

MATHEMATICS (MATH)

MATH 0399. Support for Precalculus. 2 Credit Hours.

Practicum for Learning Support students enrolled in MATH 1113 (Precalculus).

MATH 0999. Support for College Algebra. 2 Credit Hours.

This Learning Support course provides corequisite support in mathematics for students enrolled in MATH 1111 – College Algebra. Topics will parallel topics being studied in MATH 1111 and the course will provide support for the essential quantitative skills needed to be successful in MATH 1111. Taken with MATH 1111, this course provides an in-depth study of the properties of algebraic, exponential and logarithmic functions as needed for calculus. Emphasis is on using algebraic and graphical techniques for solving problems involving linear, quadratic, piece-wise defined, rational, polynomial, exponential and logarithmic functions.

MATH 1111. College Algebra. 4 Credit Hours.

This course provides an in-depth study of the properties of algebraic, exponential and logarithmic functions as needed for calculus. Emphasis is on using algebraic and graphical techniques for solving problems involving linear, quadratic, piece-wise defined, rational, polynomial, exponential and logarithmic functions.

MATH 1113. Pre-calculus. 4 Credit Hours.

This course is an intensive study of the basic functions needed for the study of calculus. Topics include algebraic, functional, and graphical techniques for solving problems with algebraic, exponential, logarithmic, and trigonometric functions and their inverses. May only be used for degree credit with departmental approval.

MATH 11X3. Transfer Precalculus. 3 Credit Hours.

MATH 1499. Support for Differential Calculus. 1 Credit Hour.

This corequisite studio course provides extra precalculus support for students enrolled in Math 1551, Differential Calculus.

MATH 1501. Calculus I. 4 Credit Hours.

Differential calculus and basic integral calculus including the fundamental theorem of calculus. Credit not allowed for both MATH 1501 and 1712.

MATH 1503. Calculus I for the Life Sciences. 4 Credit Hours.

Differential and basic calculus: sequences, difference equations, limits, continuity, differentiation, integration, applications. The topics parallel those of MATH 1501 with applications from life sciences.

MATH 1504. Calculus I for the Life Sciences. 4 Credit Hours.

Taylor approximations, introduction to differential equations, linear algebra, and introduction to multivariable calculus. Motivating examples drawn from life sciences.

MATH 1512. Honors Calculus II. 4 Credit Hours.

The topics covered parallel those of 1502 with a somewhat more intensive and rigorous treatment. Credit not allowed for both honors calculus and the corresponding regular calculus course. Credit not allowed for both MATH 1512 and MATH 1522. Credit not allowed for both MATH 1512 and MATH 15X2.

MATH 1550. Introduction to Differential Calculus. 3 Credit Hours.

An introduction to differential calculus including applications and the underlying theory of limits for functions and sequences. Credit not awarded for both MATH 1550 and MATH 1501, MATH 1551, or MATH 1503.

MATH 1551. Differential Calculus. 2 Credit Hours.

Differential calculus including applications and the underlying theory of limits for functions and sequences. Credit not awarded for both MATH 1551 and MATH 1501, MATH 1503, or MATH 1550.

MATH 1552. Integral Calculus. 4 Credit Hours.

Integral calculus: Definite and indefinite integrals, techniques of integration, improper integrals, infinite series, applications. Credit not awarded for both MATH 1552 and MATH 1502, MATH 1504, MATH 1512 or MATH 1555.

MATH 1553. Introduction to Linear Algebra. 2 Credit Hours.

An introduction to linear algebra including eigenvalues and eigenvectors, applications to linear systems, least squares. Credit not awarded for both MATH 1553 and MATH 1522, MATH 1502, MATH 1504, MATH 1512, MATH 1554 or MATH 1564.

MATH 1554. Linear Algebra. 4 Credit Hours.

Linear algebra eigenvalues, eigenvectors, applications to linear systems, least squares, diagonalization, quadratic forms.

MATH 1555. Calculus for Life Sciences. 4 Credit Hours.

Overview of integral calculus, multivariable calculus, and differential equations for biological sciences. Credit not awarded for both MATH 1555 and MATH 1552, MATH 1502, MATH 1504, MATH 1512 or MATH 2550.

