Mathematics (MATH)

Courses

MATH 0015 Arithmetic and Pre-Algebra: 3 semester hours.
Arithmetic of integers and rational numbers. Decimals; introduction to variables; linear equations; problems involving rates, ratios, proportions and percentages. Not eligible for academic credit. D

MATH 0025 Elementary Algebra: 3 semester hours.
Variables and algebraic expressions. Absolute value; linear equations and inequalities and their applications; expansion and factorization of polynomials; rational expressions; radical expressions; the real number line; the Cartesian coordinate system and graphing of linear equations. PREREQ: MATH 0015 (via MATH 0090), or ACT score of 16 to 18, or SAT score of 390 to 450, or ALEKS placement of 14 to 29. D

MATH 0090 Accelerated Mathematics Placement: 3 semester hours.
Self-paced alternative to any subsequence of MATH 0015, MATH 0025, MATH 1108, MATH 1143, or MATH 1144. Starting with MATH 0015, students sequentially complete modules and then take a mastery exam for each course. Scoring 90% or above on each exam earns placement equivalent to having passed the corresponding course. Intended for students with enough mathematics background to work independently. Credits earned do not count toward graduation credits. Graded S/U. F, S

MATH 0099 Experimental Course: 1-6 semester hours.
The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.

MATH 1108 Intermediate Algebra: 3 semester hours.
Topics in algebra, with an emphasis on solving equations and inequalities. Systems of linear equations; quadratic equations and the quadratic formula; polynomial, absolute value, rational, and radical equations and inequalities. Radical and rational exponents. Parabolas, distance formula and circles. PREREQ: MATH 0025 (via MATH 0090), or ACT score of 19 or higher, or SAT score of 500 or higher, or ALEKS placement of 30 to 100. F, S

MATH 1108P Intermediate Algebra Plus: 5 semester hours.
Variation of MATH 1108 in which students not placing into MATH 1108 receive supplemental instruction. This class meets 5 days a week. PREREQ: MATH 0015 (via MATH 0090), or ACT score of 16 to 18, or SAT score of 430 to 490, or ALEKS placement of 14 to 29. F, S

MATH 1116 Mathematics for Business: 3 semester hours.
This course will cover mathematical and problem solving skills needed for future business courses and careers in business. In class, we will focus on business applications specific, but not restricted to, the disciplines of Accounting, Economics, Finance, Health Care Administration, Informatics, Management, and Marketing. F, S, D

MATH 1123 Math in Modern Society: 3 semester hours.
Survey of applications of mathematics to real-world problems. Topics from graph theory, management science, political science, statistics, geometry, and computer science. PREREQ: MATH 0025 (via MATH 0090), or ACT score of 19 or higher, or SAT score of 500 or higher, or ALEKS placement of 30 to 100. Satisfies Objective 3 of the General Education Requirements. F, S, Su

MATH 1123P Mathematics in Modern Society Plus: 4 semester hours.
Variation of MATH 1123 in which students not placing into MATH 1123 receive supplemental instruction. Prereq: ACT score of 0 to 18, or SAT score of 0 to 490, or ALEKS placement of 0 to 29. Satisfies Objective 3 of the General Education Requirements. F, S

MATH 1127 The Language of Mathematics: 3 semester hours.
Introduction to the precise language used throughout mathematics. Development of skills including reading with comprehension, expressing mathematical thoughts clearly, reasoning logically, and employing common patterns of mathematical thought. PREREQ: MATH 0025 (via MATH 0090), or ACT score of 19 or higher, or SAT score of 500 or higher, or ALEKS placement of 30 to 100. Satisfies Objective 3 of the General Education Requirements. D

MATH 1130 Finite Mathematics: 3 semester hours.
Introduction to probability, linear systems, inequalities, and linear programming. Applications directed to non-physical science areas. PREREQ: MATH 1108 or ESET 1140, or ACT score of 23 or higher, or SAT score of 560 or higher, or ALEKS placement of 46 to 100. Satisfies Objective 3 of the General Education Requirements. D

