Mathematics and Statistics
Upper Division and Graduate Catalog
(Unofficial)

May 26, 2019

Upper division and graduate courses

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MAE 5600 Problem Solving as a Mathematical Endeavor (3)

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Heuristics and strategies to solve mathematical problems, impact of technology in solving problems and in teaching problem solving, reformulation of problems and problem posing techniques, presentation of outcomes. Introduction to the mathematical problem solving literature.

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MAE 5910 Research in Mathematics Education (4)

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This course is a graduate seminar on research in mathematics education. The aim is an introduction to research in the field of mathematics education with an emphasis on the roles of educational theory, qualitative and quantitative research paradigms and methodologies, the analysis and critique of research.

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MAE 5930 Research Methods in Mathematics Education (4)

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Graduate course on research methods in mathematics education. Introduction to the various research methods used in the field of mathematics education, with a focus on the roles of educational theory, qualitative and quantitative research paradigms and methodologies. Development of research questions and study design.

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MAT 3060 History of Mathematics (3)

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Topics related to the chronological and topical developments of mathematics, with an emphasis on topics common to secondary mathematics. The development of numeration systems (Egyptian, Babylonia, Mayan, Greek, and Hindu-Arabic Numerals) and their computational algorithms; Geometry (with an emphasis on classical Euclidean geometry); Algebra (Cardano's solution to the cubic, Descartes' linking of algebra and geometry)), Trigonometry (Mathematics in the Arab world) and 'The Calculus' (Contributions of Eudoxus, Archimedes, Newton and Leibniz). Specific topics within historical strands include: zero; logarithms; e, pi, and, function.

Prerequisite(s): C or better in MAT 2140

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MAT 3100 Introduction to Mathematical Proof (4)

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An introduction to upper division mathematics, the reading and writing of proofs, and the fundamentals of abstract mathematics. Methods of proof include direct and indirect proofs and proof by induction. Propositional logic and quantifiers. Mathematical topics to be covered include integers, rational and real numbers, sets, relations, functions, and cardinality.

Prerequisite(s): C or better in MAT 1150

Postrequisite(s): MAT 3140, MAT 3250, MAT 4170, MAT 4190, MAT 4200

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MAT 3140 Introduction to Real Analysis I (4)

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Axioms of the real numbers; sequences and convergence; limits of sequences and functions; continuity and uniform continuity of functions; open, closed, and compact subsets of the real numbers; differentiation; Extreme Value Theorem; Mean Value Theorem; Riemann's theory of integration; the Fundamental Theorems of Calculus; infinite series.

Prerequisite(s): C or better in MAT 2140 and MAT 3100.

Postrequisite(s): MAT 3150, MAT 4210, MAT 4280, MAT 5110, MAT 5450

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MAT 3150 Introduction to Real Analysis II (3)

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Sequences and series of functions, uniform convergence; calculus of functions defined by series and integrals, with emphasis on power series; limits and continuity of functions of several variables; the derivative as a linear transformation; the Inverse and Implicit Function Theorems.
Prerequisite(s): C or better in MAT 3140

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MAT 3170 Laplace Transforms and Fourier Series (2)

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Introduction to Fourier Series and Integrals with applications. Elementary theory of Laplace transformation with applications including the solution of differential equations.

Prerequisite(s): C or better in MAT 2240 or MAT 2250 or consent of instructor.

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MAT 3180 Mathematical Analysis of Engineering Problems (2)

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Introduction to the algebra and calculus of vectors including the divergence and Stokes? theorem. Introduction to analytic functions of a complex variable. Not open to mathematics majors for math elective credit.
Prerequisite(s): C or better in MAT 2140 or consent of instructor.

