MATHEMATICS (MTH)

MTH 101 - The Art of Mathematical Thinking (3.0 hours)
Core Curriculum: QR
Encouraging audience appreciation of mathematics by investigating some of the great ideas of mathematical history, seeing contemporary applications, and getting a feel for the way mathematicians think.

MTH 109 - College Algebra (3.0 hours)
For students who need to strengthen their algebra skills: factoring polynomials; solving quadratic and other equations; exponents, logarithms, and graphing.
Prerequisite: The mathematics placement exam score is at least 46.

MTH 111 - Elementary Statistics (3.0 hours)
Core Curriculum: QR
Data collection processes (observational studies, experimental design, sampling techniques, bias), descriptive methods using quantitative and qualitative data, bivariate data, correlation, and least-Âsquares regression, basic probability theory, probability distributions (normal distributions and normal curve, binomial distribution), confidence intervals and hypothesis tests using p-values and selected applications. Additionally, statistical software will be used with an emphasis on interpretation and evaluation of statistical results.

MTH 112 - Precalculus (4.0 hours)
For students needing further background in mathematics before enrolling in calculus (especially MTH 121). Thorough study of algebraic, transcendental, and trigonometric functions; emphasis on graphing and use of algebra.
Prerequisite: Grade of C or better in MTH 109; or the mathematics placement exam score is at least 61.

MTH 114 - Applied Finite Mathematics (3.0 hours)
Core Curriculum: QR
A survey of the most common mathematical techniques used in business. Topics include: linear functions, non-linear functions (polynomials, exponentials, logarithms), systems of linear equations, linear programming, sets and probability, introduction to basic statistics.
Prerequisite: Grade of C or better in MTH 109 or 112; or the mathematics placement exam score is at least 61.

MTH 115 - Brief Calculus With Applications I (4.0 hours)
Core Curriculum: QR
Differential and integral calculus with emphasis on understanding through graphs. Topics in analytic geometry, limits, derivatives, antiderivatives, definite integrals, exponential and logarithmic functions, and partial derivatives.
Prerequisite: Grade of C or better in MTH 109 or 112; or the mathematics placement exam score is at least 61.

MTH 116 - Brief Calculus With Applications II (3.0 hours)
Core Curriculum: QR
Continuation of MTH 115. Includes trig functions, integration techniques, series, differential equations, and multivariable calculus.
Prerequisite: C or better in MTH 115.

MTH 118 - Calculus With Review A (4.0 hours)
Topics in analytic geometry, limits, continuity, derivative, and pertinent algebra review.
Prerequisite: The sum of the mathematics ACT score and the mathematics placement exam score is at least 45

MTH 119 - Calculus With Review B (4.0 hours)
Core Curriculum: QR
Continuation of MTH 118. Topics in analytic geometry, definite integral, Fundamental Theorem of Calculus, and pertinent algebra review.
Prerequisite: grade of C or better in MTH 118.

MTH 120 - Discrete Mathematics (3.0 hours)
Introduction to graph theory, Boolean algebra, mathematical induction, and elementary combinatorics.
Prerequisite: Grade of C or better in MTH 112; or the mathematics placement exam score is at least 68.

MTH 121 - Calculus I (4.0 hours)
Core Curriculum: QR
Topics for this first course in calculus include functions, limits, continuity, the derivative, differentiation of algebraic, trigonometric, logarithmic and exponential functions with applications including curve sketching, anti-differentiation and applications of integrals, the Riemann sum, and the Fundamental Theorem of Calculus.
Prerequisite: Grade of C or better in MTH 112; or the mathematics placement exam score is at least 76.

MTH 122 - Calculus II (4.0 hours)
Core Curriculum: QR
Topics for this second course in calculus include techniques of integration, applications of the definite integral, infinite series, Taylor series, polar coordinates, and parametrized curves in the plane.
Prerequisite: Grade of C or better in MTH 119 or MTH 121 or its equivalent.

MTH 190 - Topics in Mathematics for Middle School Teachers (3.0 hours)
Topics for middle school math teachers which may vary each time course is offered, rotating among: analytic geometry, problem solving, linear programming. May be repeated under different topics for a maximum of 6 hours credit.
Prerequisite: C or better in MTH111 and C or better in one of MTH115, 119, or 121 and permission of the Chair.

MTH 207 - Elementary Linear Algebra With Applications (3.0 hours)
Matrix algebra, determinants, theory of simultaneous equations, vector spaces, bases, Gram-Schmidt orthogonalization, eigenvalues, eigenvectors, transformations, and applications.
Prerequisite: MTH 122, or consent of instructor.