MATH 1143 Precalculus I: Algebra: 3 semester hours.
Functions and their graphs. Notation, domain, range, composition, and inverses. Basic transformations of graphs. Polynomial, rational, exponential, and logarithmic functions and their graphs, with applications. Theory of polynomial functions and equations. PREREQ: MATH 1108 or ESET 1140, or ACT score of 23 or higher, or SAT score of 560 or higher, or ALEKS placement of 46 to 100.. Satisfies Objective 3 of the General Education Requirements. Designed to prepare students who pursue programs requiring MATH 1160 (Survey of Calculus), MATH 1170 (Calculus I), CHEM 1111 (General Chemistry) or PHYS 1111 (General Physics). F, S, Su

MATH 1143P Precalculus I: Algebra Plus: 5 semester hours.
Variation of MATH 1143 in which students not placing into MATH 1143 receive supplemental instruction. PREREQ: MATH 0025 (via MATH 0090), or ACT score of 19 to 22, or SAT score of 500 to 550, or ALEKS placement of 30 to 45. Satisfies Objective 3 of the General Education Requirements. F, S

MATH 1144 Precalculus II: Trigonometry: 2 semester hours.
Circular functions and right triangle approaches to trigonometry. Graphs of trigonometric functions: amplitude, frequency, phase shift. Trigonometric identities, inverse functions, and equations. Introduction to vectors in the plane, polar coordinates, and polar representation of complex numbers. PREREQ: MATH 1143, or ACT score of 27 or higher, or SAT score of 640 or higher, or ALEKS placement of 61 to 100. F, S, Su

MATH 1147 Precalculus: 5 semester hours.
A single one-semester course equivalent to Precalculus I: Algebra (MATH 1143) and Precalculus II: Trigonometry (MATH 1144). Credit cannot be granted in both MATH 1143 and MATH 1147, or in both MATH 1144 and MATH 1147. Satisfies Objective 3 of the General Education Requirements. PREREQ: MATH 1108 or ESET 1140, or ACT score of 23 or higher, or SAT score of 560 or higher, or ALEKS placement of 50 to 100. F, S

MATH 1153 Statistical Reasoning: 3 semester hours.
Descriptive statistics, probability, confidence intervals, and hypothesis testing for one and two parameters. Emphasis on applications to a wide variety of disciplines. PREREQ: MATH 1108 or ESET 1140, or ACT score of 23 or higher, or SAT score of 560 or higher, or ALEKS placement of 46 to 100. Satisfies Objective 3 of General Education Requirements. F, S, Su

MATH 1153P Statistical Reasoning Plus: 4 semester hours.
Variation of MATH 1153 in which students not placing into MATH 1153 receive supplemental instruction. Prereq: ACT score of 0 to 22, or SAT score of 0 to 550, or ALEKS placement of 0 to 45. Satisfies Objective 3 of General Education Requirements. F, S

MATH 1160 Survey of Calculus: 3 semester hours.
Course in differential and integral calculus designed primarily for students in biological sciences, social sciences, business, education, and humanities. Credit cannot be granted in both MATH 1160 and MATH 1170. PREREQ: MATH 1143 or MATH 1147, or ACT score of 27 or higher, or SAT score of 640 or higher, or ALEKS placement of 61 to 100. Satisfies Objective 3 of the General Education Requirements. F, S

MATH 1170 Calculus I: 4 semester hours.
First course in the sequence MATH 1170, MATH 1175, and MATH 2275. Real-valued functions of one real variable: limits, continuity, derivatives, integrals, applications. Credit cannot be granted in both MATH 1160 and MATH 1170. PREREQ: MATH 1144 or MATH 1147, or ACT score of 29 or higher, or SAT score of 680 or higher, or ALEKS placement of 76 to 100. Satisfies Objective 3 of the General Education Requirements. F, S, Su

MATH 1175 Calculus II: 4 semester hours.
Second course in the sequence MATH 1170, MATH 1175, and MATH 2275. Techniques of integration, trigonometric integrals, improper integrals. Applications of definite integrals. Sequences and series. Power series and Taylor series. Parametric curves in the plane, polar coordinates. PREREQ: MATH 1170. F, S, Su

MATH 1187 Applied Discrete Structures: 3 semester hours.
Discrete structures in CS and ECE. Boolean algebra and logic; sets, functions, and relations; iteration, recursion, and induction; algorithms; programming in pseudocode; basic counting principles; graphs and trees; and other selected topics from discrete mathematics. Equivalent to CS 1187. PREREQ: CS 1181. F, S

MATH 1199 Experimental Course: 1-6 semester hours.
The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.

