MATHEMATICS (MAT) COURSES

MAT-003 Pre-Calculus
This course is intended solely for those students who wish to take calculus, but whose preparaton makes a refresher course in pre-calculus advisable. Topics covered include a review of algebra (solving equations and inequalities, simplification of algebraic expressions) and properties of elementary functions (polynomial, rational, exponential, logarithmic, and trigonometric functions) with special emphasis on graphing these functions. MAT 003 cannot be used for any distribution credit or any area of concentration. (For students who desire a distribution credit in mathematics but do not wish to take calculus, MAT 103, 104, 106, and 108 are recommended.)
Prerequisites: none
Credits: 0.5

MAT-010 Pre-Calc. With Intro. to Calc.
This course is intended solely for those students who wish to take calculus, but whose preparation makes a slower-paced course in calculus advisable. Topics covered include a review of algebra (solving equations and inequalities, simplification of algebraic expressions), properties of polynomials and rational functions, limits, continuity, an introduction to derivatives via polynomials and rational functions, and applications of the derivative. MAT 010 cannot be used for any distribution credit or any area of concentration. (For students who desire a distribution credit in mathematics but do not wish to take calculus, MAT 103, 104, 106, and 108 are recommended.) This course is offered in the fall semester.
Prerequisites: none
Corequisites: MAT-010 placement
Credit: 1

MAT-103 Probability
Topics include a brief introduction to probability, conditional probability, and expected values as well as the application of probabilistic reasoning to interesting problems in the areas of medical testing, investing, insurance, retirement annuities, and the analysis of rare events. MAT 103 does not count toward the mathematics major or minor.
Prerequisites: none
Credits: 0.5
Distribution: Natural Science/Mathematics, Quantitative Skills

MAT-104 Statistics
In this course, we present the classical approach to statistical reasoning, both the p-value argument to testing claims and the confidence interval approach to estimation. Other topics include correlation, prediction, and paradoxes involving averages. MAT 104 does not count toward the mathematics major or minor.(MAT 103 is not a prerequisite for MAT 104)
Prerequisites: none
Credits: 0.5
Distribution: Natural Science/Mathematics, Quantitative Skills

MAT-106 Topics in Contemporary Math
A reflective examination of basic mathematical ideas. Through participation and discovery, students will consider an articulation of mathematics that focuses on patterns, abstraction, and inquiry. Topics will vary, but could include logic, Euclidean geometry, algorithms, etc. This course does not count toward the major or minor in mathematics.
Prerequisites: none
Credit: 1
Distribution: Natural Science/Mathematics, Quantitative Skills

MAT-108 Intro to Discrete Structures
An introduction to discrete mathematics for students not planning to major in mathematics. Topics include sets and logic, proof methods, counting arguments, recurrence relations, graphs, and trees. This course may be used to meet the mathematics requirement for the computer science minor. However, it does not count toward the mathematics major or minor. Students may not present both MAT 108 and 219 for credit toward graduation. This course is offered in the fall semester.
Prerequisites: none
Credit: 1
Distribution: Natural Science/Mathematics, Quantitative Skills

MAT-110 Calc. I With Pre-Calc. Review
This course is intended solely for those students who took and passed MAT 010 and desire to complete a course in calculus. Successful completion of this course is equivalent to completion of MAT 111. Topics covered include an introduction to integration via polynomials and rational functions, applications of the integral, Fundamental Theorem of Calculus, and introduction to exponential, logarithmic and trigonometric functions, and the application of the derivative and integral to these families of functions. The focus is on understanding basic concepts and gaining basic computational skills. This course counts as a distribution credit in mathematics. Credit cannot be given for both MAT 110 and MAT 111. This course is offered in the spring semester.
Prerequisites: MAT-010 with a grade of C- or better.
Credit: 1
Distribution: Natural Science/Mathematics, Quantitative Skills
Equated Courses: MAT-111

MAT-111 Calculus I
Basic calculus of one variable from an intuitive point of view. Topics include limits, continuity, derivatives and integrals of the elementary functions, Fundamental Theorem of Calculus, and applications. The focus is on understanding basic concepts and gaining basic computational skills.
Prerequisites: none
Credit: 1
Distribution: Natural Science/Mathematics, Quantitative Skills
Equated Courses: MAT-110

