MA - MATHEMATICS (MA)

*Course Fees are Per Credit Hour

MA 1XX. Math Elective. (1-3 Credits)

MA 100. Intermediate Algebra. (3 Credits)
Principles and techniques of elementary algebra; products, factors, and quotients of polynomials; operations with rational expressions; ratio and proportion; rectangular coordinate system; systems of equations and inequalities; roots and radicals; second-degree equations; the quadratic formula. Some sections of MA 100 will be accompanied by a one-hour lab which provides supplementary instruction. Not open to students with credit in MA 100E Prerequisite: minimum ACT mathematics score of 16 or minimum ALEKS score of 30. (Fall, Spring, Summer)
Course Fees: $60

MA 100E. Intermediate Algebra Enhanced. (4 Credits)
This course is required of all students whose major requires MA 112 and whose score is 15 or below on the ACT Mathematics Subtest. This course covers principles and techniques of elementary algebra; products, factors, and quotients of polynomials; operations with rational expressions, ratio and proportion; rectangular coordinate system; systems of equations and inequalities; roots and radicals; second—degree equations; the quadratic formula. To enhance the course additional material has been added from elementary algebra. Students who successfully complete MA 100E will not be allowed to register for the traditional Intermediate Algebra course (MA 100). Some sections of MA 100E will be accompanied by a one-hour lab which provides supplementary instruction.
Course Fees: $60

MA 105. Introduction to Finite Mathematics. (3 Credits)
This course covers introductory topics in finite mathematics. Topics include inductive and deductive reasoning, problem solving, sets and set operations, probability, expected value, statistical distributions, measures of central tendency and dispersion, and the normal curve. Some sections of MA 105 will be accompanied by a one-hour lab which provides supplementary instruction. (Fall, Spring, Summer)
Course Fees: $60

MA 110. Finite Mathematics. (3 Credits)
This course is intended to give an overview of topics in finite mathematics together with their applications and is taken primarily by students who are not majoring in science, engineering, commerce, or mathematics (i.e., students who are not required to take calculus). The course includes sets, counting, permutations, combinations, basic probability (including Bayes' Theorem), an introduction to statistics (including work with Binomial Distributions and Normal Distributions), matrices and their applications to Markov chains and decision theory. Additional topics may include symbolic logic, linear models, linear programming, the simplex method and applications.Some sections of MA 110 will be accompanied by a one-hour lab which provides supplementary instruction. Prerequisites: minimum mathematics ACT score of 22 or minimum ALEKS score of 46 and credit in high school Algebra I, Algebra II, and Geometry; or grade of C or better in Intermediate Algebra; or Mathematics for Liberal Arts (MA 105 is preferable to MA 100). (Fall, Spring, Summer)
Course Fees: $60

MA 111. Mathematical Reasoning for the Arts. (3 Credits)
This course will use the mathematical mode of inquiry to pose and answer questions relating to art, music, nature, and history. The course will progress chronologically from ancient Egypt and Greece to the Renaissance and move through the twentieth century advent of the computer. Topics include Euclidean and Non-Euclidean geometry; ratios; abstract mathematical thinking through sequences, series, recursion, and patterns; modular arithmetic; and relations. Although the material in this course is entirely mathematical, its topics, as well as many of the examples and some of the work the students do, will be drawn from the fields of art and music. Students will complete a significant project that applies mathematics to their field of interest. Some sections of MA 111 will be accompanied by a one-hour lab which provides supplementary instruction. (Fall, Spring, Summer)
Course Fees: $60

MA 112. College Algebra. (3 Credits)
This course emphasizes the algebra of functions - including polynomial, rational, exponential, and logarithmic functions. The course also covers systems of equations and inequalities, quadratic inequalities, and the binomial theorem. Additional topics may include matrices, Cramer's rule, and mathematical induction. Some sections of MA 112 will be accompanied by a one-hour lab which provides supplementary instruction. Prerequisites: minimum mathematics ACT score of 22 or minimum ALEKS score of 46 and credit in high school Algebra I, Algebra II, and Geometry; or grade of C or better in Intermediate Algebra. (Fall, Spring, Summer)
Course Fees: $60