MATH 1564. Linear Algebra with Abstract Vector Spaces. 4 Credit Hours.

This is an intensive first course in linear algebra including the theories of linear transformations and abstract vector spaces. Credit not awarded for both MATH 1564 and MATH 1553, MATH 1554, MATH 1522, MATH 1502, MATH 1504 or MATH 1512.

MATH 15X1. Transfer Calculus I. 3 Credit Hours.

MATH 15X2. Transfer Calculus II. 3,4 Credit Hours.

This course includes the treatment of single variable calculus in MATH 1502. This course is not equivalent to MATH 1502. Credit not allowed for both MATH 15X2 and MATH 1502. Credit not allowed for both MATH 15X2 and MATH 1512.

MATH 1601. Introduction to Higher Mathematics. 3 Credit Hours.

This course is designed to teach problem solving and proof writing. Mathematical subject matter is drawn from elementary number theory and geometry.

MATH 1711. Finite Mathematics. 4 Credit Hours.

Linear equations, matrices, linear programming, sets and counting, probability and statistics.

MATH 1712. Survey of Calculus. 4 Credit Hours.

Techniques of differentiation, integration, application of integration to probability and statistics, multidimensional calculus. Credit not allowed for both MATH 1712 and 1501.

MATH 17X1. Transfer Finite Math. 3 Credit Hours.

MATH 17X2. Transfer Survey-Calc. 3 Credit Hours.

MATH 1803. Special Topics. 3 Credit Hours.

Courses on special topics of current interest in Mathematics.

MATH 1X51. Transfer Differential Calc. 2,3 Credit Hours.

MATH 1X52. Transfer Integral Calculus. 3,4 Credit Hours.

MATH 1X53. Transfer Intro Linear Algebra. 2,3 Credit Hours.

MATH 1X54. Transfer Linear Algebra. 2,3 Credit Hours.

MATH 1X55. Transfer Calculus for Life Sci. 2,3 Credit Hours.

MATH 1XXX. Mathematics Elective. 1-21 Credit Hours.

MATH 2106. Foundations of Mathematical Proof. 3 Credit Hours.

An introduction to proofs in advanced mathematics, intended as a transition to upper division courses including Abstract Algebra I and Analysis I.

MATH 2406. Abstract Vector Spaces. 3 Credit Hours.

A proof-based development of linear algebra and vector spaces, with additional topics such as multilinear algebra and group theory.

MATH 24X1. Transfer Calculus III. 3 Credit Hours.

MATH 24X3. Transfer Diff Equations. 3 Credit Hours.

MATH 2550. Introduction to Multivariable Calculus. 2 Credit Hours.

Vectors in three dimensions, curves in space, functions of several variables, partial derivatives, optimization, integration of functions of several variables. Vector Calculus not covered. Credit will not be awarded for both MATH 2550 and MATH 2605 or MATH 2401 or MATH 2551 or MATH 1555.

MATH 2551. Multivariable Calculus. 4 Credit Hours.

Multivariable calculus: Linear approximation and Taylor's theorems, Lagrange multiples and constrained optimization, multiple integration and vector analysis including the theorems of Green, Gauss, and Stokes. Credit will not be awarded for both MATH 2551 and MATH 2401 or MATH 2411 or MATH 2561.

MATH 2552. Differential Equations. 4 Credit Hours.

Methods for obtaining numerical and analytic solutions of elementary differential equations. Applications are also discussed with an emphasis on modeling. Credit not awarded for both MATH 2552 and MATH 2403 or MATH 2413 or MATH 2562.

MATH 2561. Honors Multivariable Calculus. 4 Credit Hours.

The topics covered parallel those of MATH 2551 with a somewhat more intensive and rigorous treatment. Credit not awarded for both MATH 2561 and MATH 2401 or MATH 2411 or MATH 2551.

MATH 2562. Honors Differential Equations. 4 Credit Hours.

The topics covered parallel those of MATH 2552 with a somewhat more intensive and rigorous treatment.

MATH 2603. Introduction to Discrete Mathematics. 4 Credit Hours.