MAT-112 Calculus II
A continuation of MAT 111. Numerical and symbolic techniques of integration, applications of integration, an introduction to partial derivatives and multiple integrals, sequences and series, and Taylor's Theorem.
Prerequisites: MAT-110, 111 with a grade of C- or better or 112 placement
Credit: 1
Distribution: Natural Science/Mathematics, Quantitative Skills
Equated Courses: APCR

MAT-178 Special Topics
This course is designed for the treatment of material outside the regular offerings of the department. For a given semester, the course content and other particulars will be announced before advance registration for that semester. This course is offered irregularly.
Prerequisites: none
Credit: 1
Distribution: Natural Science/Mathematics, Quantitative Skills

MAT-219 Combinatorics
This course is an introduction to combinatorial reasoning. Topics include graphs, circuits in graphs, graph coloring, trees, counting principles, generating functions, and recurrence relations. Students may not present both MAT 108 and 219 for credit towards graduation. This course is offered in the spring semester of even-numbered years.
Prerequisites: MAT-223
Credit: 1
Distribution: Natural Science/Mathematics

MAT-221 Found of Geometry
A development of Euclidean and non-Euclidean geometries from a modern viewpoint. This course is offered in the spring semester.
Prerequisites: MAT-112
Credit: 1
Distribution: Natural Science/Mathematics, Quantitative Skills

MAT-222 Theory of Numbers
A study of elementary number theory. Topics include divisibility, congruences, properties of prime numbers, number theoretic functions, diophantine equations, and additional selected topics. This course is offered in the spring semester of odd-numbered years.
Prerequisites: MAT-112
Credit: 1
Distribution: Natural Science/Mathematics, Quantitative Skills

MAT-223 Elementary Linear Algebra
An introduction to linear mathematics. Linear systems of equations, matrices, determinants, vector spaces, bases and dimension, function spaces, linear transformations, eigenvalues and eigenvectors, inner products, and applications. An important aspect of the course is to introduce the student to abstract thinking and proofs.
Prerequisites: MAT-112 with a minimum grade of C- or 223 placement.
Credit: 1
Distribution: Natural Science/Mathematics, Quantitative Skills
Equated Courses: CR

MAT-224 Elem Differential Equations
Introduction to ordinary differential equations. Special solution techniques and some theory for first-order and linear equations including integrating factors, constant coefficients, undetermined coefficients, variation of parameters, power series solutions, Laplace transforms, and systems of differential equations applications. This course is offered in the spring semester.
Prerequisites: Prereq MAT-112 with a minimum grade of C- and 223.
Credit: 1
Distribution: Natural Science/Mathematics, Quantitative Skills
Equated Courses: CR

MAT-225 Multivariable Calculus
Calculus in higher dimensions. Limits, continuity, differentiability, directional derivatives, constrained and unconstrained optimization, geometry of curves, multiple integrals, general coordinate systems, path and surface integrals, vector calculus, theorems of Green and Stokes applications. This course is offered in the fall semester.
Prerequisites: MAT-112 with a minimum grade of C- and 223.
Credit: 1
Distribution: Natural Science/Mathematics, Quantitative Skills

MAT-226 Operations Research
Linear and nonlinear optimization, linear programming, integer programming, duality, combinatorics, the simplex method and related algorithms, game theory, Markov chains, queuing theory. This course is offered irregularly.
Prerequisites: MAT-223
Credit: 1
Distribution: Natural Science/Mathematics

MAT-235 Stochastic Simulation
Interesting real world phenomena often involve randomness at some level, and this course develops mathematical and computational tools for studying these systems. In particular, students will study and implement computer simulation models of continuous and discrete stochastic processes with potential applications in physics, economics, epidemiology, networks, sports, elections, and industrial engineering. Specific topics for study include: basic probability models, pseudo-random number generation, queueing models, discrete event simulations, Poisson processes, random walks, Markov chains, Monte Carlo methods, and statistical analysis of simulated data.
Prerequisites: Prereq of MAT 112 and CSC 111
Credit: 1
Distribution: Natural Science/Mathematics

MAT-251 Mathematical Finance
The course gives an overview of the mathematical reasoning behind the pricing of options. Topics include binomial models, put-call parity, a probabilistic derivation of the Black-Scholes pricing formula for call options, and delta hedging. We will also look at Asian, gap, and barrier options. This course is offered in the fall semester.
Prerequisites: MAT-112
Credits: 0.5
Distribution: Natural Science/Mathematics, Quantitative Skills