MTH 223 - Calculus III (4.0 hours)
Core Curriculum: QR
Topics for this third course in calculus including vector analysis of three-dimensional Euclidean space, functions of several variables, partial differentiation, multiple integrals, line integrals and surface integrals, the integral theorems of vector calculus.
Prerequisite: Grade of C or better in MTH 122.

MTH 224 - Elementary Differential Equations (3.0 hours)
Solutions of limited classes of first order equations; second order linear equations; Laplace transform methods; numerical methods; autonomous systems, including linear systems of two variables.
Prerequisite: MTH 223

MTH 300 - Topics for Middle School Math Teachers (3.0 hours)
Topics of special interest which may vary each time course is offered, rotating among geometry, algebra/number theory, and problem-solving. Historical motivations will be provided within each topic. For middle school teacher certification; does not count toward a math major or math minor. May be repeated under different topics for a maximum of 9 hours credit.
Prerequisite: C or better in MTH 111 and C or better in one of MTH 115, 119, or 121 and permission of the Chair.

MTH 301 - Combinatorics (3.0 hours)
Combinatorial analysis, recurrence relations, generating functions, and finite-state machines.
Prerequisite: MTH 120, 122; or MTH 223.

MTH 302 - Introduction to Graph Theory (3.0 hours)
Theory and applications of graphs, including historical motivations. Fundamental properties of graphs, circuits, cycles, trees, and graph algorithms; planarity and coloring.
Prerequisite: MTH 120, 122; or MTH 223.

MTH 305 - Modern Geometry (3.0 hours)
Introduction to properties of formal axiom systems. Study of finite geometries, Euclidean and non-Euclidean geometries, including historical motivations. Topics will be explored using appropriate dynamic software.
Prerequisite: MTH 223.

MTH 307 - Linear Algebra (3.0 hours)
Vector spaces, linear transformations, inner product spaces, Jordan canonical forms, spectral theorems, and selected topics.
Prerequisite: MTH 207.

MTH 310 - Introduction to Number Theory (3.0 hours)
Historical development of number theory; primes and their distribution; divisibility; unique factorization of integers; congruences; Diophantine equations; number theoretic functions; and a subset of more advanced topics such as Fermat's Theorem or Euler's Theorem
Prerequisite: MTH 223.

MTH 325 - Probability and Statistics I (3.0 hours)
An upper-level treatment of fundamental concepts in probability theory and statistics: discrete and continuous random variables; particular probability distributions of each type; multivariate probability distributions; conditional and marginal probabilities; moment-generating functions; Central Limit Theorem.
Prerequisite: MTH 223

MTH 326 - Probability and Statistics II (3.0 hours)
A continuation of MTH 325 which focuses on statistical inference by way of confidence intervals, hypothesis tests, least-squares regression models, and analysis of variance. Key concepts also include: measures of goodness for point estimators, minimum-variance unbiased estimators, uniformly most powerful tests, maximum likelihood estimators.
Prerequisite: MTH 325

MTH 335 - Topics in Actuarial Science (3.0 hours)
Core Curriculum: EL
Topics may vary each time course is offered, rotating among compound interest, mathematics of life contingencies, and actuarial mathematics. Some topics will coincide with those on actuarial exams. May be repeated under different topics for a maximum of 9 hours credit.
Prerequisite: MTH 207, MTH 223; or consent of instructor.

MTH 345 - Differential Equations (3.0 hours)
First-order equations; higher-order linear equations; systems of linear equations; existence and uniqueness theorems; qualitative analysis of nonlinear systems; and a subset of more advanced topics such as Sturm-Liouville theory, bifurcation analysis, series solutions methods, or difference equations
Prerequisite: MTH 207, 223; or consent of instructor.

MTH 371 - History of Mathematics (3.0 hours)
A survey of the historical development of mathematics from antiquity to the twentieth century. Emphasis will be on the interrelations between the various areas of mathematics as well as the mathematical content itself.
Prerequisite: MTH 207 and 3 semester hours from courses numbered MTH 301 or above; or consent of instructor.

MTH 390 - Mathematical Modeling (3.0 hours)
Introduction to constructing and evaluating mathematical models for describing and analyzing real world phenomena. Continuous and/or discrete models.
Prerequisite: MTH 223; consent of instructor.

MTH 403 - Complex Variables I (3.0 hours)
Introduction to complex calculus: analytic functions, integration, Cauchy's formula, Laurent series, the residue theorem and its applications; and a subset of more advanced topics such as conformal mapping, the Riemann mapping theorem, harmonic functions, and analytic continuation.
Prerequisite: MTH 207, 223; or MTH 224.