Mathematical logic and proof, mathematical induction, counting methods, recurrence relations, algorithms and complexity, graph theory and graph algorithms. Credit not awarded for both MATH 2603 and MATH 2602.

MATH 2605. Calculus III for Computer Science. 4 Credit Hours.

Topics in linear algebra and multivariate calculus and their applications in optimization and numerical methods, including curve fitting, interpolation, and numerical differentiation and integration.

MATH 2698. Undergraduate Research Assistantship. 1-12 Credit Hours.

Independent research conducted under the guidance of a faculty member.

MATH 2699. Undergraduate Research. 1-12 Credit Hours.

Independent research conducted under the guidance of a faculty member.

MATH 26X2. Transfer Linear & Disc Math. 3 Credit Hours.

MATH 26X3. Transfer Discrete Math. 3 Credit Hours.

MATH 2740. Foundations of Mathematics and Computing. 3 Credit Hours.

This course introduces the essential mathematical concepts and computational techniques that form the basis of modern computing.

MATH 2801. Special Topics. 1 Credit Hour.

Courses on special topics of current interest in mathematics.

MATH 2802. Special Topics. 2 Credit Hours.

Courses on special topics of current interest in mathematics.

MATH 2803. Special Topics. 3 Credit Hours.

Courses on special topics of current interest in mathematics.

MATH 2804. Special Topics. 4 Credit Hours.

Courses on special topics of current interest in mathematics.

MATH 2805. Special Topics. 5 Credit Hours.

Courses on special topics of current interest in mathematics.

MATH 2X51. Transfer Multivariable Calc. 3,4 Credit Hours.

MATH 2X52. Transfer Differential Equation. 3,4 Credit Hours.

MATH 2XXX. Mathematics Elective. 1-21 Credit Hours.

MATH 3012. Applied Combinatorics. 3 Credit Hours.

Elementary combinatorial techniques used in discrete problem solving: counting methods, solving linear recurrences, graph and network models, related algorithms, and combinatorial designs.

MATH 3012R. Applied Combinatorics Recitation. 0 Credit Hours.

Recitation for MATH 3012.

MATH 3022. Honors Applied Combinatorics. 3 Credit Hours.

Topics are parallel to those of MATH 3012 with a more rigorous and intensive treatment. Credit is not allowed for both MATH 3012 and 3022.

MATH 3215. Introduction to Probability and Statistics. 3 Credit Hours.

This course is a problem-oriented introduction to the basic concepts of probability and statistics, providing a foundation for applications and further study.

MATH 3225. Honors Probability and Statistics. 3 Credit Hours.

The topics covered parallel those of MATH 3215, with a more rigorous and intensive treatment. Credit is not allowed for both MATH 3215 and 3225.

MATH 3235. Probability Theory. 3 Credit Hours.

This course is a mathematical introduction to probability theory, covering random variables, moments, multivariable distributions, law of large numbers, central limit theorem, and large deviations. Credit not awarded for both MATH 3235 and MATH 3215 or 3225 or 3670.

MATH 3236. Statistical Theory. 3 Credit Hours.

An introduction to theoretical statistics for students with a background in probability. A mathematical formalism for inference on experimental data will be developed. Credit not awarded for both MATH 3236 and MATH 3215 or 3225 or 3670.

MATH 3406. A Second Course in Linear Algebra. 3 Credit Hours.

This course will cover important topics in linear algebra not usually discussed in a first-semester course, featuring a mixture of theory and applications.

MATH 3670. Probability and Statistics with Applications. 3 Credit Hours.
Introduction to probability, probability distributions, point estimation, confidence intervals, hypothesis testing, linear regression and analysis of variance. Students cannot receive credit for both MATH 3670 and MATH 3770 or ISYE 3770 or CEE 3770.

MATH 3740. Probability and Statistics for Computing and Machine Learning. 3 Credit Hours.

Introductory probability and statistics for computing and machine learning, from random variables, joint distribution and concentration inequalities to parameter estimation, statistical models and Bayesian simulation.

MATH 3801. Special Topics. 1 Credit Hour.

Courses on special topics of current interest in mathematics.

MATH 3802. Special Topics. 2 Credit Hours.