MAT-252 Math. Interest Theory
This course will involve a thorough treatment of the mathematical theory of interest, with special attention paid to calculating present and accumulation values for annuities (series of payments made at regular time intervals). Some topics include nominal and effective rates of interest and discount, force of interest, amortization schedules, sinking funds, and bonds. This course is offered in the fall semester.
Prerequisites: MAT-112
Credits: 0.5
Distribution: Natural Science/Mathematics, Quantitative Skills

MAT-253 Probability Models
This course is an introduction to discrete and continuous random variables. Distributions considered include the hypergeometric, binomial, geometric, Poisson, uniform, normal, gamma, chi-square, t and F. We will cover the Central Limit Theorem, multivariate distributions, and transformations of random variables. This course is offered in the fall semester.
Prerequisites: MAT-112
Credits: 0.5
Distribution: Natural Science/Mathematics, Quantitative Skills

MAT-254 Statistical Models
This course gives an overview of confidence intervals, classical hypothesis testing procedures: z-tests, t-tests, F-tests, Chi-square tests, Latin square designs, and regression. An intuitive but mathematical treatment is given for all the distributions and procedures involved. This course is offered in the spring semester.
Prerequisites: MAT-112
Credits: 0.5
Distribution: Natural Science/Mathematics, Quantitative Skills

MAT-277 Special Topics
This course is designed for the treatment of material outside the regular offerings of the department. For a given semester, the course content and other particulars will be announced before advance registration for that semester. This course is offered irregularly.
Prerequisites: none
Credit: 1

MAT-287 Independent Study
Enrollment through Instructor and Department Chair approval.
Prerequisites: none
Credits: 0.5-1
Distribution: Natural Science/Mathematics

MAT-314 Modeling With Diff. Eq
A course to develop the basic skills of formulation, simplification, and analysis of mathematical models for describing and predicting phenomena in the natural and social sciences, with special emphasis in modeling with differential equations. Topics may be taken from fields such as physics, chemistry, biology, psychology, economics, and political science. This course is offered in the fall semester of even-numbred years.
Prerequisites: MAT-224
Credit: 1
Distribution: Natural Science/Mathematics

MAT-323 Topics in Linear Algebra
An in-depth study of some of the topics covered in MAT 223, including the theory of vector spaces, linear transformations, and Euclidean spaces, together with some additional topics, which may include isomorphisms, duality, canonical forms, and applications of linear algebra. This course is offered irregularly.Refer to the Course Descriptions document on the Registrar's webpage for Topics and Descriptions of current offerings.
Prerequisites: MAT-223
Credit: 1
Distribution: Natural Science/Mathematics

MAT-324 Topics in Differential Equations
A second course in differential equations offering study of special topics in more depth or beyond those covered in MAT 224. Topics may include existence and uniqueness theory, stability theory, Green's functions, dynamical systems, partial differential equations, and applications of differential equations. This course is offered in the fall semester of odd-numbered years.Refer to the Course Descriptions document on the Registrar's webpage for Topics and Descriptions of current offerings.
Prerequisites: MAT-224
Credit: 1
Distribution: Natural Science/Mathematics

MAT-331 Abstract Algebra I
A first course in higher abstract mathematics. Emphasis is placed on writing proofs. Topics include groups and rings. This course is offered in the spring semester.
Prerequisites: Prereq MAT-223 with a mimimum grade of C-.
Credit: 1
Distribution: Natural Science/Mathematics

MAT-332 Abstract Algebra II
A continuation of MAT 331. Topics will depend on the instructor but may include fields, modules, Galois theory, or advanced topics in groups and rings. This course is offered irregularly.
Prerequisites: MAT-331
Credit: 1
Distribution: Natural Science/Mathematics

MAT-333 Funct Real Variable I
A first course in the foundations of modern analysis. Topics include set theory, topology of the real numbers, sequences, series, differentiation, integration, and rigorous proofs of the major theorems of single-variable calculus. This course is offered in the fall semester.
Prerequisites: MAT-223
Credit: 1
Distribution: Natural Science/Mathematics

MAT-334 Funct Real Variable II
A continuation of MAT 333. Topics will depend on the instructor but may include sequences and series of functions, Fourier analysis, elementary functional analysis, advanced multivariable calculus or metric spaces. This course is offered irregularly.
Prerequisites: MAT-333
Credit: 1
Distribution: Natural Science/Mathematics