MA 113. College Trigonometry. (3 Credits)
This course is a continuation of Pre-Calculus Algebra. It includes the study of trigonometric and inverse trigonometric functions and includes extensive work with trigonometric identities and trigonometric equations. The course also covers vectors, complex numbers, DeMoivre's Theorem, and polar coordinates. Additional topics may include conic sections, sequences, and using matrices to solve linear systems. Some sections of MA 113 will be accompanied by a one-hour lab which provides supplementary instruction. Prerequisite: minimum mathematics ACT score of 25 or minimum ALEKS score of 61 or MA 112 with a minimum grade of C. (Fall, Spring, Summer)
Course Fees: $60

MA 115. Pre-Calculus Algebra and Trigonometry. (4 Credits)
This course is a one semester combination of Pre-calculus Algebra and Pre-calculus Trigonometry intended for superior students. The course covers the following topics: algebra of functions (including polynomial, rational, exponential, and logarithmic functions); systems of equations and inequalities; quadratic inequalities; the binomial theorem; the study of trigonometric and inverse trigonometric functions including extensive work with trigonometric identities and trigonometric equations; vectors; complex numbers; DeMoivre's Theorem; polar coordinates. Some sections of MA 115 will be accompanied by a one-hour lab which provides supplementary instruction. Not open to students with credit in MA 151. Prerequisites: minimum mathematics ACT score of 22 or minimum ALEKS score of 46 and credit in high school Algebra I, Algebra II, and Geometry; or grade of C or better MA 112. (Fall, Spring)
Course Fees: $60

MA 121. Calculus for Business and Life Sciences I. (3 Credits)
Algebraic and some transcendental functions; limits; continuity; derivatives; maxima and minima; applications. Some sections of MA 121 will be accompanied by a one-hour lab which provides supplemental instruction. Not open to students with credit in MA 221. Prerequisite: Minimum mathematics ACT score of 25 or minimum ALEKS score of 61 or MA 112 with a grade of C or higher. (Fall, Spring, Summer)
Course Fees: $60

MA 122. Calculus for Business and Life Sciences II. (3 Credits)
Anti-derivatives; the definite integral; applications of the definite integral; functions of two or more variables; partial derivatives; maxima and minima; applications; right triangle trigonometry; the unit circle; trigonometric and inverse trigonometric functions; the Pythagorean and symmetric identities; and derivatives and integrals of the sine and cosine functions. Some sections of MA 121 will be accompanied by a one-hour lab which provides supplemental instruction. Not open to students with credit in MA 222. Prerequisite: MA 121 with a grade of C or higher. (Fall, Spring, Summer)
Course Fees: $60

MA 125. Calculus I. (4 Credits)
This is the first of three courses in the basic calculus sequence. Topics include limits, derivatives, the application of the derivative, definite and indefinite integrals, exponential and logarithmic functions, and inverse functions. Some sections of MA 125 will be accompanied by a one-hour lab which provides supplementary instruction. Prerequisite: Minimum mathematics ACT score of 28 or minimum ALEKS score of 76 or MA 115 with C or above or MA 113 with a C or above. (Fall, Spring)
Course Fees: $60

MA 125H. Honors Calculus I. (4 Credits)
This is the first of three courses in the basic calculus sequence. Topics include limits, derivatives, applications of the derivative, definite and indefinite integrals, exponential and logarithmic functions, and inverse functions. This course is an in-depth investigation of the above topics that will include extra study in areas such as theory, programming, or applications. Some sections of MA 125H will be accompanied by a one-hour lab which provides supplementary instruction. Prerequisite: Minimum mathematics ACT score of 28 or minimum ALEKS score of 76 or MA 115 with C or above or MA 113 with a C or above. (Fall)
Course Fees: $60