MATH 2240 Linear Algebra: 3 semester hours.
Introduction to linear algebra. Linear systems, matrices, determinants, vector spaces, linear transformations, linear independence, eigenvalues and eigenvectors, orthogonalization. PREREQ: MATH 1170. F, S, Su

MATH 2256 Structure of Arithmetic for Elementary School Teachers: 3 semester hours.
Development of number systems. Emphasis on principles, representations, and concept development. For elementary education majors. PREREQ: MATH 1143, or ACT score of 27 or higher, or SAT score of 640 or higher, or ALEKS placement of 61 to 100. Satisfies Objective 3 of the General Education Requirements. D

MATH 2257 Structure of Geometry and Probability for Elementary School Teachers: 3 semester hours.
Topics from geometry, probability, and statistics. Emphasis on principles, representations, and concept development. For elementary education majors. PREREQ: MATH 1143, or ACT score of 27 or higher, or SAT score of 640 or higher, or ALEKS placement of 61 to 100. Satisfies Objective 3 of the General Education Requirements. D

MATH 2275 Calculus III: 4 semester hours.
Third course in the sequence MATH 1170, MATH 1175, and MATH 2275. Multivariable calculus. Vector algebra and geometry. Functions of several variables. Differentiation. Optimization. Multiple Integrals. Parametric curves and surfaces. Line and surface integrals. Vector fields. Green's, Stokes', and divergence theorems. PREREQ: MATH 1175. F, S

MATH 2287 Foundations of Mathematics: 3 semester hours.
Logic and proofs, sets, functions, relations, mathematical induction, and the cardinality of sets. PREREQ: MATH 1170. F

MATH 2299 Experimental Course: 1-6 semester hours.
The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.

MATH 3310 Mathematical Modeling: 3 semester hours.
Theory and practice of mathematical modeling. Development and analysis of models for solving open-ended problems in science and engineering. Discrete models, linear models and continuous models, and their implementation. PREREQ: MATH 1175 and either CS 1181 or ME 1165; or permission of instructor. S

MATH 3326 Elementary Analysis: 3 semester hours.
A beginning course in analysis on the real line. Proof writing and the underlying logic are emphasized throughout the course. Topics include sets and functions, sequences, convergence, limits, continuity, and infinite series. PREREQ: MATH 1175 and either MATH 2240 or MATH 2287. F, S

MATH 3327 Vector Analysis: 3 semester hours.
Calculus of vector functions of several variables, derivative matrix, chain rule, inverse function theorem, multiple integration. Change of variables. Integrals over curves and surfaces. Green's, Stokes' and divergence theorems. Applications to physics. PREREQ: MATH 2275. EF

MATH 3332 Data Science and Applied Machine Learning: 3 semester hours.
This course covers intermediate subjects in data science and machine learning using the python data science stack, including pandas, numpy, and scikit-learn. Both supervised and unsupervised non-neural-network algorithms will be covered. Data wrangling, exploratory data analysis, preprocessing techniques, feature engineering, dimensionality reduction, ensemble methods, and evaluation of models will also be covered. Equivalent to CS 3332. PREREQ: CS 1181 and MATH 2240 S

MATH 3335 Elementary Number Theory: 3 semester hours.
Divisibility, prime numbers, congruences, Diophantine equations and other topics. PRE-REQ: MATH 1187 or MATH 2287 or permission of instructor. D

MATH 3343 Modern Geometry: 3 semester hours.
Planar Euclidean geometry. Rigid motions and symmetry in the plane. PREREQ: MATH 1187 or MATH 2287 or permission of instructor. ES

