Mathematics (MTH) - Courses

Courses

MTH 051 Cr.2
Intermediate Algebra
A course to enhance the student's skills in selected areas of intermediate algebra; areas covered include polynomials, rational expressions, exponents, equations, and inequalities. Letter grade, but only "F" calculated in GPA. Transcript credit only. Offered Fall, Spring.

MTH 115 Cr.2
Mathematics for Early Childhood and Elementary Teachers I
This course is designed for prospective early childhood and elementary teachers. Content strands include number and operations and algebraic thinking. Topics from these strands include pre-number concepts, place-value and numeracy, and multiple representations and algorithms for whole number and fraction arithmetic. Mathematical structure is also emphasized to analyze arithmetic and algebraic situations. Aligned with state and national standards, this course emphasizes problem solving, communication, reasoning, and representation in mathematics. Mathematical connections will be made to contextual problems and representations when appropriate. Prerequisite: declared early childhood education or elementary/middle education major. Offered Fall, Spring.

MTH 116 Cr.2
Mathematics for Early Childhood and Elementary Teachers II
This course is designed for prospective early childhood and elementary teachers. Content strands include geometry, measurement, data, and chance. Topics from these strands include properties of geometric figures, geometric measurement (length, area, volume), representations of data, and chance processes. Aligned with state and national standards, this course will emphasize problem solving, communication, reasoning, and representation in mathematics. Mathematical connections will be made to contextual problems and representations when appropriate. Prerequisite: declared early childhood education or elementary/middle education major. Offered Fall, Spring.

MTH 123 Cr.4
Mathematics for Decision Making
This course is designed to teach students the mathematical skills needed for decision making in the 21st century. Topics for this course include set theory, syllogisms and fallacies, counting and probability, financial mathematics, and statistical concepts. Offered Fall, Spring, Summer.

MTH 150 Cr.4
College Algebra
A college algebra course on the properties, graphs, and applications of elementary functions. Topics include the real and complex numbers, concepts from analytic geometry, solutions to equations and inequalities, the elementary algebraic functions, and the logarithmic and exponential functions. Prerequisite: a grade of "C" or better in MTH 051 or an appropriate placement test score. (Successful completion of MTH 151, MTH 175, or MTH 207 precludes taking MTH 150 for credit.) Offered Fall, Spring, Summer.

MTH 151 Cr.4
Precalculus
A precalculus course on properties, graphs, and applications of elementary transcendental functions. Topics include concepts from analytic geometry; theory of equations; the logarithmic, exponential, trigonometric, and inverse trigonometric functions; and analytic trigonometry. Prerequisite: grade of "C" or better in MTH 150 or an appropriate placement test score. (Successful completion of MTH 151 precludes taking MTH 150. Successful completion of MTH 207 precludes taking MTH 151.) Offered Fall, Spring, Summer.

MTH 160 Cr.4
Mathematics for Business
This course is an introduction to the quantitative methods for treating problems that arise in business-related fields. Topics include finite mathematics, logic, probability, functions and functional models, exponential and logarithmic functions and models, and an introduction to differential calculus. Examples and applications from management, economic sciences, and other business-related areas are included. This course is for students planning to major in business. Prerequisite: grade of "C" or better in MTH 150 or appropriate placement test score; CBA major, CASSH economics major, or business administration minor. Offered Fall, Spring, Summer.

MTH 175 Cr.4
Applied Calculus
Basic concepts and methods from differential and integral calculus. Logarithmic and exponential functions are included, but not trigonometric functions. Emphasis of the course is on models and applications in business and the social, life, and physical sciences. Prerequisite: grade of "C" or better in MTH 150 or an appropriate placement test score. (Successful completion of MTH 175 precludes taking MTH 150. Successful completion of MTH 207 precludes taking MTH 175.) Offered Fall, Spring, Summer.

MTH 207 Cr.4
Calculus I
This course is a rigorous introduction to calculus. Topics include limits; continuity; the Intermediate Value Theorem; differentiation and integration including derivatives or integrals of trigonometric, logarithmic and exponential functions; the Mean Value Theorems; and the Fundamental Theorem of Calculus. The course also covers a variety of applied problems on related rates, extrema, optimization, areas, and net change. Prerequisite: grade of "C" or better in MTH 151 or an appropriate placement score. (Successful completion of MTH 207 precludes taking MTH 150, MTH 151, MTH 160, or MTH 175 for credit.) Offered Fall, Spring, Summer.