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MAT 3250 Introduction to Number Theory (3)

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Fundamentals of the system of integers, Pythagorean triples, Diophantine equations, fundamental theorem of arithmetic, congruences, Fermat's little theorem and Euler's formula, arithmetic functions, power residues, primitive roots and indices, prime numbers and their distribution, and advanced topics such as quadratic reciprocity, Lagrange's four square theorem.
Prerequisite(s): C or better in MAT 3100.
Postrequisite(s): MAT 4950

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MAT 3300 Modern Euclidean Geometry (4)

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Axiomatic development of Euclidean and neutral geometries. Geometry of the triangle, circle and polygons. Constructions with classical tool and with dynamic software. Introduction to deductive reasoning and techniques of proof, including loci. Transformational approach to geometry.
Prerequisite(s): Sophomore standing or consent of instructor
Postrequisite(s): MAT 3310, MAT 4950

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MAT 3310 Modern Geometry (3)

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Inversions of the Euclidean plane. Classic theorems of geometry. Euclidean geometry in 3D. Introduction to projective geometry. Introduction to non-Euclidean geometry with emphasis on the hyperbolic case.
Prerequisite(s): C or better in MAT 3300 or consent of instructor.

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MAT 3470 Combinatorics (3)

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Basic counting techniques. Generating functions and their applications. Recurrence relations. Principle of inclusion-exclusion. Other topics selected from: Polya theory of counting, Coding theory, Matching algorithms. **Prerequisite(s)**: C or better in MAT 2250 or consent of instructor.

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MAT 3800 Mathematics of Operations Research I (3)

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Introduction to the mathematics of linear programming and the Simplex Method. Mathematical modeling of linear programming problems. The Revised Simplex Method. Duality theory and sensitivity analysis.The Dual Simplex Method, parametric programming, and the upper bound technique.Introduction to interior point algorithms.

Prerequisite(s): C or better in MAT 2250.

Postrequisite(s): MAT 3810, MAT 4800

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MAT 3810 Mathematics of Operations Research II (3)

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Transportation and assignment problems. Network problems: shortest path, minimum spanning tree, maximum flow. The Network Simplex method. Introduction to PERT-CPM techniques. Introduction to dynamic programming. Integer programming. Nonlinear programming: Kuhn-Tucker conditions. Introduction to quadratic, separable, and convex programming. Introduction to game theory, Markov Chains, and queueing theory

Prerequisite(s): C or better in MAT 3800

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MAT 3940 Mathematical Concepts for Elementary School Teachers: Algebraic and Statistical Reasoning

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Deep consideration of the Operations and Algebraic Thinking as well as the Data Analysis Domain of the Common Core Standards in Mathematics for K-8 students. Representation and interpretation of data; summary and description of variability. Analysis and description of patterns and relationships, Writing and interpretation of numerical and algebraic expressions. ratios and proportional reasoning, Probability. Familiarity with the idea of function in different modalities: table, graph, symbolic, verbal. Modeling of the Standards of Mathematical practice. Emphasis on the use of different representations and different models for mathematical idea. Discussion of the role of precise language and notation in the development of mathematical thinking. Analysis of different ways of argumentation in mathematics. This course has a field work component.

Prerequisite(s): C or better in MAT 1940.

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MAT 3950 Mathematical Concepts for Elementary School Teachers: Geometry (3)

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Deep consideration of the Measurement and Geometry domains of the Common Core Standards in Mathematics for K-8 students. Reason with 2-D and 3-D shapes and their attributes. Understanding of the progression of the geometric topics and the coherence of the definitions. Measurement and deductive reasoning as complementary paths to develop geometric ideas. Emphasis on conceptual understanding and not formulas. Develop a foundation for understanding area, volume, congruence, similarity, and symmetry. Transformations of the plane and the interconnection between algebra and geometry. Modeling of the Standards of Mathematical practice. Emphasis on the use of different representations and different models for mathematical idea. Discussion of the role of precise language and notation in the development of mathematical thinking. Analysis of different ways of argumentation in mathematics. This course has a field work component.

Prerequisite(s): C or better in MAT 3940.

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MAT 4000 Special Study for Upper Division Students (1-3)

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Individual or group investigation, research, studies, or surveys of selected problems at advanced level. Proposals to be initiated by student(s) with guidance from faculty. Total credit limited to 6 units, with a maximum of 3 units per semester.

