

Mathematical Sciences

MA 0010 - Development of Mathematics Skills

Individualized instruction in mathematics problem solving and general study skills from professional math coaches. Helps students with demanding college-level mathematics courses. Credits do not count toward graduation.

Credits: 0.0; May be repeated

Semesters Offered: Fall, Spring

Restrictions: Permission of instructor required

MA 0030 - Team Approach for College Algebra

Collaborative approach to the study of mathematics. Helps students with MA1030 and gives experience in team problem solving. Credit does not count toward graduation.

Credits: 0.0; May be repeated

Semesters Offered: Fall, Spring, Summer

Co-Requisite(s): MA 1030

MA 0031 - Team Approach for College Algebra II

Collaborative approach to the study of mathematics. Helps students with MA1031 and gives experience in team problem solving. Credit does not count toward graduation.

Credits: 0.0; May be repeated

Semesters Offered: Fall, Spring, Summer

Co-Requisite(s): MA 1031

MA 1020 - Quantitative Literacy

Stresses the role of contemporary mathematical thinking and the connection between mathematics and our daily lives. Topics include the mathematics of the Census, planning and scheduling, coding theory, game theory, symmetry and patterns, logic and modeling, and political flavor topics.

Credits: 4.0

Lec-Rec-Lab: (0-4-0)

Semesters Offered: Fall, Spring

Restrictions: Must be enrolled in one of the following Major(s): Comm and Culture Studies, Health and Physical Education, Theatre & Entertainment Tech (BA), Scientific & Tech Comm (BS), Psychology, Social Sciences, Liberal Arts with History Opt, Scientific & Tech Comm (BA), Humanities, Liberal Arts

MA 1030 - College Algebra I

Part one of a two semester series for students whose algebraic preparation is not sufficient for MA1032. Topics include numerical pre-algebra skills (fractions and decimals) and basic algebra skills (exponents, polynomials, rational expressions, roots, equations and inequalities).

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall, Spring, Summer

Co-Requisite(s): MA 0030

MA 1031 - College Algebra II with Trigonometry

A continued study of algebra and trigonometry covering functions and graphs, trigonometric graphs, identities and equations, and inverse trigonometric functions. MA1030 and MA1031 together are equivalent to MA1032.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall, Spring, Summer

Co-Requisite(s): MA 0031

Pre-Requisite(s): MA 1030

MA 1032 - Data, Functions, & Graphs Plus

Review of algebra and trigonometry covering roots, radicals, factoring polynomial and rational expressions, equations and inequalities, functions and graphs, trigonometric graphs, identities and equations and inverse trigonometric functions.

Credits: 4.0

Lec-Rec-Lab: (0-3-2)

Semesters Offered: Fall, Spring, Summer

Pre-Requisite(s): ACT Mathematics \geq 19 or SAT Mathematics \geq 500

MA 1135 - Calculus for Life Sciences

Topics include analytic geometry, limits, continuity of functions, transcendental functions, derivatives, integrals, and applications of the derivative in the fields of economics, biological sciences, and social sciences. Extensive use of graphing calculator. (See mathematical sciences department for recommended calculator). Credit applicable only to those curricula specifying this course.

Credits: 4.0

Lec-Rec-Lab: (0-4-0)

Semesters Offered: Fall, Spring, Summer

Restrictions: May not be enrolled in one of the following College(s):

College of Engineering

Pre-Requisite(s): MA 1032 or MA 1031 or ACT Mathematics \geq 26 or SAT Mathematics \geq 600

MA 1160 - Calculus with Technology I

An introduction to single-variable calculus, which includes a computer laboratory. Topics include trigonometric, exponential, and logarithmic functions, differentiation and its uses, and basic integration. Integrates symbolic tools, graphical concepts, data and numerical calculations.

Credits: 4.0

Lec-Rec-Lab: (0-4-0)

Semesters Offered: Fall, Spring, Summer

Pre-Requisite(s): MA 1032 or MA 1031 or ACT Mathematics \geq 29 or SAT Mathematics \geq 650

MA 1161 - Calculus Plus w/ Technology I

An introduction to single-variable calculus, which includes a computer laboratory. Topics include trigonometric, exponential, logarithmic functions, differentiation and its uses, and basic integration. Integrates symbolic tools, data and numerics, and graphical concepts and is similar to MA1160, going at a slower pace and incorporating cooperative learning study skills.