Courses on special topics of current interest in mathematics.

MATH 3803. Special Topics. 3 Credit Hours.

Courses on special topics of current interest in mathematics.

MATH 3804. Special Topics. 4 Credit Hours.

Courses on special topics of current interest in mathematics.

MATH 3805. Special Topics. 5 Credit Hours.

Courses on special topics of current interest in mathematics.

MATH 3XXX. Mathematics Elective. 1-21 Credit Hours.

MATH 4012. Algebraic Structures in Coding Theory. 3 Credit Hours.

Introduction to linear error correcting codes with an emphasis on the algebraic tools required, including matrices vector spaces, groups, polynomial rings, and finite fields.

MATH 4022. Introduction to Graph Theory. 3 Credit Hours.

The fundamentals of graph theory: trees, connectivity, Euler torus, Hamilton cycles, matchings, colorings, and Ramsey theory.

MATH 4032. Combinatorial Analysis. 3 Credit Hours.

Combinatorial problem-solving techniques including the use of generating functions, recurrence relations, Polya theory, combinatorial designs, Ramsey theory, matroids, and asymptotic analysis.

MATH 4080. Senior Project I. 2 Credit Hours.

The first of a two-course sequence of faculty-directed independent research culminating in the writing of a senior thesis and its presentation.

MATH 4090. Senior Project II. 2 Credit Hours.

The second course of a two-course sequence of faculty-directed independent research culminating in the writing of a senior thesis and its presentation.

MATH 4107. Introduction to Abstract Algebra I. 3 Credit Hours.

This course develops in the theme of "Arithmetic congruence and abstract algebraic structures". Strong emphasis on theory and proofs.

MATH 4108. Introduction to Abstract Algebra II. 3 Credit Hours.

Continuation of Abstract Algebra I, with emphasis on Galois theory, modules, polynomial fields, and the theory of linear associative algebra.

MATH 4150. Introduction to Number Theory. 3 Credit Hours.

Primes and unique factorization, congruences, Chinese remainder theorem, Diophantine equations, Diophantine approximations, quadratic reciprocity. Applications such as fast multiplication, factorization, and encryption.

MATH 4210. Mathematical Foundations of Data Science. 3 Credit Hours.

Data science methods and their mathematical foundations: linear regression, classification, and clustering, kernel methods, regression trees and ensemble methods, dimension reduction.

MATH 4221. Stochastic Processes I. 3 Credit Hours.

Simple random walk and the theory of discrete time Markov chains.

MATH 4222. Stochastic Processes II. 3 Credit Hours.

Renewal theory, Poisson processes and continuous time Markov processes, including an introduction to Brownian motion and martingales.

MATH 4255. Monte Carlo Methods. 3 Credit Hours.

Probability distributions, limit laws, and applications through the computer.

MATH 4261. Mathematical Statistics I. 3 Credit Hours.

Sampling distributions, Normal, t, chi-square, and f distributions. Moment-generating function methods, Bayesian estimation, and introduction to hypothesis testing.

MATH 4262. Mathematical Statistics II. 3 Credit Hours.

Hypothesis testing, likelihood ratio tests, nonparametric tests, bivariate and multivariate normal distributions.

MATH 4280. Introduction to Information Theory. 3 Credit Hours.

The measurement and quantification of information. These ideas are applied to the probabilistic analysis of the transmission of information over a channel along which random distortion of the message occurs.

MATH 4305. Topics in Linear Algebra. 3 Credit Hours.

Finite dimensional vector spaces, inner product spaces, least squares, linear transformations, the spectral theorem for normal transformations. Applications to convex sets, positive matrices, difference equations.

MATH 4317. Analysis I. 3 Credit Hours.

Real numbers, topology of Euclidean spaces, Cauchy sequences, completeness, continuity and compactness, uniform continuity, series of functions, Fourier series.

MATH 4318. Analysis II. 3 Credit Hours.

Differentiation of functions of one real variable, Riemann-Stieltjes integral, the derivative in \mathbb{R}^n , and integration in \mathbb{R}^n .

MATH 4320. Complex Analysis. 3 Credit Hours.

Topics from complex function theory, including contour integration and conformal mapping.