MA 126. Calculus II. (4 Credits)
This is the second of three courses in the basic calculus sequence. Topics include techniques of integration, applications of the integral, sequences, series, conic sections. parametric equations, and polar coordinates. Some sections of MA 126 will be accompanied by a one-hour lab which provides supplementary instruction. Prerequisite: MA 125 with a C or above. (Fall, Spring)
Course Fees: $60

MA 147. Elementary Statistics. (3 Credits)
Descriptive statistics; probability; confidence intervals; tests of hypothesis; appropriate applications. Not open to students with credit in MA 190. Some sections of MA 147 will be accompanied by a one-hour lab which provides supplementary instruction. Prerequisite: Minimum ACT mathematics score of 22 or minimum ALEKS score of 46 or credit in MA 100 or higher. (Fall, Spring)
Course Fees: $60

MA 181H. Honors Seminar. (2 Credits)
A special topics course emphasizing the beauty and utility of mathematical thought and its role in society. Topics, which vary by semester, are chosen to be interest to a general audience with varying levels of experience in mathematics. (Offered on sufficient demand)
Course Fees: $60

MA 227. Calculus III. (4 Credits)
This is the third of three courses in the basic calculus sequence. Topics include vectors, vector-valued functions. functions of several variables, partial derivatives, multiple integrals, vector fields, line integrals, and surface integrals. Prerequisite: MA 126 with a C or above. (Fall, Spring)
Course Fees: $60

MA 237. Linear Algebra. (3 Credits)
This course introduces the basic theory of linear equations and matrices, real vector spaces, bases and dimensions, linear transformations and matrices, determinants, eigenvalues and eigenvectors, inner product spaces, and the diagonalization of symmetric matrices. Programming will be used to further investigate some topics. Not open to students with credit in MA 331. Prerequisites: MA 126 with a grade of C or higher and CS 155 with a grade of C or higher. (Offered upon sufficient demand)
Course Fees: $60

MA 238. Applied Differential Equations I. (3 Credits)
An introduction to numerical methods, qualitative behavior of first-order differential equations, techniques for solving separable and linear equations analytically, and applications to various models (e.g., population, motion, chemical mixtures, etc.); techniques for solving higher-order linear differential equations with constant coefficients (general theory, undetermined coefficients, reduction of order, and the method of variation of parameters), with emphasis on interpreting the behavior of the solutions, and applications to physical models whose governing equations are of higher order; the Laplace transform as a tool for the solution of initial-value problems whose inhomogeneous terms are discontinuous. Prerequisite: MA 126. Not open to students with credit in MA 355. (Offered on sufficient demand)
Course Fees: $60

MA 251. Number and Operations for the Elementary School Teacher. (3 Credits)
This course emphasizes the concepts of arithmetic needed by teachers of elementary students. Topics include problem solving, patterns and inductive reasoning, logic, numeration systems, models and algorithms for whole numbers, integers, fractions, ratio and proportion, decimals, and percents. This class does not satisfy requirements for the math major, minor or the general studies component. Prerequisites: MA 110 with a grade of C or higher or MA 112 with a grade of C or higher and ASBI/FBI background clearance. (Fall, Spring, Summer)
Course Fees: $60

MA 252. Geometry and Measurement for the Elementary School Teacher. (3 Credits)
This course emphasizes the concepts of geometry and measurement covered in the elementary classroom. Topics include angles, geometric shapes and properties, measurement and measurement systems, perimeter, area, volume, surface area, congruence, constructions, similarity, and transformations. This class does not satisfy requirements for the math major, minor or the general studies component.
Prerequisites: MA 110 with a grade of C or MA 112 with a grade of C or higher and ASBI/FBI background clearance. (Fall, Spring, Summer)
Course Fees: $60