MTH 208 Cr.4
Calculus II
A continuation of Calculus I with a rigorous introduction to sequences and series. Topics include techniques of integration, improper integrals, tests for the convergence of series, power series representations of functions, Taylor's Theorem with Remainder, and a variety of applications to physical sciences including arc length, areas of surfaces of revolution, and parametric and polar equations. Prerequisite: grade of "C" or better in MTH 207. Offered Fall, Spring.

MTH 215 Cr.2
Mathematics for Middle School Teachers I
This course is designed for prospective elementary and middle school teachers. Content strands include number systems and algebraic thinking. Topics from these strands include rational number arithmetic, proportional reasoning, the symbolic language of algebra, and multiple representations to generalize relationships. Aligned with state and national standards, this course will emphasize problem solving, communication, reasoning, and representation in mathematics. Mathematical connections will be made to contextual problems and representations when appropriate. Prerequisite: grade of "C" or better in MTH 115 or declared math education major. Offered Fall, Spring, Summer.

MTH 216 Cr.2
Mathematics for Middle School Teachers II
This course is designed for prospective elementary and middle school teachers. Content strands include geometry, statistics and probability. Topics from these strands include properties of geometric figures, congruence and similarity, concepts of measurement with attention to the meaning of measurement formulas, data analysis, and the calculations of probabilities for simple and compound events. Aligned with state and national standards, this course will emphasize problem solving, communication, reasoning, and representation in mathematics. Mathematical connections will be made to contextual problems and representations when appropriate. Prerequisite: grade of "C" or better in MTH 116 or declared math education major. Offered Fall, Spring, Summer.

MTH 225 Cr.4
Foundations of Advanced Mathematics
An introduction to mathematical reasoning. Mathematical logic, including quantification and the predicate calculus is introduced and used to discuss set theory, relations, functions, counting, graphs, and algorithms. Elementary proofs, including proofs by induction are stressed. Prerequisite: grade of "C" or better in MTH 175 or MTH 207. Course not open to those who have credit in CS 225. Offered Fall, Spring.

MTH 265 Cr.4
Mathematical Models in Biology
An introduction to the use of calculus and stochastic based models to the biological sciences. Mathematical tools such as discrete and continuous differential equations, linear algebra, phase portraits, probability theory and descriptive and inferential statistics that are necessary to analyze and interpret biological models will be covered. Biological topics may include single species and interacting population dynamics, modeling infectious diseases, enzyme kinetics, and quantitative genetics. Prerequisite: grade of "C" or better in MTH 175 or MTH 207. Offered Spring.

MTH 299 Cr.1
Mathematics and Statistics Tutor Training Practicum
This course is designed to offer training and supervision for tutors in the Murphy Learning Center. The course will include an overview of peer tutoring and learning theory, an overview of the general tutoring process, and an examination of best practices for tutoring various client populations. Students will develop a reflective tutoring practice based on readings and course discussions. The course must be taken during the student's first year of employment in the Learning Center. Failure to complete the course will result in termination from the Learning Center. Students who repeat the course will engage more deeply with the content and provide meaningful insights for their peers. Repeatable for credit - maximum three. Consent of instructor. Pass/Fail grading. Offered Fall, Spring.

MTH 308 Cr.4
Linear Algebra with Differential Equations
This course will study linear algebra with emphasis on computer programming and applications. Specific topics include systems of linear equations, matrix operations, linear independence, linear transformations, matrix factorization, vector spaces and subspaces in R^n, basis and dimension, determinants, eigenvalues and eigenvectors, diagonalization, systems of first order linear differential equations, dynamical systems, inner products and orthogonality, least squares, and singular value decomposition. Software will be integrated throughout the course to complement mathematical content. Lect. 3, Lab. 1. Prerequisite: grade of "C" or better in MTH 208 or MTH 265 or (MTH 207 and CS 225 or MTH 225). CS 120 or concurrent enrollment highly recommended. Offered Fall, Spring.

MTH 309 Cr.4
Linear Algebra
This course is an introduction to the fundamental concepts of linear algebra. Topics include systems of linear equations, matrices, vector spaces, subspaces, basis and dimension, linear transformations and their matrix representations, similar matrices and diagonalization, projections and orthogonalization, and applications. In addition to computational proficiency, there is an emphasis on conceptual understanding of definitions and theorems, as well as the comprehension and construction of proofs. Prerequisite: grade of "C" or better in MTH 208; grade of "C" or better in MTH 225 or CS 225. Offered Fall, Spring.