MATH 4347. Partial Differential Equations I. 3 Credit Hours.

Method of characteristics for first- and second-order partial differential equations, conservation laws and shocks, classification of second-order systems and applications.

MATH 4348. Partial Differential Equations II. 3 Credit Hours.

Green's functions and fundamental solutions. Potential, diffusion, and wave equations.

MATH 4431. Introductory Topology. 3 Credit Hours.

Point set topology, topological spaces and metric spaces, continuity and compactness, homotopy, and covering spaces.

MATH 4432. Introduction to Algebraic Topology. 3 Credit Hours.

Introduction to algebraic methods in topology. Includes homotopy, the fundamental group, covering spaces, simplicial complexes. Applications to fixed point theory and group theory.

MATH 4441. Differential Geometry. 3 Credit Hours.

The theory of curves, surfaces, and more generally, manifolds. Curvature, parallel transport, covariant differentiation, Gauss-Bonnet theorem.

MATH 4541. Dynamics and Bifurcations I. 3 Credit Hours.

A broad introduction to the local and global behavior of nonlinear dynamical systems arising from maps and ordinary differential equations.

MATH 4542. Dynamics and Bifurcations II. 3 Credit Hours.

A continuation of Dynamics and Bifurcations I.

MATH 4580. Linear Programming. 3 Credit Hours.

A study of linear programming problems, including the simplex method, duality, and sensitivity analysis with applications to matrix games, interger programming, and networks.

MATH 4581. Classical Mathematical Methods in Engineering. 3 Credit Hours.

The Laplace transform and applications, Fourier series, boundary value problems for partial differential equations.

MATH 4640. Numerical Analysis I. 3 Credit Hours.

Introduction to numerical algorithms for some basic problems in computational mathematics. Discussion of both implementation issues and error analysis.

MATH 4641. Numerical Analysis II. 3 Credit Hours.

Introduction to the numerical solution of initial and boundary value problems in differential equations.

MATH 4695. Undergraduate Internship. 1-21 Credit Hours.

Undergraduate internship for academic credit.

MATH 4698. Undergraduate Research Assistantship. 1-12 Credit Hours.

Independent research conducted under the guidance of a faculty member.

MATH 4699. Undergraduate Research. 1-12 Credit Hours.

Independent research conducted under the guidance of a faculty member.

MATH 4740. Computational Methods for Simulation and Machine Learning. 3 Credit Hours.

Introduction to numerical methods which are fundamental in modeling, simulation, and machine learning.

MATH 4755. Mathematical Biology. 3 Credit Hours.

Problems from the life sciences and the mathematical methods for solving them are presented. The underlying biological and mathematical principles and the interrelationships are emphasized. Crosslisted with BIOL 4755.

MATH 4777. Vector and Parallel Scientific Computation. 3 Credit Hours.

Scientific computational algorithms on vector and parallel computers. Speed-up and algorithm complexity, interprocesses communication, synchronization, modern algorithms for linear systems, programming techniques, code optimization. Crosslisted with CS 4777.

MATH 4782. Quantum Information and Quantum Computing. 3 Credit Hours.

Introduction to quantum computing and quantum information theory, formalism of quantum mechanics, quantum gates, algorithms, measurements, coding, and information. Physical realizations and experiments. Crosslisted with PHYS 4782.

MATH 4801. Special Topics. 1 Credit Hour.

Courses on special topics of current interest in mathematics.

MATH 4802. Special Topics. 2 Credit Hours.

Courses on special topics of current interest in mathematics.

MATH 4803. Special Topics. 3 Credit Hours.

Courses on special topics of current interest in mathematics.

MATH 4804. Special Topics. 4 Credit Hours.

Courses on special topics of current interest in mathematics.

MATH 4805. Special Topics. 5 Credit Hours.

Courses on special topics of current interest in mathematics.

MATH 4873. Special Topics. 3 Credit Hours.

This course enables the school of Mathematics to comply with requests for courses in selected topics.

MATH 4999. Reading or Research. 1-21 Credit Hours.

Reading or research in topics of current interest.

MATH 4XXX. Mathematics Elective. 1-21 Credit Hours.