Credits: 5.0

Lec-Rec-Lab: (0-5-0)

Semesters Offered: Fall, Spring

Pre-Requisite(s): MA 1032 or MA 1031 or ACT Mathematics \geq 26 or SAT Mathematics \geq 600

MA 1910 - Exploring Symmetry Groups

Mathematical discovery and invention in group theory: transformations, finite figures, strip patterns, wall patterns, finite groups, and Cayley diagrams. Develops the ability to find and describe patterns, to generalize from observations, to formulate conjectures, and to support conjectures with analysis and, when possible, formal proof.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall - Offered alternate years beginning with the 2000-2001 academic year

MA 1920 - Exploring Knots and Surfaces

Mathematical discovery and invention in topological graph theory: networks, graphs, graph coloring, surfaces and graphs, and knots. Develops the ability to find and describe patterns, to generalize from observations, to formulate conjectures, and to support conjectures with analysis and, when possible, formal proof.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall - Offered alternate years beginning with the 2001-2002 academic year

MA 1930 - Exploring Number Theory

Mathematical discovery and invention in number theory: number puzzles, Chinese Remainder Theorem, codes, primitive roots, and quadratic reciprocity. Develops the ability to find and describe patterns, to generalize from observations, to formulate conjectures, and to support conjectures with analysis and, when possible, formal proof.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall - Offered alternate years beginning with the 2006-2007 academic year

MA 1940 - Exploring Non-Euclidean Geometry

Mathematical discovery and invention in Non-Euclidean geometry: definitions of straight and angle, transformations, congruence, parallel transport, projections, and finite geometries. Develops the ability to find and describe patterns, to generalize from observations, to formulate conjectures, and to support conjectures with analysis and, when possible, formal proof.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall - Offered alternate years beginning with the 2003-2004 academic year

MA 2010 - Recreational Mathematics

Topics include such things as fair division, time travel, maze threading, logic puzzles and paradoxes, famous math problems and solutions, cryptarithmic puzzles, how to use and misuse maps, mathematical humor, symmetry and coloring as problem-solving strategies, error-correcting codes, some transfinite arithmetic, and topology of compact surfaces.

Credits: 2.0

Lec-Rec-Lab: (0-2-0)

Semesters Offered: Spring - Offered alternate years beginning with the 2001-2002 academic year

MA 2160 - Calculus with Technology II

Continued study of calculus, which includes a computer laboratory. Topics include integration and its uses, function approximation, vectors, and elementary modeling with differential equations.

Credits: 4.0

Lec-Rec-Lab: (0-4-0)

Semesters Offered: Fall, Spring, Summer

Pre-Requisite(s): MA 1160 or MA 1161 or MA 1135

MA 2320 - Elementary Linear Algebra

An introduction to linear algebra and how it can be used. Topics include systems of equations, vectors, matrices, orthogonality, subspaces, and the eigenvalue problem. Not open to students with credit in MA2321 or MA2330.

Credits: 2.0

Lec-Rec-Lab: (0-2-0)

Semesters Offered: Fall, Spring, Summer

Restrictions: May not be enrolled in one of the following Major(s): Mathematics, Computer Science

Pre-Requisite(s): MA 1160 or MA 1161

MA 2321 - Elementary Linear Algebra

Offered first half of semester, to be taken concurrently with MA3521. The course is an introduction to linear algebra and how it can be used. Topics include systems of equations, vectors, matrices, orthogonality, subspaces and the eigenvalue problem. Not open to students with credit in MA2320 or MA2330.