MTH 310 Cr.4
Calculus III: Multivariable Calculus
A continuation of Calculus II with a rigorous introduction to vector and multivariable calculus. Topics include vectors, parametric curves, partial derivatives, directional derivatives, the chain rule, Lagrange multipliers, extrema, double and triple integrals, the Jacobian and change of coordinates, and vector calculus in 2-D and 3-D spaces culminating with Green's Theorem, Stokes' Theorem, and the Divergence Theorem. Prerequisite: grade of "C" or better in MTH 208. Offered Fall, Spring.

MTH 311 Cr.3
Number Theory
Topics are selected from such areas as: divisibility and factorization, congruence, distribution of prime numbers, and Diophantine equations. Problem-solving strategies and unsolved problems are stressed. Applications are developed in related areas. Prerequisite: grade of "C" or better in MTH 225 or CS 225; grade of "C" or better in MTH 308 or MTH 309. Offered Spring.

MTH 315 Cr.3
Algebraic Structures for Middle and High School Teachers
This course explores the fundamental ideas of algebraic concepts and infinite processes in school mathematics. Content includes representing and solving equations and inequalities with emphasis on properties of real numbers; representing and analyzing functional relationships with emphasis on proportional, linear, quadratic, and exponential functions; evaluating and generalizing patterns of change and infinite processes with emphasis on sequences, series, limits, and derivatives. This content is taught through a lens of mathematical argumentation, modeling, reasoning, and proof. Prerequisite: grade of "C" or better in MTH 150 or an appropriate placement test score; grade of "C" or better in MTH 215 or declared math education major. Offered Fall.

MTH 316 Cr.3
Geometry for Middle and High School Teachers
This course explores the fundamental ideas of measurement and geometry concepts in school mathematics. Content includes the analysis and classification of two- and three-dimensional geometric figures, the exploration and application of geometric transformations, tessellations, symmetry, congruence, and similarity as well as non-Euclidean geometry. This content is taught through a lens of mathematical argumentation, modeling, reasoning, and proof. Prerequisite: grade of "C" or better in MTH 216 or declared math education major. Offered Spring.

MTH 317 Cr.3
Graph Theory
An introduction to graph theory-emphasizing algorithms. Topics include graphs and sub graphs, isomorphism, degree sequences, digraphs, networks, algorithm complexity and NP-completeness, trees, Euler circuits and Hamilton cycles, planarity and graph coloring. Prerequisite: CS 120; grade of "C" or better in MTH 225 or CS 225; grade of "C" or better in MTH 308 or MTH 309. Offered Fall.

MTH 320 Cr.3
History of Mathematics
This course studies the evolution of mathematics. It includes discussion and evaluation of major periods of development including the lives and works of preeminent mathematicians and a sampling of problem solving methods from various historical periods. Emphasis is on Western mathematics from earliest recorded history through the developments of calculus and modern mathematics. Prerequisite: grade of "C" or better in MTH 225 or CS 225 or concurrent enrollment. Offered Spring - Odd Numbered Years.

MTH 321 Cr.3
Teaching Mathematics with Technology
This course covers traditional, emerging, and interactive technologies used in the teaching and learning of mathematics. Teacher education candidates gain an understanding of the use and application of instructional technology. Students explore how software, hardware, and instructional media can be used to enhance mathematics instruction in grades 4-12. Topics include instructional technology for visualizing and exploring mathematics, enhancing and delivering lessons, as well as interactive communication tools. Prerequisite: grade of "C" or better in MTH 150 or an appropriate placement test score. Offered Spring.

MTH 331 Cr.3
Modern Geometry
This course is a study of the axiomatic foundations of two and three dimensional Euclidean geometry and two-dimensional non-Euclidean geometry. The course includes a thorough discussion of transformations and their use in congruency, similarity, and scaling of geometric figures through the use of geometric constructions, dynamic geometry software, axiomatic reasoning, and proof. This course will also focus on connecting course content with the content of secondary school geometry courses. Prerequisite: grade of "C" or better in MTH 225 or CS 225; grade of "C" or better in MTH 308 or MTH 309 or concurrent enrollment. Offered Occasionally.

MTH 353 Cr.3
Differential Equations and Dynamical Systems
A first course on the modern study of differential equations including mathematical modeling and numerical solutions. Topics include the formulation of differential equations and interpretation of solutions, first-order linear and separable equations, second order equations, a dynamical systems approach to linear and nonlinear first order systems, and an introduction to numerical approximation and visualization of solutions in a modern programming language. Applications and modeling of real-world phenomena will be integrated throughout. Prerequisite: grade of "C" or better in MTH 308, or grade of "C" or better in MTH 309 and CS 120. Offered Fall.