MATH 3350 Statistical Methods: 3 semester hours.
A calculus-based introduction to statistical procedures, including simple regression, basic experimental design, and non-parametric methods. PREREQ: MATH 1160 or MATH 1170. F, S

MATH 3352 Introduction to Probability: 3 semester hours.
Fundamentals of probability, discrete and continuous random variables, distributions such as binomial, uniform, Poisson, hypergeometric, normal, gamma; expectation; joint, marginal, conditional distributions; central limit theorem; applications to statistics. Emphasizes material needed to develop statistical inference methods. PREREQ: MATH 1175 or permission of instructor. F, S

MATH 3360 Differential Equations: 3 semester hours.
Theory and applications of ordinary differential equations. First order equations, higher order linear equations, systems, Laplace transforms, power series methods. PREREQ: MATH 1175; MATH 2240 or MATH 2275 recommended. F, S

MATH 3362 Introduction to Complex Variables: 3 semester hours.
Introduction to the study of functions of a complex variable including the algebra and geometry of complex numbers, analytic functions, power series, integral theorems, and applications. PREREQ: MATH 2275. ES

MATH 3399 Experimental Course: 1-6 semester hours.
The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.

MATH 4403 Survey of Combinatorics and Graph Theory: 3 semester hours.
Enumeration techniques, including generating functions. Applications. Introductory graph theory. PREREQ: MATH 1175 and MATH 2240. D

MATH 4404 Topics in Combinatorics and Graph Theory: 3 semester hours.
Continuation of MATH 4403. Application of algebraic, analytic, and/or probabilistic methods to combinatorial, graph-theoretic, and algorithmic problems. PREREQ: MATH 4403 or permission of instructor. D

MATH 4405 Numerical Linear Algebra: 3 semester hours.
Numerical techniques for problems in linear algebra, including solutions of linear systems, least squares, eigenvalue problems, and other topics with an emphasis on computation and applications. PREREQ: MATH 2240 and either ME 1165 or CS 1181; or permission of the instructor. ES

MATH 4406 Advanced Linear Algebra: 3 semester hours.
Advanced linear algebra with a strong emphasis on proof. Real and complex vector spaces, linear transformations, polynomials associated to matrices, determinants, canonical forms, inner product spaces. PREREQ: MATH 2240. OF

MATH 4407 Modern Algebra I: 3 semester hours.
Rings, fields, groups, algebras, and selected topics in abstract algebra. PREREQ: MATH 2240 and either MATH 2287 or MATH 3335. F

MATH 4408 Modern Algebra II: 3 semester hours.
Rings, fields, groups, algebras, and selected topics in abstract algebra. PREREQ: MATH 4407. ES

MATH 4421 Advanced Engineering Mathematics I: 3 semester hours.
Analysis of complex linear and nonlinear engineering systems using advanced techniques, including Laplace transforms, Fourier series and classical partial differential equations. PREREQ: MATH 3360. F

MATH 4422 Advanced Engineering Mathematics II: 3 semester hours.
Analysis of complex linear and nonlinear engineering systems using advanced techniques, including probability and statistics, advanced numerical methods and variational calculus. PREREQ: MATH 4421. D

MATH 4423 Introduction to Real Analysis I: 3 semester hours.
The real number system, topology of metric spaces, sequences, limits, series of functions and convergence, continuity, theory of differentiation and Riemann integration of functions of one variable and several variables, and selected topics on measure theory and integration. PREREQ: MATH 2240 and MATH 3326. F

MATH 4424 Introduction to Real Analysis II: 3 semester hours.
The real number system, topology of metric spaces, sequences, limits, series of functions and convergence, continuity, theory of differentiation and Riemann integration of functions of one variable and several variables, and selected topics on measure theory and integration. PREREQ: MATH 4423 and MATH 3360. OS

MATH 4441 Introduction to Numerical Analysis I: 3 semester hours.
Introduction to numerical techniques for solving problems dealing with nonlinear equations, systems of linear equations, differential equations, interpolation, numerical integration, and differentiation. PREREQ: MATH 2240, MATH 3326, and MATH 3360 or permission of instructor. OF

