MATH 001: Introduction to Mathematics (4 Credits)
Mathematical reasoning and problem solving. Emphasis on building mathematical intuition and analytical skills via simplification of problems and inductive discovery methods. Topics are selected from logic, number theory, set theory, geometry, probability, statistics, and graph theory.

Note(s): Intended for students with little technical background who wish to acquire a mathematical perspective or prepare for a more advanced course such as MATH 003 or MATH 004. Those taking MATH 001 in preparation for MATH 004 must enroll concurrently in MATH 003L. Also suitable for candidates for teaching credentials. Limit 30 students.

Meets the following Gen Ed requirements: Quantitative and Computational Reasoning

MATH 003L: Pre-Calculus Workshop (0 Credits)
A streamlined course designed to prepare students for the calculus sequence (MATH 047–048). Properties and graphs of elementary functions. Emphasis on developing conceptual understanding and problem-solving skills.

Note(s): Concurrently, students must enroll in a pre-calculus lab, MATH 003L, designed to strengthen their algebraic skills. Limit 30 students.

Meets the following Core requirements: Quantitative Literacy
Meets the following Gen Ed requirements: Quantitative and Computational Reasoning

MATH 005L: Pre-Calculus Workshop (0 Credits)
This course is a continuation of Discrete Mathematics I. Topics are selected from: logic, Boolean algebra, proof techniques such as mathematical induction and proof by contradiction, sums, sets, and the Halting Problem.

Note(s): Prerequisites: Strong background in high school mathematics and consent of instructor, or MATH 001 or MATH 003 and their associate workshop MATH 003L. Limit 25 students.

Meets the following Core requirements: Quantitative Literacy
Meets the following Gen Ed requirements: Quantitative and Computational Reasoning

MATH 006: Discrete Mathematics II (4 Credits)
This course is a continuation of Discrete Mathematics I. Topics are selected from: functions, counting methods, probability, statistics, recursion, recurrence relations, graph theory, matrices, regular expressions, finite state automata, grammars, and languages.

Prerequisite(s): MATH 004
Note(s): Prerequisite of MATH 004 may be waived with instructor consent. Limit 25 students.

Meets the following Core requirements: Quantitative Literacy
Meets the following Gen Ed requirements: Quantitative and Computational Reasoning

MATH 007: Calculus I (3 Credits)
Calculus I & II and Multivariable Calculus (MATH 049) are designed to build a solid foundation in calculus. Topics in Calculus I include: limits; continuity; derivatives; techniques for differentiation; linearization and differentials; the Mean Value Theorem; interpretations of derivatives in geometry and science; extreme values of functions, with applications to graphing and optimization problems in economics, life sciences, and physics; and an introduction to integrals.

Note(s): Concurrently with MATH 007, students must enroll in a calculus workshop, MATH 007L. Prerequisite: MATH 003 or high school equivalent. Limit 25 students.

Meets the following Core requirements: Quantitative Literacy
Meets the following Gen Ed requirements: Quantitative and Computational Reasoning

MATH 008L: Calculus I Workshop (2 Credits)

MATH 009: Calculus II (3 Credits)

Prerequisite(s): MATH 007

Note(s): Students must enroll in a calculus workshop MATH 009L Limit 25 students.

Meets the following Core requirements: Quantitative Literacy
Meets the following Gen Ed requirements: Quantitative and Computational Reasoning

MATH 009L: Calculus II Workshop (2 Credits)

MATH 049: Multivariable Calculus (4 Credits)
The theory of calculus in higher dimensional spaces. Vector functions and scalar functions of several variables. The notions of derivative and integral appropriate to such functions. In particular, partial derivatives, gradient, multiple integration, extrema, and applications of these notions. Line and surface integrals, Green’s Theorem, and Stoke’s Theorem.

Prerequisite(s): MATH 048

Meets the following Core requirements: Quantitative Literacy
Meets the following Gen Ed requirements: Quantitative and Computational Reasoning

MATH 050: Linear Algebra (4 Credits)
Matrix algebra and determinants, and the theory of vector spaces, including: the notion of subspace, independence, basis and dimension, linear transformations, and eigenvalues and eigenvectors. Applications to geometry, systems of linear equations, and the theory of approximations are given.

Prerequisite(s): MATH 047 or MATH 004

Note(s): Prerequisites of MATH 47 or MATH 4 may be waived by instructor consent. Limit 25 students.

Meets the following Core requirements: Quantitative Literacy
Meets the following Gen Ed requirements: Quantitative and Computational Reasoning
MATH 080: Topics in Mathematics (0.25-1.25 Credits)

MATH 102: Probability and Statistics (4 Credits)
An introduction to the concepts and applications of probability and statistics, with a strong foundation in theory as well as practice, including the possible use of technology. Topics include fundamentals of probability, random variables, distributions, expected values, special distributions, sampling, tests of significance, statistical inference, regression, and correlation.
Prerequisite(s): MATH 047 and MATH 048
Note(s): The prerequisite of MATH 048 may be taken concurrently, at the discretion of the instructor.
Meets the following Gen Ed requirements: Quantitative and Computational Reasoning

MATH 104: Differential Equations (4 Credits)
Ordinary differential equations of first and second order as well as systems of such equations. More general techniques for finding solutions are developed gradually. Applications to physical and social sciences.
Prerequisite(s): MATH 050 and MATH 048
Meets the following Gen Ed requirements: Quantitative and Computational Reasoning