MTH 362 Cr.3
Complex Variables
Introduction to complex numbers and functions of one complex variable. Topics include Cauchy--Riemann equations, Cauchy integral formula, power series, contour integrals, the residue calculus, conformal maps and applications. Prerequisite: grade of "C" or better in MTH 308 or MTH 309, grade of "C" or better in MTH 310. Offered Spring - Even Numbered Years.

MTH 371 Cr.3
Numerical Methods
This course introduces students to the formulation, computer implementation, and analysis of numerical solutions of problems in science and engineering. Specific topics include function approximation by Taylor series, systems of linear equations, root finding methods, polynomial and piecewise polynomial interpolation, spline functions, numerical integration and differentiation, finite-difference methods for ordinary differential equations, optimization and linear programming. Algorithm accuracy, stability, error, and convergence analysis are discussed, and computer programming is integrated throughout. Optional topics may include least-squares method, Fourier series, partial differential equations, Monte-Carlo methods, Markov chains, and machine learning. Prerequisite: grade of "C" or better in MTH 308, or grade of "C" or better in CS 120 and MTH 309. Offered Spring - Odd Numbered Years.

MTH 395 Cr.1-3
Special Topics in Mathematics
Special topics in mathematics not covered by regular courses taught in this department. The particular topic is decided mutually by the student and instructor. Repeatable for credit - maximum six. Consent of department. Offered Occasionally.

MTH 401 Cr.3
Survey of Advanced Mathematics
This course surveys the three pillars of modern theoretical mathematical knowledge - algebra, analysis, and topology - with an emphasis on interconnections among various college-level mathematics topics as well as the relationship between college-level and school mathematics. Prerequisite: grade of "C" or better in MTH 225; admission to teacher education. (Successful completion of MTH 407 or MTH 411 precludes taking MTH 401 for credit.) Offered Spring.

MTH 407 Cr.3
Real Analysis I
This course covers the basic theory underlying the differential and integral calculus. Convergence of sequences is examined. Theoretical concepts of calculus are examined and particular attention is given to writing proofs. Prerequisite: grade of "C" or better in MTH 225 or CS 225, MTH 308 or MTH 309, and MTH 310. Offered Every Third Semester.

MTH 408 Cr.3
Real Analysis II
This course covers convergence of series and basic theory of power series. Further study of real analysis via selected topics such as the theory of convergence, Lebesgue-Stieltjes integration, Fourier Analysis, probability theory, approximation theory and metric spaces. Prerequisite: grade of "C" or better in MTH 407. Offered Spring - Odd Numbered Years.

MTH 411 Cr.3
Abstract Algebra I
This course is a rigorous approach to algebraic systems including the study of groups, rings, integral domains and fields with application to polynomials. Prerequisite: grade of "C" or better in MTH 225 or CS 225; grade of "C" or better in MTH 308 or MTH 309. Offered Every Third Semester.

MTH 412 Cr.3
Abstract Algebra II
Continuation of MTH 411. Further study of rings, integral domains and fields. Prerequisite: grade of "C" or better in MTH 411. Offered Spring - Even Numbered Years.

MTH 415 Cr.3
Topology
This course is an introduction to the study of topological spaces and their structure-preserving (i.e., continuous) functions. Students develop concepts from point-set topology including methods of construction of topological spaces, continuity, connectedness, compactness, and Hausdorff condition. Prerequisite: grade of "C" or better in MTH 225 or CS 225, MTH 308 or MTH 309, and MTH 310. Offered Every Third Semester.

MTH 435 Cr.3
Mathematics for Data Driven Modeling
This course is an in-depth study of modern applied mathematics and its application in data-driven science and engineering. Topics include dimensional reduction (single value decomposition), Fourier Analysis (with applications in signal/image processing), machine learning, data-driven dynamical systems, and control. Prerequisite: grade of "C" or better in CS 120 and MTH 309, or grade of "C" or better in MTH 308. Offered Spring - Even Numbered Years.

MTH/BIO/CHM/PHY 451 Cr.2
Curriculum and Content in Science and Mathematics
This is a methods course for science education and mathematics education majors that focuses on how content knowledge and pedagogical content knowledge are used to inform instruction. The course focuses on exploration of state and national standards, academic language, and methods of assessment. Prerequisite: EDS 203, EDS 206; concurrent enrollment in the department's section of BIO/CHM/MTH/PHY 454 or BIO/CHM/MTH/PHY 455; admission to teacher education. (Cross-listed with BIO/CHM/MTH/PHY; may only earn credit in one department.) Consent of instructor. Offered Spring.