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MAT 4010 Introduction to Numerical Analysis I (3)

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Theoretical error and machine error associated with algorithms. Approximation of solution of non-linear equations, systems of linear equations, systems of non-linear equations, and eigenvalue/eigenvector problems.
Prerequisite(s): C or better in MAT 2010 and MAT 2250.
Postrequisite(s): MAT 4020

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MAT 4020 Introduction to Numerical Analysis II (3)

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Polynomial interpolation, cubic splines, numerical differentiation and integration, numerical solutions of differential equations including Runge-Kutta and predictor-corrector methods for solving initial value problems.
Prerequisite(s): C or better in MAT 4010.

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MAT 4170 Introduction to Abstract Algebra I (4)

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Introduction to algebraic structures, groups, rings, and fields; permutation groups, cyclic groups, homomorphisms and isomorphisms, quotient groups, polynomial rings.

Prerequisite(s): C or better in MAT 3100.

Postrequisite(s): MAT 4180, MAT 4950, MAT 5170

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MAT 4180 Introduction to Abstract Algebra II (3)

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Continuation of the study of algebraic structures, groups, rings, and fields; ring homomorphisms and isomorphisms, ideals, quotient rings, construction of field of quotients; field extensions.

Prerequisite(s): C or better in MAT 4170.

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MAT 4190 Advanced Linear Algebra (4)

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The fields of real and complex numbers, vector spaces over general fields, subspaces, span and linear independence, bases and dimension, existence of bases, linear coordinates, linear transformations and matrix representations, isomorphism and change of basis, diagonalizability, inner product spaces, the Gram-Schmidt process, unitary operators and orthogonality, normal operators, self-adjoint operators, and the spectral theorem, Jordan canonical form.
Prerequisite(s): C or better in MAT 2250 and MAT 3100.

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MAT 4200 Differential Geometry (3)

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Local curve theory (Frenet-Serret Frame, Fundamental Theorem for Curves), local surface theory (Gauss Map, Principal, Gaussian, Mean, and Normal curvatures, Gauss's Theorema Egregium), Gauss-Bonnet Theorem.
Prerequisite(s): C or better in MAT 2250 and MAT 3100.

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MAT 4210 Introduction to Topology (3)

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Metric Spaces, General Topological Spaces, Continuity, Subspaces, Product Topology, Quotient Topology, Compactness, Connectedness.
Prerequisite(s): C or better in MAT 3140
Postrequisite(s): MAT 5210

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MAT 4280 Functions of a Complex Variable (4)

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Algebra, geometry, and topology of complex numbers; limits of complex functions, complex functions as mappings, continuity; multivalued functions and branches; complex differentiability and analyticity, harmonic functions; differentiation of power series functions; definition and properties of the elementary functions; contour integration and the Cauchy integral theorems; the maximum modulus principle; Taylor and Laurent series; the residue theorem; conformal mapping; the argument principle; applications to problems in mathematics, physics, and engineering at the discretion of the instructor.
Prerequisite(s): C or better in MAT 2140 and C or better in MAT 3140.
Postrequisite(s): MAT 5280

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MAT 4310 Differential Equations (3)

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Theory of ordinary differential equations. Fundamental existence and uniqueness theorems for initial and boundary value problems, linear systems, regular singular points, eigenvalue problems, Sturm-Liouville theory, Second-order elliptic equations, parabolic and hyperbolic equations, boundary value problems for elliptic equations, initial/ boundary value problems for hyperbolic and parabolic equations.
Prerequisite(s): C or better in MAT 2250.
Postrequisite(s): MAT 4320

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MAT 4320 Differential Equations and Dynamical Systems (3)

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Stability and qualitative behavior of systems of linear and non-linear differential equations. Bifurcations in one and two dimensions. The Poincare-Bendixison theorem. An introduction to discrete dynamical systems and chaos. An introduction to first-order non-linear partial differential equations with applications.

Prerequisite(s): C or better in MAT 4310

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MAT 4410 Internship in Mathematics (1-2)

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On-the-job training and work experience in mathematics and statistics under the guidance of a faculty internship coordinator and on-site job supervisor. The internship is arranged by the student and may not be a continuation of an ongoing job or volunteer experience. A minimum of 4 hours per week (60 hours/semester) per unit credit. Completion of 60 or more units. Overall GPA of 2.0 or higher. **Prerequisite(s)**: Completed application signed by the on-site job supervisor and on-campus internship coordinator.

