MA - MATHEMATICS (MA)

*Course Fees are Per Credit Hour

MA 525. 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 major field courses in mathematics. Prerequisite/corequisite: MA 421, College Geometry, or equivalent.
Course Fees: $60

MA 600. Applied Engineering Programming. (3 Credits)
Use of high level programming language (Matlab) and associated application programming interfaces (API) to design and create models for manufacturing processes. Programming methods for designing, implementing and using machines used in manufacture. The approach will be practical where students will learn to develop, debug and execute scripts to achieve specific objectives. (Fall)
Course Fees: $60

MA 601. Fundamental Concepts in Mathematics for the Elementary School Teacher. (3 Credits)
Mathematics as a language and a tool for thinking. Emphasis is placed on teaching with meaning and on seeing arithmetic as a unified system of correlated ideas, facts, and principles. Includes fundamental notions of number, measure, logic, proof, and function.
Course Fees: $60

MA 602. Advanced Applied Engineering Mathematics. (3 Credits)
Advanced Applied Engineering Mathematics: Mathematics remains the language which engineers design, modify and use machines. Topics covered will include: linear algebra, differential equations, numerical methods and approximations, use of computer algebra systems like MATLab. (Fall)
Course Fees: $60

MA 605. Applied Statistics I. (3 Credits)
An advanced course in statistical methods and applications including statistical computing utilizing the Statistical Analysis System Prerequisite: MA 345.
Course Fees: $60

MA 606. Applied Statistics II. (3 Credits)
A second course in statistical methods with applications. The topics of this course include regression analysis, ANOVA, ANCOVA, Chi-Square Tests, Non- parametric tests. Prerequisite: MA 605.
Course Fees: $60

MA 611. Applied Mathematics for the Teacher. (3 Credits)
Process approach to problem solving. Emphasis placed on fundamental steps in the solution of problems.
Course Fees: $60

MA 612. Selected Topics in Mathematics for the Teacher. (3 Credits)
Selected topics suitable for laboratory mathematics; mathematics modeling; secondary school mathematics from an advanced point of view.
Course Fees: $60

MA 613. Foundations in Statistics for the Teacher. (3 Credits)
This course emphasizes the concepts of data analysis, probability, and statistics covered in the secondary classroom. Topics include graphical representations of data, descriptive and inferential statistics, and probability models.
Course Fees: $60

MA 617. Symbolic Logic. (3 Credits)
Concept of a logistic system and the propositional calculus. Truthtables and their applications to problems. Syllogistic inference and rules. Class membership and inclusion, the algebra of classes.
Course Fees: $60

MA 621. Foundations in Algebra for the Teacher. (3 Credits)
Elementary number theory. Groups, fields, systems of linear equations and transformations. Vector algebra.
Course Fees: $60

MA 623. Foundations in Analysis for the Teacher. (3 Credits)
Development of the real number system, limits and continuity, and basic point set theory.
Course Fees: $60

MA 624. History and Philosophy of Mathematics. (3 Credits)
Development of mathematics in algebra, geometry, an analysis Impact of science and philosophy made by Euclid, Descartes, Newton, Euler, Gauss, Wierstrass, Cantor, Hamilton, Boole, and Galois.
Course Fees: $60

MA 625. Foundations in Geometry for the Teacher. (3 Credits)
Development of Euclidean geometry in two and three dimensions using the axiomatic methods. Introduction to non-Euclidean geometries.
Course Fees: $60

MA 627. Mathematical Thinking for the Teacher I. (3 Credits)
Theoretical framework for mathematical learning, transitioning from action to process to object level thinking. Explicit method for teaching mathematical thinking using computer programming to push the learner to recognize and use connections, relationships and patterns among mathematical ideas, write general expressions, conjecture and write convincing arguments or proof. Project based applications reinforce abstract thinking about the mathematical concepts as representations are used to model and interpret physical and technical phenomena.
Course Fees: $60

MA 630. Foundations of Advanced Mathematics. (3 Credits)
Proof-writing techniques; logic; sets and functions; fundamental topics in analysis, abstract and linear algebra, number theory, and combinatorics. Prerequisite: Admission to MS in Mathematics Program or permission of instructor.
Course Fees: $60

MA 631. Vector Spaces. (3 Credits)
This course is an abstract, mathematically rigorous study of linear algebra through the examination of vector spaces and linear transformations. Topics include fields, structure of vector spaces, linear transformations and matrices, systems of linear equations, determinants, diagonalization, eigenspaces, inner product spaces, and canonical forms. Prerequisite: MA 630.
Course Fees: $60

MA 637. Group Theory. (3 Credits)
Introduction to groups; subgroups; group homomorphisms; quotient groups; direct products; semidirect products; group actions; and the Sylow theorems. Prerequisite: A grade of B or higher in MA 630 or permission of instructor.
Course Fees: $60

MA 638. Rings and Fields. (3 Credits)
This course provides an in depth, rigorous study of rings, domains, modules, and fields. Additional topics may include, commutative algebras, tensor products, exact sequences, or Galois theory. Prerequisite: MA 630.
Course Fees: $60

MA 640. General Topology. (3 Credits)
This course is an introduction to point-set topology. Topics include compactness, connectedness, quotient spaces, separation properties, Tychonoff's theorem, the Urysohn lemma, Tietze's theorem, and the characterization of separable metric spaces. Prerequisites: MA 630.
Course Fees: $60