MTH 452 Cr.2
The Learner and Learning in Mathematics
This is a methods course for mathematics education majors that focuses on learning theories, equitable practices, and culturally relevant pedagogy. The course draws on recommendations from state and national standards. Prerequisite: EDS 203, EDS 206; concurrent enrollment in MTH 454 or MTH 455; admission to teacher education. Consent of instructor. Offered Fall.

MTH 454 Cr.2
Field Experience I in Mathematics Education
This course is the first field experience in a school environment. Candidates plan and teach lessons within the designated grade range of 4-12. Candidates are introduced to classroom management and conflict resolution. A multi-day, consistent schedule in the middle or high school field experience classroom is established by the course instructor in consultation with the teacher candidate and cooperating teacher. Prerequisite: EDS 203, EDS 206; concurrent enrollment in MTH 451 or MTH 452; admission to teacher education. Consent of instructor. Offered Fall, Spring.

MTH 455 Cr.2
Field Experience II in Mathematics Education
This course is the second field experience in a school environment. Candidates plan and teach lessons within the designated grade range of 4-12. Candidates are introduced to classroom management and conflict resolution. A multi-day, consistent schedule in the middle or high school field experience classroom is established by the course instructor in consultation with the teacher candidate and cooperating teacher. Prerequisite: EDS 203, EDS 206; concurrent enrollment in MTH 451 or MTH 452; admission to teacher education. Consent of instructor. Offered Fall, Spring.

MTH 460 Cr.3
Capstone on Teaching and Learning Mathematics for Secondary Teachers
The course is designed to help teacher candidates make connections between advanced undergraduate mathematics and mathematical content taught at the middle and secondary levels. In doing so, this course aims to provide students with a deeper conceptual foundation for the content they will be teaching. Prerequisite: grade of "C" or better in MTH 309 or concurrent enrollment; MTH 315, MTH 316; admission to teacher education; junior standing. Consent of instructor. Offered Fall.

MTH 479 Cr.1-3
Mathematics/Statistics Teaching Assistant
This courses provides an opportunity for students to work with a faculty member and assist with the instruction of a mathematics or statistics course. Specific activities may include preparation of materials, classroom instruction, and assessment. Repeatable for credit- maximum six. Consent of instructor. Offered Fall, Spring, Summer.

MTH 480 Cr.3
Studies in Applied Mathematics
Advanced studies of applications of mathematics and computation to solve problems and understand processes from a variety of fields (for example, industry, medicine and the physical and life sciences.) Requirements include an application/ modeling project with a written report and class presentation. Prerequisite: grade of "C" or better in MTH 353. Offered Spring - Even Numbered Years.

MTH 485 Cr.3
Industrial Mathematics Capstone
This course aims to provide students with a unique experience to apply their math/statistics skills in a practical setting and to strengthen their soft skills. Throughout the semester, students work in teams to solve a real project in an applied discipline, usually supported by an industrial company or a government research facility. Students will apply skills such as data manipulation/visualization/analysis, programming and modeling, and other technologies as needed to solve the problem. Students will communicate the final findings to a general audience via a written report and oral presentation. Repeatable for credit - maximum six. Prerequisite: CS 120, MTH 308, STAT 245; junior standing. Offered Fall.

MTH 495/595 Cr.1-3
Special Topics in Mathematics
Special topics in mathematics not covered by regular courses taught in this department, such as topology, set theory and advanced numerical analysis. The particular topic is decided mutually by the students and the instructor. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/ expectations. Repeatable for credit - maximum six. Prerequisite: junior standing. Consent of department. Offered Occasionally.

MTH 498 Cr.1-3
Independent Study
Directed readings or presentation of material not available in formal departmental courses under the supervision of a faculty member. Registration by written consent of supervising faculty member and department chair. Repeatable for credit - maximum six. Consent of department. Offered Occasionally.

MTH 499 Cr.1-3
Research Topics
An opportunity to pursue individual research topics under the direction of a faculty member. Depending on the nature of the research project, study is expected to involve substantial computational or theoretical work in addition to literature review and instruction. In addition to a written report to the supervising faculty member, expected outcomes may include: software, papers and presentations to the department and regional meetings. Not applicable to a mathematics major or minor. Registration by written consent of supervising faculty member. Repeatable for credit - maximum six. Consent of department. Offered Occasionally.