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MAT 4440 Vector and Tensor Analysis (3)

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An integrated course in the algebra, geometry, and calculus of vectors and tensors; topics in differential geometry; applications to mechanics of deformable media, hydrodynamics, and general relativity.
Prerequisite(s): C or better in MAT 2140 and MAT 2250.

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MAT 4610 Senior Project I (3)

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Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report.
Prerequisite(s): Completion of all lower division requirements and either MAT 3140 or MAT 4180 and consent of instructor.
Postrequisite(s): MAT 4620

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MAT 4620 Senior Project II (2)

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Continuation of a project under faculty supervision or selection and completion of a new project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment.
Prerequisite(s): Project results are presented in a formal report. C or better in MAT 4610 and consent of instructor.

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MAT 4630 Undergraduate Seminar (1)

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Presentations by students on new developments in mathematics including those from projects and independent study.
Prerequisite(s): Senior standing.

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MAT 4750 Graph Theory (3)

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An introduction to graph theory and its applications. Topics include trees, Eulerian and Hamiltonian graphs, connectivity, planarity, colorings, scheduling.
Prerequisite(s): C or better in MAT 3100

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MAT 4800 Mathematical Programming (3)

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Theoretical presentation of the basic principles of linear programming, duality, algorithms and applications. Development of the theory of nonlinear programming, algorithms and applications.
Prerequisite(s): C or better in MAT 2010, MAT 2250, and MAT 3800, or graduate standing.
Postrequisite(s): MAT 5800

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MAT 4850 Introduction to Mathematical Modeling I (3)

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Introduction to general principles of mathematical modeling using discrete and continuous models. Deterministic difference and differential equation models will be highlighted. Applications include population dynamics, traffic modeling, and mechanical systems.
Prerequisite(s): C or better in MAT 2010, MAT 2250, and STA 2200.
Postrequisite(s): MAT 4860

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MAT 4860 Introduction to Mathematical Modeling II (3)

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Introduction to general principles of mathematical modeling using stochastic models. Discrete stochastic models and Markov chains will be highlighted. Applications include economics, population dynamics, and biological systems. **Prerequisite(s)**: C or better in MAT 4850.

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MAT 4950 Teaching Mathematics in Secondary School I (4)

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Deep analysis of middle school mathematics curriculum from an advanced viewpoint, focused on the real number system. Creation of robust connections among the different topics, emphasizing their structure. Emphasizes both algebraic and geometric reasoning. Discussion of the role of precise language and notation in the development of mathematical thinking. This course has a field work component.

Prerequisite(s): MAT 3300, MAT 3250, MAT 3140, MAT 4170 or consent of instructor

Postrequisite(s): MAT 4960

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MAT 4960 Teaching Mathematics in Secondary School II (4)

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Deep analysis of high school mathematics curriculum from an advanced viewpoint, including formal geometry, trigonometry, vectors, and complex numbers. Creation of robust connections among the different topics, emphasizing their structure. Emphasis on the use of different representations of a mathematical idea. Discussion of the role of precise language and notation in the development of mathematical thinking. Analysis of different ways of argumentation in mathematics. This course has a field work component.
Prerequisite(s): CR in MAT 4950.

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MAT 4990 Special Topics for Upper Division Students (1-3)

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Group study at an advanced level of a selected well-defined topic or area not covered by a regularly offered course.

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MAT 5000 Special Study for Graduate Students (1-3)

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Individual or group investigation, research, studies, or surveys of selected problems at graduate level. Proposals to be initiated by student(s) with guidance from faculty. Total credit limited to 6 units, with a maximum of 3 units per semester.

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MAT 5010 Introduction to Mathematical Typesetting (1)

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Introduction to the use of LaTeX or other typesetting language for mathematics, with a particular emphasis on document preparation for instructional materials, articles, presentations, and Master's theses.
Prerequisite(s): Graduate standing or consent of instructor.