MTH 404 - Modern Algebra I (3.0 hours)
Basic theory of groups, rings, and fields with an emphasis on groups and rings, including the Fundamental Theorem of Homomorphisms.
Prerequisite: MTH 207, 223.

MTH 405 - Modern Algebra II (3.0 hours)
Advanced theory of groups, rings, and fields with an emphasis on fields and field extensions. Other topics may include Galois theory and classical problems of insolvability.
Prerequisite: MTH 404.

MTH 406 - Elementary Topology (3.0 hours)
Introduction to rudiments of point set topology. Concepts of compactness, connectedness, and continuity, in context of general topological spaces and metric spaces.
Prerequisite: MTH 207, 223; or consent of instructor

MTH 410 - Numerical Methods I (3.0 hours)
Introduction to numerical and computational aspects of various mathematical topics: finite precision, solutions of non-linear equations, interpolation, approximation, linear systems of equations, and integration.
Prerequisite: CS 100 or 101; MTH 207 and 223.

MTH 411 - Numerical Methods II (3.0 hours)
Continuation of MTH 410: further techniques of integration, ordinary differential equations, numerical linear algebra, nonlinear systems of equations, boundary value problems, and optimization.
Prerequisite: MTH 224 or 345; MTH 410.

MTH 414 - Partial Differential Equations (3.0 hours)
Theory of, and solution techniques for, partial differential equations of first and second order, including the heat equation, wave equation and Laplace equation in rectangular, cylindrical, and spherical coordinates. Topics include classification of PDE in terms of order, linearity, and homogeneity; solution techniques include separation of variables, Fourier series, and integral operators; and a subset of more advanced topics such as transform methods and numerical methods. Credit will be given for only one of MTH 414, MTH 514.
Prerequisite: MTH 224 or MTH 345

MTH 420 - Introduction to Analysis (3.0 hours)
Real number system and functions of real variables: sequences, limits, continuity, differentiation, series, uniform convergence, and the Riemann-Stieltjes integral.
Prerequisite: MTH 207, 223.

MTH 421 - Advanced Calculus (3.0 hours)
Functions of several variables. Calculus of transformations, implicit and inverse function theorems, line and surface integrals, Fourier analysis, fixed point theorems, and applications.
Prerequisite: MTH 420 or consent of instructor.

MTH 427 - Applied Statistical Methods (3.0 hours)
Regression analysis, time series analysis, and forecasting
Prerequisite: MTH325; MTH326 or consent of instructor.

MTH 428 - Topics in Applied Statistics (3.0 hours)
A continuation of Math 427 to include further studies in statistics such as Bayesian statistics, statistical computing, or multivariate methods. May be repeated under different topics for a maximum of 6 hours credit.
Prerequisite: Math 325; Math 326 or consent of instructor.

MTH 435 - Stochastic Processes (3.0 hours)
Conditional probability and expectation, probability models, Markov chains, Poisson process, renewal theory, Brownian motion processes.
Prerequisite: MTH 325 and MTH 207

MTH 490 - Topics in Mathematics (3.0 hours)
Topics of special interest which may vary each time course is offered. Topic stated in current Schedule of Classes.
Prerequisite: consent of instructor.

MTH 491 - Directed Individual Studies in Mathematics (1.0-16.0 hours)
Individual work in special areas of mathematics for advanced, qualified undergraduate students. May register for more than 6 hrs. credit only if enrolled in an approved special off campus program.
Prerequisite: consent of Department Chair.

MTH 494 - Senior Project in Mathematics I (0.0 hours)
Topics in mathematics selected, studied, and discussed by students under faculty guidance. Each student explores an area of mathematics and selects a topic in which he or she has a particular interest.
Prerequisite: Senior standing (junior standing with consent of instructor).

MTH 495 - Senior Project in Mathematics II (3.0 hours)
Core Curriculum: EL,WI
A selected topic in mathematics is studied by a student under faculty guidance. Each student writes a paper and gives a presentation on his or her topic.
Prerequisite: MTH 494; senior standing.

MTH 510 - Numerical Methods I (3.0 hours)
Introduction to numerical and computational aspects of various mathematical topics: finite precision, solutions of non-linear equations, interpolation, approximation, linear systems of equations, and integration. Cross listed as CS 510.
Prerequisite: CS 101; MTH 207 and 223.

MTH 514 - Partial Differential Equations (3.0 hours)
Theory of, and solution techniques for, partial differential equations of first and second order, including the heat equation, wave equation and Laplace equation in rectangular, cylindrical, and spherical coordinates. Topics include classification of PDE in terms of order, linearity, and homogeneity; solution techniques include separation of variables, Fourier series, and integral operators; and a subset of more advanced topics such as transform methods and numerical methods.
Prerequisite: MTH 224 or 345.