MA 253. Data Analysis, Probability, and Statistics for the Elementary School Teacher. (3 Credits)
This course emphasizes the concepts of data analysis, probability, and statistics covered in the elementary classroom. Topics include graphical representations of data, descriptive statistics, and probability models. This class does not satisfy requirements for the math major, minor or the general studies component. Prerequisites: MA 110 with a grade of C or higher or MA 112 with a grade of C or higher and ASBI/FBI background clearance. (Fall, Spring, Summer)
Course Fees: $60

MA 295. Undergraduate Directed Research. (1-3 Credits)
Undergraduate Directed Research (UDR) courses give students the opportunity to conduct closely supervised research on a chosen mathematics topic and to write a substantial paper or report based on semester long study and analysis of the research question. Research plans must be discussed with the supervising faculty member and students must submit a project proposal to be approved by the department chair prior to registration in the course. (Offered upon sufficient demand)
Course Fees: $60

MA 325. Foundations of Mathematics. (3 Credits)
This course provides a transition to higher mathematics with strong emphasis on proof writing skills. Topics include propositional logic, methods of proof, sets, functions, relations, and elementary number theory. Students will be required to learn and use the mathematical typesetting language LaTeX. Prerequisite: MA 126 with a grade of C or higher. (Fall, Spring)
Course Fees: $60

MA 331. Linear Algebra with Proof. (3 Credits)
This course serves as an introduction to linear algebra and its applications with the auxiliary goal of transitioning students from computational to abstract mathematical thinking. Topics include linear equations and systems, vectors and matrices, rank and dimension, determinants, introduction to vector spaces and linear transformations, eigenvalues and eigenvectors, and inner products. Applications may include linear models, Markov chains, numerical linear algebra, discrete dynamical systems, finite linear games, or linear programming and optimization. Students will be expected to write mathematical proofs as well as solve computational problems using a programming language such as MATLAB. Not open to students with credit in MA 237. Prerequisite: MA 126 with a grade of C or higher. Prerequisite or Corequisite: CS 245 with a grade of C or higher OR MA 325 with a grade of C or higher. (Fall, Spring)
Course Fees: $60

MA 345. Applied Statistics I. (3 Credits)
A course in statistical methods with applications. Descriptive statistics, probability, statistical inference including one- and two-sample problems, Chi-Square applications, one-way analysis of variance, linear correlation and regression analysis, and nonparametric statistics. Prerequisite: MA 125 with a grade of C or above OR MA 122 with a grade of C or above. (Fall, Spring)
Course Fees: $60

MA 355. Differential Equations. (3 Credits)
A survey of techniques for solving differential equations in which the unknown function depends upon one independent variable; emphasis on analytical techniques, with extensive use of integration methods from calculus; solving higher-order linear differential equations both with constant and with variable coefficients; constructing mathematical models using first-order equations; using the Laplace transform for solving initial-value problems with constant coefficients, both with continuous and discontinuous driving functions. Not open to students with credit in MA 238. Prerequisite: MA 126 with a grade of C or higher. (Spring)
Course Fees: $60

MA 356. Applied Differential Equations II. (3 Credits)
A study of the techniques for solving ordinary differential equations by the use of infinite series; numerical methods of solutions; partial differential equations. Prerequisites: MA 227 and (MA 238 or 355). (Offered on sufficient demand)
Course Fees: $60

MA 360. Topics in Industrial Mathematics. (3 Credits)
This special topics course will cover mathematical methods used to solve various problems from industry or other fields outside of mathematics. Approval of the instructor is required prior to registration in the course. Prerequisite: Permission of Instructor. (Offered upon sufficient demand)
Course Fees: $60

MA 360H. Topics in Industrial Mathematics - Honors. (3 Credits)
This special topics course will cover mathematical methods used to solve various problems from industry or other fields outside of mathematics. Approval of the instructor is required prior to registration in the course. Prerequisite: Permission of Instructor. (Offered upon sufficient demand)
Course Fees: $60