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MAT 5080 Numerical Analysis I (3)

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Direct and iterative methods to solve linear systems of equations. Matrix splitting, inversions, eigenvalues and eigenvectors. Numerical solutions of non-linear equations. Rates of convergence and techniques to reduce error propagation.
Prerequisite(s): C or better in MAT 4010 or consent of instructor.
Postrequisite(s): MAT 5090

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MAT 5090 Numerical Analysis II (3)

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Interpolation and approximation of functions, including Fourier and fast Fourier methods. Numerical differentiation and integration. Numerical solutions of ordinary differential equations. Error propagation and convergence rates of the different methods.

Prerequisite(s): C or better in MAT 5080 or consent of instructor.

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MAT 5110 Real Analysis I (4)

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Lebesgue measure and integration, Borel sets, monotone functions and functions of bounded variation, L^p spaces, measure spaces and measurable functions, the Radon-Nikodym theorem, the Fubini theorems, applications.
Prerequisite(s): C or better in MAT 3140 or consent of the instructor.
Postrequisite(s): MAT 5120

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MAT 5120 Real Analysis II (4)

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Metric spaces, an introduction to functional analysis and classical Banach spaces, completeness, and approximation. Further topics in measure theory or functional analysis such as duality or Hilbert spaces as determined by the instructor. .
Prerequisite(s): C or better in MAT 5110 or consent of the instructor.

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MAT 5170 Abstract Algebra I (3)

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Groups, quotient groups, isomorphism theorems, composition series, solvable groups, group actions, Sylow theorems, rings, ideals, ring homomorphisms and quotient rings, prime and maximal ideals, principal ideal rings, euclidean domains, unique factorization domains.
Prerequisite(s): C or better in MAT 4170 or consent of the instructor.
Postrequisite(s): MAT 5180

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MAT 5180 Abstract Algebra II (3)

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Polynomial rings, field extensions, and advanced topics in ring/field theory such as module theory and Galois theory.
Prerequisite(s): C or better in MAT 5170.

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MAT 5210 Topology (3)

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A brief review of point-set topology and introduction to homotopy, the fundamental group, and covering spaces. Classification of surfaces, manifolds, simplicial homology, and knot theory.
Prerequisite(s): C or better in MAT 4210 or consent of instructor.

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MAT 5280 Complex Analysis (3)

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The Cauchy-Goursat theorem; Cauchy's integral theorems and consequences; regularity of analytic functions; sequences and series of analytic functions; analytic functions defined by integrals; meromorphic functions and the logarithm; singularities, poles, and the residue theorem; analytic continuation; the Fourier transform and the Paley-Wiener theorem; conformal mappings, normal families, and the Riemann mapping theorem.
Prerequisite(s): C or better in MAT 4280, or consent of instructor.
Postrequisite(s): MAT 5290

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MAT 5290 Complex Analysis II (3)

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Entire functions, Weierstrass infinite products, Hadamard factoriazation; the Gamma and Zeta functions; elliptic functions; selected topics such as the prime number theorem, Riemann surfaces and and uniformization, the Dirichlet problem, advanced applications to problems in engineering and physics.
Prerequisite(s): C or better in MAT 5280.

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MAT 5450 Mathematical Modeling I (3)

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Modeling of deterministic systems using ordinary and partial differential equations. Fixed points, bifurcations and stability of solutions. General modeling principles and techniques. Perturbation theory and sensitivity analysis. Case studies.
Prerequisite(s): C or better in MAT 2250 and MAT 3140 and MAT 2010 (or equivalent), or consent of instructor.
Postrequisite(s): MAT 5460

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MAT 5460 Mathematical Modeling II (3)

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Modeling of discrete time systems. Fixed points, bifurcations and stability of solutions. Cellular automata, stochastic models, parameter estimation. Case studies.

Prerequisite(s): C or better in MAT 5450 or consent of instructor.

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MAT 5800 Optimization Theory and Application (3)

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Topics will include convex sets, convex functions, extrema of functions, optimality conditions and duality, algorithms and applications to large scale mathematical programming problems.
Prerequisite(s): C or better in MAT 4800 or consent of instructor.

