimation, single parameter and two-sample hypothesis testing, power, Neyman-Pearson Lemma, p-value, beta, ANOVA, randomized block analysis and design, Goodness-of-Fit, Wilcoxon Sign test, Mann-Whitney U test, Friedman Test, Kruskal-Wallis H Test, and rank correlation coefficient. Prerequisite: A "C" or better in MAT 31143 Probability or consent of instructor.

MAT 33043 Differential Equations

Differential Equations explores various techniques for finding solutions to first- and second-order differential equations. Topics covered include first-order differential equations, first-order systems, linear systems, nonlinear systems, Laplace Transforms, and the Runge-Kutta numerical method. Prerequisite: Grade of "C" or better in MAT 21144 Calculus II

MAT 42143 Abstract Algebra

This course develops rigorous understanding of algebraic structures. Students construct and critique proof of properties concerning finite groups, finite simple groups, rings, integral domains, fields, polynomial rings, ring factorization, extension fields, finite fields, Sylow Theorems, and Lagrange's Theorem. Prerequisite: A "C" or better in MAT 20043 Discrete Mathematics and MAT 22043 Linear Algebra.

MAT 43443 Numerical Methods

Introduces numerical techniques and algorithms fundamental to scientific computer work, including discussion of error, roots of equations, interpolation, systems of equations, numerical integration, and methods of solution of ordinary differential equations. Prerequisite: MAT 21144 Calculus II.

MAT 45143 Introduction to Real Analysis

Introduction to Real Analysis develops the theory of calculus carefully and rigorously from basic principles, giving the student of mathematics the ability to construct, analyze and critique mathematical proofs in analysis. Prerequisite: Grade of "C" or better in MAT 30243 Transitions to Higher Mathematics.

MAT 49201 Integrative Seminar in Mathematics

Capstone course that evaluates comprehensive knowledge of undergraduate mathematics. Assessment includes narrative from student describing his/her understanding of the program's learning objectives, comprehensive assessment of intuitive undergraduate mathematics, and a research component whereby the student submits some original mathematics. Prerequisite: Completion of all required major courses or instructor consent.