MAT-337 Numerical Analysis
This course will address topics such as numerical solution of non-linear equations in one variable, interpolation, approximation, differentiation, integration, difference equations, differential equations and their applications, boundary value problems, linear systems, matrices, and optimization. This course is offered in the fall semester of even-numbered years.
Prerequisites: CSC-111 and MAT-223
Credit: 1
Distribution: Natural Science/Mathematics

MAT-338 Topics Computational Math
A course to develop mathematical and computational techniques in areas of mathematics or interdisciplinary study in which computation plays a central and essential role. Topics vary by semester but may include computational geometry, computer algebra, scientific computing, and symbolic computation. This course is offered in the fall semester of odd-numbered years.Refer to the Course Descriptions document on the Registrar's webpage for Topics and Descriptions of current offerings.
Prerequisites: CSC-111 and MAT-112
Credit: 1
Distribution: Natural Science/Mathematics, Quantitative Skills

MAT-341 Topology
A study of elementary topology. Topics discussed will include topologies, separation axioms, connectedness, compactness, continuity, and metric spaces. This course is offered in the spring semester of even-numbered years.
Prerequisites: MAT-223
Credit: 1
Distribution: Natural Science/Mathematics

MAT-344 Complex Analysis
Analytic functions, mapping of elementary functions, integrals, residue theory, conformal mapping. This course is offered in the spring semester of odd-numbered years.
Prerequisites: MAT-223
Credit: 1
Distribution: Natural Science/Mathematics

MAT-353 Probability Models II
This course is a continuation of MAT 253 (Probability Models). Topics include survival functions, hazard functions, order statistics, continuous and discrete distributions not considered in MAT 253, mixed random variables. Brownian motion and stochastic calculus. We will look at a wide variety of probability problems associated with insurance. This course is offered in the fall semester.
Prerequisites: MAT-253
Credits: 0.5
Distribution: Natural Science/Mathematics

MAT-354 Mathematical Statistics
This course takes a more theoretical look at estimation and hypothesis testing than MAT 254 (Statistical Models). Topics include maximum likelihood estimators (MLE's), the information inequality, asymptotic theory of MLE's, likelihood ratio tests, most powerful tests, uniformly most powerful tests,and Bayesian statistics. This course is offered in the spring semester of even years.
Prerequisites: MAT-253 and 254
Credits: 0.5
Distribution: Natural Science/Mathematics

MAT-355 Regression Models
This course takes a matrix-based look at regression (introduced in MAT 254, Statistical Models). We focus on the probabilistic reasoning behind regression, in particular the inferences we can make using linear combinations of normal random variables. We also look briefly at some time series models. This course is offered in the spring semester of odd years.
Prerequisites: MAT-223, 253, 254
Credits: 0.5
Distribution: Natural Science/Mathematics

MAT-377 Special Topics
This course is designed for the treatment of material outside the regular offerings of the department. For a given semester, the course content and other particulars will be announced before advance registration for that semester. This course is offered irregularly.Refer to the Course Descriptions document on the Registrar's webpage for Topics and Descriptions of current offerings.
Prerequisites: none
Credits: 0.5-1
Distribution: Natural Science/Mathematics

MAT-378 Special Topics
This course is designed for the treatment of material outside the regular offerings of the department. For a given semester, the course content and other particulars will be announced before advance registration for that semester. This course is offered irregularly.
Prerequisites: none
Credits: 0.5-1
Distribution: Natural Science/Mathematics

MAT-387 Independent Study
Directed reading and research on special topics for qualified students. May be repeated for credit. Level varies (intermediate or advanced); determined in consultation with instructor. Enrollment through Instructor and Department Chair approval.
Prerequisites: none
Credits: 0.5-1
Distribution: Natural Science/Mathematics

MAT-388 Independent Study
Directed reading and research on special topics for qualified students. May be repeated for credit. Level varies (intermediate or advanced); determined in consultation with instructor. Enrollment through Instructor and Department Chair approval.
Prerequisites: none
Credits: 0.5-1
Distribution: Natural Science/Mathematics

MAT-400 Seminar
Topics in the history and foundations of mathematics, the special emphasis varying from year to year. Every student will be expected to write a term paper. This course is offered irregularly.
Prerequisites: none
Credits: 0.5
Distribution: Natural Science/Mathematics

MAT-IND Independent Study
Students may enroll in independent study courses for 0.5 or 1 course credit(s), with the approval of a supervising faculty member, the appropriate department/program chair, and the student's advisor. Registration forms for independent study are available in the Registrar's Office. Enrollment through Instructor and Department Chair approval.
Prerequisites: none
Credits: 0.5-1