MA 391. Mathematics Seminar. (2 Credits)
This course includes a survey of Mathematical Technology, a discussion of career options in the STEM fields, and strategies for reading and comprehending a technical paper. Other topics are included at instructor discretions. Prerequisites: MA 325 with a grade of C or above.
Course Fees: $60

MA 395. Undergraduate Directed Research. (1-3 Credits)
Undergraduate Directed Research (UDR) courses give students the opportunity to conduct closely supervised research on a chosen mathematics topic and to write a substantial paper or report based on semester long study and analysis of the research question. Research plans must be discussed with the supervising faculty member and students must submit a project proposal to be approved by the department chair prior to registration in the course. (Offered upon sufficient demand)
Course Fees: $60

MA 395H. Undergraduate Directed Research - Honors. (1-3 Credits)
Undergraduate Directed Research (UDR) courses give students the opportunity to conduct closely supervised research on a chosen mathematics topic and to write a substantial paper or report based on semester long study and analysis of the research question. Research plans must be discussed with the supervising faculty member and students must submit a project proposal to be approved by the department chair prior to registration in the course. (Offered upon sufficient demand)
Course Fees: $60

MA 420. Combinatorics and Graph Theory. (3 Credits)
Basic theory and applications of combinatorics and theory. Topics in enumerative combinatorics may include: generating functions, compositions, partitions, Fibonacci numbers, permutations, cycle structure of permutations, permutations statistics, Stirling numbers of the first and second kind, Bell numbers, or principle of inclusion and exclusion. Topics in graph theory may include: Eulerian and Hamiltonian cycles, minimum spanning tree algorithm, planar graphs and coloring problems. Prerequisites: MA 325 with a grade of C or above.
Course Fees: $60

MA 421. College Geometry. (3 Credits)
Euclidean and non-Euclidean geometry including the topics of congruence, convexity, and plane and space separation. Prerequisite: MA 325 with a grade of C or above. (Spring)
Course Fees: $60

MA 425. Methods and Materials for Teaching Secondary Mathematics. (3 Credits)
Practical aspects of teaching and learning mathematics at the secondary level. Topics covered include secondary mathematics curricula, preparation and presentation of lesson material, classroom management, and professional behaviors. Does not satisfy requirements for mathematics major, minor, or general studies component. Prerequisites: MA 325 with a C or higher, ABI/FBI background clearance. (Fall)
Course Fees: $60

MA 431. Advanced Linear Algebra I. (3 Credits)
This course is a proof based investigation of linear algebra with a theoretical emphasis. Topics include systems of linear equations; matrices; determinants; vector spaces; linear transformations; eigenvalues, and eigenvectors. Prerequisites: MA 126 with a grade of C or higher and CS 245 with a grade of C or higher or MA 325 with a grade of C or higher. (Offered upon sufficient demand)
Course Fees: $60

MA 432. Advanced Linear Algebra II. (3 Credits)
Eigenvalues and eigenvectors; linear programming; Markov processes; numerical linear algebra; game theory and other applications. Prerequisite: MA 431. (Offered on sufficient demand)
Course Fees: $60

MA 437. Introduction to Abstract Algebra I. (3 Credits)
Sets, relations, and functions; elementary number theory; group theory including subgroups, cyclic groups, cosets, and LaGrange's theorem; introduction to rings. Prerequisites: MA 126 with a grade of C or above and MA 325 with a grade of C or above.
Course Fees: $60

MA 438. Introduction to Abstract Algebra II. (3 Credits)
Theory of rings; integral domains; fields; group theory II; introduction to Galois theory. Prerequisite: MA 437. (Offered on sufficient demand)
Course Fees: $60

MA 445W. Applied Statistics II. (3 Credits)
A second course in statistical methods with applications. Experimental design, analysis of variance, general regression analysis, orthogonal contrasts, analysis of covariance, and nonparametric statistics. Introduction of statistical computing utilizing the Statistical Analysis System (SAS). Prerequisite: MA 345 or equivalent. (Offered upon sufficient demand)
Course Fees: $60