MA 641. Elementary Number Theory. (3 Credits)
This course serves as an introduction to elementary number theory and its applications. Topics include integers and divisibility, prime numbers, the fundamental theorem of arithmetic, multiplicative and arithmetic functions, modular arithmetic and congruences, the Chinese remainder theorem, quadratic reciprocity, primitive roots, and applications to cryptography. An auxiliary goal of this course is further refinement of students' mathematical writing skills. Additional topics may include diophantine equations, elliptic curves, continued fractions, arithmetic geometry, or an introduction to analytic, algebraic, or computational methods in number theory. Prerequisites: MA 630 with a grade of C or higher, or permission of instructor.
Course Fees: $60

MA 642. Enumerative Combinatorics. (3 Credits)
This is an introductory course in combinatorics. Topics include the pigeonhole principle, permutations, combinations, binomial coefficients, ordinary and exponential generating functions, recurrence relations, principle of inclusion and exclusion, and Polya's theory of counting. Prerequisite: MA 630.
Course Fees: $60

MA 644. Introduction to Graph Theory. (3 Credits)
Algorithmic and theoretical aspects of graph theory are discussed, including: matchings, colorings, scheduling problems, Hamiltonian and Eulerian cycles, trees, connectivity, and planar graphs. Time permitting, other topics may be included. Prerequisite: MA 630.
Course Fees: $60

MA 645. Statistical Learning. (3 Credits)
This is an introductory course on statistical learning. It provides an overview of concepts for classical unsupervised and supervised learning. Topics include classification, regression, tree-based methods, support vector machines, and resampling methods. Prerequisite: MA 227 (or equivalent) or admission to MS in Mathematics program.
Course Fees: $60

MA 647. Mathematical Statistics I. (3 Credits)
Probability and combinational methods, discrete probability functions; probability density functions for continuous variates; mathematical expectation; moment generating functions; appropriate applications. Prerequisite: MA 227.
Course Fees: $60

MA 648. Mathematical Statistics II. (3 Credits)
This is the second of two courses in the mathematical statistics sequence. Topics include sampling distributions, data reduction, estimation, large sample estimation, tests of statistical hypotheses, and nonparametric statistical inference. Prerequisite: MA 647.
Course Fees: $60

MA 651. Advanced Calculus I. (3 Credits)
Logic; basic set theory and topology; real number system; limits; functions; continuity; sequences and series. Prerequisite: MA 630 or permission of instructor.
Course Fees: $60

MA 652. Advanced Calculus II. (3 Credits)
Derivatives; sequences and series of functions; convergence; power series; Riemann-Stieltjes integral; Fourier series. Prerequisite: MA 651 with a grade of C or higher.
Course Fees: $60

MA 653. Real Analysis I. (3 Credits)
Real number system, Lebesgue measure, Lebesgue integral, convergence theorems, differentiation of monotone functions, absolute continuity and the fundamental theorem of calculus, L^p spaces, Holder and Minkowoski inequalities, and bounded linear functions on the L^p spaces. Prerequisite: MA 652 with a grade of C or higher.
Course Fees: $60

MA 654. Real Analysis II. (3 Credits)
Measure and integration on abstract measure spaces, signed measures, Hahn decomposition, Radon-Nikdoym theorem, Lebesque decomposition, measures on algebras and their extensions, product measures, and Fubini's theorem. Prerequisites: MA 653.
Course Fees: $60

MA 655. Complex Analysis. (3 Credits)
This course is a mathematically rigorous, proof-based approach to the theory of functions of a single complex variable. Topics include geometry and algebra of the complex plane, analytic and elementary functions, complex integration, series representation of analytic functions, residues and poles, and conformal mapping. Prerequisite: MA 630 .
Course Fees: $60

MA 657. Multivariate Statistical Analysis. (3 Credits)
This is an introductory course on multivariate statistical analysis. It provides an overview of the theory and applications of the multivariate normal distribution, estimation of the mean vector and the coincidence matrix, the distributions of sample correlation coefficients, the generalized T^2-statistic, and the Wishart distribution. Prerequisite: MA 647.
Course Fees: $60

MA 661. 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. Also listed as CS 561 but creditable only in the field for which registered. Prerequisites: CS 155 or 210; MA 227.
Course Fees: $60

MA 667. Theory of Finite Groups. (3 Credits)
This course is a continuation of topics in group theory from MA 637 with a strong emphasis on the structure of finite groups. Topics include a review of introductory group theory, Sylow theory, composition series and subnormality, split extensions, solvable groups, simple groups, commutators, fusion, and the transfer homomorphism. Computational algebra software may be utilized. Prerequisite: MA 637.
Course Fees: $60

MA 675. Introduction to Partial Differential Equations I. (3 Credits)
This is the first of two courses in the PDE sequence. Topics include integral curves and surfaces of vector fields, quasi-linear and linear equations of first order, series solutions of the Cauchy-Kovalesky theorem, and characteristics and canonical forms of linear partial differential equations. Prerequisite: MA 630 .
Course Fees: $60

MA 676. Introduction to Partial Differential Equations II. (3 Credits)
This is the second of two courses in the PDE sequence. Topics include the Divergence Theorem and Green's Identities, the Laplace Equation, the wave equation, the heat equation, and systems of first order linear and quasilinear equations. Prerequisite: MA 675.
Course Fees: $60

MA 691. Graduate Seminar. (3 Credits)
Mathematics topics selected according to the interest and needs of the individual student, with study at the graduate level. This 3 credit hour course may be taken twice for a total of 6 hours of credit. Prerequisites: graduate classification and approval of the chair of the department.
Course Fees: $60

MA 698. Algebra Comprehensive Exam. (0 Credits)
Algebra Comprehensive Exam. Prerequisites: MA 637 and MA 638.
Course Fees: $60

MA 699. Analysis Comprehensive Exam. (0 Credits)
Analysis comprehensive exam. Prerequisites: MA 651 and MA 652, both with a grade of C or higher.
Course Fees: $60