MATH 108: Mathematical Modeling (4 Credits)
A mathematical model is a description of a real-world system using mathematical concepts and language. This course is an introduction to the basics of mathematical modeling emphasizing model construction, analysis and application. Using examples from a variety of fields such as physics, biology, chemistry, economics, and sociology, students will learn how to develop and use mathematical models of real-world systems.
Prerequisite(s): MATH 048 and MATH 050

MATH 127: Linear Optimization (4 Credits)
Introduction to linear optimization, optimizing a linear function subject to a set of linear constraints, emphasizing quantitative modeling, methodology, and the underlying mathematical structures and geometrical ideas. Topics include problem formulation, simplex method, sensitivity analysis, and duality theory.
Prerequisite(s): MATH 004 or MATH 047 or ECON 081
Note(s): Concurrent workshop required. Prerequisite of MATH 004 or MATH 047 or ECON 081 may be waived by instructor.
Meets the following Gen Ed requirements: Quantitative and Computational Reasoning
Crosslisted with: CS 127

MATH 128: Theory of Computation (4 Credits)
An introduction to the mathematical basis for the study of computability and to the formal theory behind compiler design. Topics include the formal models of computation such as finite state automata, pushdown automata, and Turing machines; languages and grammars, such as regular languages and grammars, context-free languages and grammars, and recursively enumerable languages and grammars; and the problems that a machine can and cannot solve.
Prerequisite(s): MATH 006 or MATH 048
Note(s): Concurrent workshop required. Prerequisite of MATH 006 or MATH 048 may be waived by the instructor.
Meets the following Gen Ed requirements: Quantitative and Computational Reasoning
Crosslisted with: CS 128

MATH 131: Introduction to Abstract Algebra (4 Credits)
This course introduces mathematical proof techniques in the context of Abstract Algebra. Set theory, logic, equivalence relations, and proof techniques are interwoven with basic number theory and modular congruence in the integers and in polynomial rings. Other topics include criteria for reducibility and irreducibility in polynomial rings over the rational, the real, and the complex numbers; the quotient of a polynomial ring; abstract rings, subrings, and ring homomorphisms and isomorphisms; and ideals and quotient rings. Basic group theory is included as time permits.
Prerequisite(s): MATH 048
Note(s): The instructor may waive the prerequisites for exceptional students. Limit 25 students.

MATH 132: Topics in Algebra (4 Credits)
This course goes deeper into the study of Abstract Algebra. Topics vary from group theory (homomorphisms and isomorphisms, Lagrange’s Theorem, normality, quotients, fundamental isomorphism theorems, symmetric groups, direct products, classification of finite abelian groups) to basic commutative algebra (integral domains, Euclidean domains, principal ideal domains, unique factorization domains, factorization of quadratic integers, and the field of fractions of an integral domain) to Galois theory. Additional topics as time and interest permits.
Prerequisite(s): MATH 131 or MATH 050

MATH 141: Real Analysis I (4 Credits)
The Real Analysis sequence is a rigorous presentation of the basic concepts of real analysis, including the real number system, suprema and infima, and completeness; estimations and approximations; sequences, subsequences, and convergence; cluster points, limits of sequences, and the Bolzano–Weierstrass Theorem; Cauchy sequences; infinite series and the convergence tests; and power series.
Prerequisite(s): MATH 048 and MATH 131

MATH 142: Real Analysis II (4 Credits)
Continuation of Real Analysis I. Topics include: elementary properties of functions of a single variable; local and global behavior of functions; continuity and limits; Intermediate Value Theorem; properties of continuous functions on compact intervals; Rolle’s Theorem; Mean Value Theorem; l’Hôpital’s rule for indeterminate forms; linearization and applications to convexity; theory of Taylor polynomials; the Riemann integral; Fundamental Theorems of Calculus; improper integrals; and sequences and series of functions.
Prerequisite(s): MATH 141

MATH 154: Foundations of Geometry (4 Credits)
A survey of various systems of geometry from a modern point of view, using techniques from algebra and logic. Possible topics include Euclidean geometry, non-Euclidean geometries (such as elliptic, hyperbolic, and parabolic geometry), affine geometry, projective geometry, and finite geometries.
Prerequisite(s): MATH 050
Note(s): Prerequisite of MATH 050 may be waived with instructor consent. Limit 25 students. Open to sophomores, juniors, seniors, and graduate students.

MATH 158: Topics in Topology (4 Credits)
This course provides an introduction to the area of mathematics that studies geometric properties unaffected by continuous deformation. Topics may vary among point-set topology, metric spaces, compactness, surfaces, the Fundamental Group, simplicial homology, computational topology, and topological data analysis. Prerequisites can be waived with consent of instructor.
Prerequisite(s): MATH 131
MATH 160: Complex Analysis (4 Credits)
An introduction to the calculus of functions that have complex numbers as arguments and values. Topics include algebra and geometry of complex numbers; elementary functions of a complex variable; differentiation and integration of complex functions; Cauchy's Integral Theorem; Taylor's and Laurent's (infinite) series for complex functions; residues; and conformal mapping.
Prerequisite(s): MATH 141
Note(s): Open to sophomores, juniors, and seniors only.

MATH 179: Directed Research (0.25-1 Credits)

MATH 180: Topics in Mathematics (4 Credits)
Offers topics that are not offered in the regular curriculum from the following fields: algebra, algebraic geometry, algebraic logic, analysis, applied linear algebra, combinatorics, geometry, linear algebra, mathematical logic and foundations of mathematics, number theory, representation theory, and topology.
Prerequisite(s): MATH 047 and MATH 048
Meets the following Gen Ed requirements: Quantitative and Computational Reasoning