MA 447. Mathematical Statistics I. (3 Credits)
Probability and combinatorial methods; discrete probability functions; probability density functions for continuous variates; mathematical expectation; moment generating functions; appropriate applications. Prerequisite or Corequisite: Credit or concurrent enrollment in MA 227. (Offered upon sufficient demand)
Course Fees: $60

MA 448. Mathematical Statistics II. (3 Credits)
Sampling distributions; confidence intervals; tests of hypothesis; regression analysis; analysis of variance; appropriate applications. Prerequisite: MA 447 with a grade of C or higher. (Offered upon sufficient demand)
Course Fees: $60

MA 451. Introduction to Analysis. (3 Credits)
Basic analysis and topology of the real line, sequences, series, functions, limits, and continuity. Prerequisites: MA 227 with a grade of C or higher and MA 325 with a grade of C or higher. (Spring)
Course Fees: $60

MA 452. Advanced Calculus. (3 Credits)
Functions of several variables; mapping; partial derivatives; power series; uniform convergence; line and surface integrals; vector analysis. Prerequisite: MA 451. (Offered on sufficient demand)
Course Fees: $60

MA 455. Complex Variables. (3 Credits)
Algebra and geometry of complex numbers; elementary functions and their mappings; analytic functions; integration in the complex plane; Cauchy's integral theorem; Taylor and Laurent expansions; calculus of residues. Prerequisite: MA 227 with a grade of C or higher or MA 237 with a grade of C or higher or MA 238 with a grade of C or higher or MA 325 with a grade of C or higher or MA 355 with a grade of C or higher. (Offered upon sufficient demand)
Course Fees: $60

MA 461. Numerical Analysis. (3 Credits)
Error analysis for iterative methods; approximation theory; numerical differentiation and quadrature; initial-value problems for ordinary differential equations; iterative techniques in matrix algebra. Prerequisites: CS 155 and MA 227. (Offered upon sufficient demand)
Course Fees: $60

MA 471W. Applied Mathematics. (3 Credits)
A study of mathematical models, modeling techniques, and simulations of experiments. Examples may be drawn from the fields of engineering, ecology, economics, medicine, chemistry, and/or biology. Prerequisites: CS 155 with a grade of C or higher and MA 227 with a grade of C or higher and MA 325 with a grade of C or higher and either MA 238 with a grade of C or higher or MA 355 with a grade of C or higher. (Fall)
Course Fees: $60

MA 475W. Introduction to Operations Research. (3 Credits)
The nature of operations research; modeling problems using operations research techniques; linear programming; the Simplex Method, theory and practice; special problems; network analysis; dynamic programming; theory of games. Prerequisites: MA 126 and CS 110 or 155. Corequisite: MA 431. (Offered on sufficient demand)
Course Fees: $60

MA 490. Undergraduate Math Mentoring. (1 Credit)
Students will work on their own mathematics research project in mathematics education and in parallel apply innovative teaching/mentoring strategies from the literature of mathematics education. They will participate in peer led teaching/mentoring in the Mathematics Learning Center. Prerequisites: MA 126 with a grade of C or higher and Departmental approval required. (Offered upon sufficient demand)
Course Fees: $60

MA 491. Special Topics. (1-3 Credits)
Mathematics topics selected according to the interest and needs of the individual student, with study at advanced undergraduate level. Prerequisite: Instructor approval. (Offered upon sufficient demand)
Course Fees: $60

MA 495. Undergraduate Directed Research. (1-3 Credits)
Undergraduate Directed Research (UDR) courses give students the opportunity to conduct closely supervised research on a chosen mathematics topic and to write a substantial paper or report based on semester long study and analysis of the research question. Research plans must be discussed with the supervising faculty member and students must submit a project proposal to be approved by the department chair prior to registration in the course. (Offered upon sufficient demand)
Course Fees: $60