MATH 4442 Introduction to Numerical Analysis II: 3 semester hours.
Extension of MATH 4441 for students who wish to pursue more advanced techniques with emphasis on analysis. Typical topics covered include numerical methods applied to partial differential equations, integral equations, and in-depth treatment of topics covered in MATH 4441. PREREQ: MATH 4441. ES

MATH 4445 Optimization Methods and Their Applications: 3 semester hours.
This course provides a comprehensive introduction to optimization, covering both theoretical foundations and practical applications. Key topics include projection theorems, minimum norm problems, and techniques in nonlinear, unconstrained, constrained, and convex optimization. Additional topics may be included. Students will apply these methods to solve a variety of real-world problems across different fields. PREREQ: MATH 2240, MATH 2275, and CS 1181; or permission of instructor. EF

MATH 4450 Mathematical Statistics I: 3 semester hours.
Probability, random variables, discrete and continuous distributions, order statistics, limit theorems, point and interval estimation, uniformly most powerful tests, likelihood ratio tests, chi-square and F tests, nonparametric tests. PREREQ: MATH 3326 and MATH 3352. OF

MATH 4451 Mathematical Statistics II: 3 semester hours.
Probability, random variables, discrete and continuous distributions, order statistics, limit theorems, point and interval estimation, uniformly most powerful tests, likelihood ratio tests, chi-square and F tests, nonparametric tests. PREREQ: MATH 4450. ES

MATH 4453 Topics in Statistics: 1-3 semester hours.
Content varies. May be repeated for up to 6 credits. PREREQ: Permission of instructor. D

MATH 4457 Applied Regression Analysis: 3 semester hours.
Simple and multiple linear regression, polynomial regression, diagnostics, model selection, models with categorical variables. PREREQ: MATH 3350 or MATH 3352 or permission of instructor. EF

MATH 4458 Experimental Design: 3 semester hours.
The linear model for experimental designs, analysis of variance and covariance, block designs, factorial designs, nested designs, choice of sample size. PREREQ: MATH 3350 or MATH 3352 or permission of instructor. D

MATH 4459 Applied Multivariate Analysis: 3 semester hours.
Matrix computation of summary statistics, graphical analysis of multivariate procedures, multivariate normal distribution, MANOVA, multivariate linear regression, principal components, factor analysis, canonical correlation analysis. PREREQ: MATH 2240 and one of the following: MATH 3350, MATH 4457, MATH 4458, or permission of instructor. OS

MATH 4463 Topics in Applied Mathematics: 1-3 semester hours.
Topics that deal with mathematical methods that find use in other disciplines, business, and industry. PREREQ: Permission of instructor. D

MATH 4465 Partial Differential Equations: 3 semester hours.
Equations of the first and second orders, methods of solution, Laplace's Equation, heat equation, and wave equation. Emphasis on applications in physical sciences and engineering. PREREQ: MATH 2275 and MATH 3360. os

MATH 4477 Theoretical Foundations of Deep Learning: 3 semester hours.
This course focuses on foundational topics in machine learning, such as density estimation with Gaussian mixture models, classification with support vector machines, universal approximation theorem for (deep) neural networks, reproducing kernel Hilbert spaces, and stochastic gradient descent. The course may include additional selected topics such as the generalization problem in machine learning, applications in scientific computing and natural language processing. PREREQ: MATH 2240, MATH 2275, MATH 3352 OS

MATH 4481 Directed Readings and Problems: 1-3 semester hours.
Individual work under the direction of a professor. May be repeated for up to 6 credits. PREREQ: Senior or graduate student in good standing. D

MATH 4491 Mathematics Seminar: 1-3 semester hours.
Advanced reading and discussion on selected topics in mathematics. May be repeated. PREREQ: 90 credits or equivalent. D

MATH 4494 Undergraduate Research: 1-3 semester hours.
Students will engage in a directed research project culminating in a formal written report. PREREQ: Permission of instructor. D

MATH 4499 Experimental Course: 1-6 semester hours.
The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.