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MAT 5990 Special Topics for Graduate Students (1-3)

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Group study at a graduate level of a selected well-defined topic or area not covered by a regularly offered course.

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MAT 6910 Directed Research (1-3)

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Individual research in a specialized area, under the direction of a graduate faculty member; work does not pertain directly to the thesis. Total credit limited to 6 units, with a maximum of 3 units per semester.

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MAT 6960 Master's Degree Thesis (1)

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Independent research and study under supervision of a faculty advisor. Research results must be reported in an acceptable form. Prerequisite(s): Student must have advanced to candidacy. Students must obtain the written permission of the graduate coordinator in order to register for this course.
Prerequisite(s): Advancement to Candidacy required.

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MAT 6970 Comprehensive Examination (1)

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Preparation for the comprehensive examination. Failure to complete exam satisfactorily the second time will result in termination from the program. Not applicable for students in the Mathematics Education emphasis.
Prerequisite(s): Advancement to candidacy required. Students must obtain the written permission of the graduate coordinator in order to register for this course.

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SME 5010 Mathematics Teaching Practicum I (3)

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Discussion and analysis of teaching techniques, mathematics classroom observations, guided group activities and self analysis of teaching philosophy; group activity development and studying common lesson materials. Participation in in-class group activities at an appropriate level for mathematics graduate students. Review of selected literature on the teaching and learning of mathematics.

Prerequisite(s): Mathematics graduate, or senior level undergraduate, student status.

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SME 5020 Mathematics Teaching Practicum II (3)

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Development and practice of organizational, assessment and pedagogical skills appropriate for the college mathematics instructor.
Prerequisite(s): Concurrent teaching assignment as a Graduate Teaching Associate in the Department of Mathematics and Statistics.

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STA 3100 Sampling Methods and Applications (3)

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Simple random sampling, stratified, cluster, systematic, multistage, multiphase and probability sampling methods. Source of errors, sample size estimation. Applications in ecology.
Prerequisite(s): C or better in STA 1200 or STA 1300 or STA 2100 or STA 2260, or consent of instructor.

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STA 4200 Nonparametric Statistics (3)

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Common nonparametric tests such as sign tests, Wilcoxon test, chi- square test, rank correlation tests and permutation tests. Null distributions of test statistics and their approximations.
Prerequisite(s): C or better in STA 2100 or STA 2260 or TOM 3020 or EC 3220 or IME 3120 or graduate standing.

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STA 4250 Survival Analysis (3)

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Survival models. Types of censoring. Life-tables. Estimation of survival functions from complete and incomplete mortality data. Actuarial and maximum likelihood methods. Kaplan-Meier estimator. Weighted log -rank and Mantel-Haenszel tests . Parametric regression models. Cox proportional hazards model. Probit and Logit models. Use of computer package such as SAS or MINITAB or R.
Prerequisite(s): C or better in STA 2100 and STA 2200, or STA 2260, or IME3120, or consent of instructor.

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STA 4300 Introduction to Random Processes (4)

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Random walks, Markov chains and processes, transient and recurrent states, stationary and steady state or equilibrium distributions, Chapman-Kolmogorov equation, forward and backward differential equations: Poisson processes, birth-death chains and processes, classical single and multiple server queueing systems, Little's formula, advanced queueing models.
Prerequisite(s): C or better in STA 2200 or STA 2260, or consent of instructor.
Postrequisite(s): STA 5300

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STA 4320 Applied Regression Analysis (4)

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Simple linear regression and scatterplots, multiple linear regression, matrix formulation of regression, least squares estimation, interpretation of regression coefficients, hypothesis tests for regression coefficients, confounding and multicollinearity, interaction and effect modification, regression diagnostics and remedial measures, model selection, use of statistical software packages for all techniques discussed.
Prerequisite(s): C or better in STA 2100 or STA 2260 or TOM 3020 or EC 3220 or IME 3120 and MAT 2250, or consent of instructor.
Postrequisite(s): STA 5320, STA 5900

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STA 4350 Analysis of Variance and Design of Experiments (4)

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ANOVA techniques, multiple comparisons, computer solutions. Randomized groups and blocks designs, interactions. Latin square, split-plot, simple and confounded factorial designs. Treatment of missing data, incomplete block designs, fractional factorial designs, multifactor experiments with randomization restrictions.
Prerequisite(s): C or better in STA 2100 or STA 2260 or TOM 3020 or EC 3220 or IME 3120, or consent of instructor.
Postrequisite(s): STA 5900

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STA 4400 Mathematical Statistics I (3)

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Theory of probability, discrete and continuous probability distributions, multivariate distributions, distributions of function of random variables, moment generating functions, modes of convergence, asymptotic distributions, central limit theorem.
Prerequisite(s): C or better in MAT 2140.

