

# Mathematics

## First-Year Program

Students who seek the intellectual formation or stimulation which mathematics can provide, or who wish to become better acquainted with classical mathematics, or who intend to pursue certain types of theoretical studies in the social sciences or the humanities, should choose MATH 1013. Students who wish to have sufficient mathematical background to pursue studies in the sciences (such as chemistry, computer science, engineering, forestry, mathematics, physics, or statistics) should choose MATH 1013. Since the usual prerequisites to this course are high school algebra, analytic geometry and some trigonometry, students should have grade 12 mathematics.

MATH 1033 is directed principally to students intending to Major in any of the social sciences, elementary education, or business administration. Students should have grade 12 mathematics.

MATH 1103 is designed to introduce students to many different branches and topics of mathematics and to make students more mathematically literate. Students wishing to add breadth to their knowledge of mathematics, particularly those whose areas of interest employ a wide range of mathematical methods, should choose MATH 1103.

## MATH-1013. Introduction to Calculus I

A review of analytic geometry and functions; derivatives of algebraic functions; mean value theorem; fundamental theorem of calculus; applications of differentiation, including extreme values and related rates; integration; differentials. Three hours of lecture and one tutorial per week. Prerequisite: grade 12 mathematics or equivalent.

## MATH-1023. Introduction to Calculus II

Conic sections; transcendental functions and their derivatives; techniques of integration; areas and volumes; Taylor's theorem. Prerequisite: a grade of C or higher in MATH 1013.

## MATH-1033. Finite Mathematics for the Social Sciences

Functions, matrices, linear programming, permutations and combinations, probability and statistics, interest and annuities. Prerequisite: Grade 12 mathematics or its equivalent. Three lecture hours and one tutorial hour per week.

## MATH-1103. Introduction to Mathematical Reasoning

This course is a historical survey of most of the major branches of modern mathematics, including number theory, cryptology, logic, function theory, calculus, geometry, lattice theory, symmetry groups, tiling theory, topology, and knot theory. A recurring theme is the concept of proof and the axiomatic method in mathematics. Students learn how to choose appropriate mathematical models, how mathematicians prove their results, and how a single branch of mathematics can be applied to problems arising across a spectrum of different fields.

## MATH-2213. Linear Algebra

Matrices and determinants; vectors in  $R^2$  and  $R^3$ ; real finite-dimensional vector spaces and linear transformations; eigenvalues and eigenvectors; complex vector spaces and inner product spaces; unitary and Hermitian matrices. Prerequisite: MATH 1023 or MATH 1033 or consent of the instructor.

**MATH-2513. Introduction to Logic (PHIL)**

A lecture course in which students learn how to identify and evaluate arguments drawn from a wide variety of sources. It will develop informal methods such as the identification of argument structure and informal fallacies. It will also develop formal methods that involve taking arguments in English, symbolizing them in a formal language, and evaluating the strengths and weaknesses of the argument's forms. Also covered are basic probability theory, inductive logic, and statistical reasoning.

**MATH-2613. Elementary Differential Equations**

This is a study of basic solution techniques and applications of differential equations with attention to concepts and computational efficiency. Topics include equations of the first order and first degree, Bernoulli's equations, orthogonal trajectories, linear differential equations, linear equations with constant coefficients, and nonhomogeneous equations. Prerequisite: a grade of C or higher in MATH 1023. Three hours per week.

**MATH-3613. Partial Differential Equations**

This is a study of basic solution techniques and applications of partial differential equations with attention to concepts and computational efficiency. Topics include first order equations, geometric theory, second order equations, classification, Laplace, wave and heat equations, Sturm-Liouville theory, Fourier series and boundary and initial value problems. Prerequisite: A grade of C or higher in MATH 2613.

**MATH-3813. Introduction to Logic (PHIL 3813)**

This is a course in first-order symbolic logic in its second main branch (predicate logic). The aim is to acquaint students with the formal language of modern deductive logic and to develop the basic techniques of good deductive reasoning. The course will be of interest to philosophy Majors in particular (especially those who are planning to do graduate work in philosophy), but will benefit anyone who wants to acquire skills in abstract thinking. A good grounding in sentential logic is presupposed. Prerequisite: PHIL 2513 or permission of the instructor.

**MATH-3913. Statistics with Applications**

Descriptive statistics and representation of single-variable data, descriptive analysis and presentation of bivariate data, probability, probability distributions, sample variability, statistical inferences, linear correlation, and regression analysis. Prerequisite: MATH 1023.

## Independent Study

**MATH-4013. Independent Study**

Special courses in topics not normally covered in regular course offerings in Mathematics. Students work closely with a faculty member on a project involving independent research. Approval must be given by the by Director.

*NOTE: Not all courses listed are offered each year. Please consult with the Program Director for more information about current and planned course offerings.*