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STA 4430 Mathematical Statistics II (3)

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Methods of point and interval estimation, unbiasedness, mean square error, efficiency, consistency, completeness, sufficient statistics, Neyman-Pearson theory of testing hypotheses, likelihood ratio tests, sequential analysis.
Prerequisite(s): C or better in STA 4400.

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STA 4700 Categorical Data Analysis (3)

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Contingency Tables, Odds ratio, Fisher's Exact tests, Chi-square tests, M-tests, Generalized Linear Models including Logistic Regression and Poisson Regression. **Prerequisite(s)**: C or better in STA 2100 or STA 2260 or TOM 3020 or EC 3220 or IME 3120 or graduate standing.

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STA 5010 Applied Statistics for Research (3)

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Introduction to research methods. Data summaries and numerical descriptive measures. Principles of probability, Normal distributions. Test of hypotheses. Analysis of variance for completely randomized design, randomized blocks, Latin squares and factorials, design of experiment, correlation, method of least squares, simple and multiple regression, techniques for variable selection. Use of computer packages for applied problems.
Prerequisite(s): Graduate standing. Exposure to any college-level introductory statistics course is highly recommended, but not required.

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STA 5250 Time Series Analysis (3)

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Difference equations. Stationary and non-stationary models. Autocorrelation and partial autocorrelation functions. Autoregressive (AR), Moving average (MA), Autoregressive-moving average (ARMA), and Autoregressive integrated moving average (ARIMA) models. Models for seasonal time series. Identification, estimation, diagnostic checking and forecasting. Use of computer package such as SAS or MINITAB or R.
Prerequisite(s): C or better in STA 2100 and STA 2200, or STA 2260, or IME 3120, or consent of instructor.

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STA 5300 Random Processes (4)

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Gaussian processes, covariance matrices, mean and covariance properties, Wiener processes and white noise, second order stationary processes. Analysis of queueing systems with equilibrium results for single and multiple server queues. Almost periodic processes. Frequency distribution of second order stationary processes. Linear filtering. Renewal processes. Method of stages. Priority queues.
Prerequisite(s): C or better in STA 4300, or consent of instructor.

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STA 5320 Linear Statistical Models (3)

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Review of selected linear algebra and probability background material, including projection matrices and the multivariate normal distribution; matrix formulation of the multiple linear regression model, estimation, hypothesis testing, predictions, restrictions, and rank deficiency; one-way, two-way, and higher-way analysis of variance, random effects and variance components; illustration with statistical software and matrix computation software such as R or MATLAB.
Prerequisite(s): C or better in STA 4320 and MAT 2250 or equivalent linear algebra course or consent of instructor.

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STA 5650 Multivariate Data Analysis (3)

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Multivariate distribution. Variance-covariance matrices. Multivariate Normal distribution, Inference about a mean vector. Multivariate Regression, MANOVA, Classification and Discriminant analysis, Principal components, Factor analysis and Clustering. Use of computer package such as SAS or R.
Prerequisite(s): C or better in MAT 2250 and STA 2100 or STA 2260 or TOM 3020 or EC 3220 or IME 3120, or graduate standing.

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STA 5900 Supervised Statistical Consulting (2)

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Use of computer package and spreadsheet. Statistical and probabilistic modeling techniques. Planning of surveys and experiments. Data analysis, report writing and presentation, oral communication with clients. Role-playing and group discussions. May be repeated for a maximum of 4 units of credit.
Prerequisite(s): C or better in STA 4320 or STA 4350, or consent of instructor.

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