Credits: 2.0

Lec-Rec-Lab: (0-4-0)

Semesters Offered: Fall, Spring

Restrictions: May not be enrolled in one of the following Major(s): Mathematics, Computer Science

Co-Requisite(s): MA 3521

Pre-Requisite(s): MA 2160

MA 2330 - Introduction to Linear Algebra

An introduction to linear algebra and how it can be used, including basic mathematical proofs. Topics include systems of equations, vectors, matrices, orthogonality, subspaces, and the eigenvalue problem. Not open to students with credit in MA2320 or MA2321. Course prerequisite is any math class numbered MA1090 or higher.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall, Spring

Pre-Requisite(s): MA 1160 or MA 1161

MA 2710 - Introduction to Statistical Analysis

Introduction to statistical reasoning and methods. Topics include uses and abuses of statistics, sources of data and data quality, graphical and descriptive methods, correlation and regression, probability and statistical inference. Labs involve data generation and analysis aided by statistical software. Not open to students with credit in MA2720 or MA3710.

Credits: 3.0

Lec-Rec-Lab: (0-2-1)

Semesters Offered: Spring

Restrictions: Must be enrolled in one of the following Major(s): Mathematics

Pre-Requisite(s): MA 1160 or MA 1161

MA 2720 - Statistical Methods

Introduction to the design and analysis of statistical studies. Topics include methods of data collection, descriptive and graphical methods, probability, statistical inference on means, regression and correlation, and single variable ANOVA. Not open to students with credit in MA3710.

Credits: 4.0

Lec-Rec-Lab: (0-4-0)

Semesters Offered: Fall, Spring, Summer

Restrictions: May not be enrolled in one of the following Major(s): Mathematics

Pre-Requisite(s): MA 1020 or MA 1032 or MA 1031 or ACT Mathematics >= 26

MA 2910 - Mathematical Experimentation

Mathematical discovery and invention in topics such as algebra, analysis, applied mathematics, discrete mathematics, geometry, and statistics.

Class projects require students to find and describe patterns, generalize from observations, formulate and support conjectures with analysis and, when possible, proof. Projects require written reports describing the student's findings, conjectures, and conclusions. Course prerequisite is any math course numbered MA1090 or higher.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Spring

Pre-Requisite(s): MA 1160 or MA 1161

MA 2990 - Elementary Topics in Mathematics

Students study a particular area in mathematics ordinarily not covered in existing courses. Intended for first- or second-year students.

Credits: variable to 4.0; Repeatable to a Max of 6

Semesters Offered: Fall, Spring, Summer

Restrictions: Permission of instructor required

MA 3160 - Multivariable Calculus with Technology

Introduction to calculus in two and three dimensions, which includes a computer laboratory. Topics include functions of several variables, partial derivatives, the gradient, multiple integrals; introduction to vector-valued functions and vector calculus, divergence, curl, and the integration theorems of Green, Stokes, and Gauss.

Credits: 4.0

Lec-Rec-Lab: (0-4-0)

Semesters Offered: Fall, Spring, Summer

Pre-Requisite(s): MA 2160

MA 3202 - Introduction to Coding Theory

Transmission via noisy channels, hamming distance, linear codes, the ISBN-code, encoding and decoding, finite fields, Reed-Solomon codes, deep space communication, the compact disk code, sphere packing bound, hamming codes, hamming decoding.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Pre-Requisite(s): MA 2320 or MA 2321 or MA 2330

MA 3203 - Introduction to Cryptography

Topics include private-key cryptography, shift substitution, permutation and stream ciphers, cryptanalysis, perfect secrecy, public-key cryptography, and the RSA cryptosystem.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring, Summer

Pre-Requisite(s): MA 2320 or MA 2321 or MA 2330

MA 3210 - Introduction to Combinatorics

Topics include set theory, mathematical induction, integers, functions and relations, counting methods, recurrence relations, generating functions, permutations, combinations, principle of inclusion and exclusion, graphs (including planar graphs). Further possible topics are graph coloring, trees and cut-sets, combinatorial designs, Boolean algebra.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall, Summer

Pre-Requisite(s): MA 2320 or MA 2321 or MA 2330

MA 3310 - Introduction to Abstract Algebra

Introduction to proofs in algebra. Topics include elementary number theory (induction, binomial theorem, fundamental theorem of arithmetic, Euclidean algorithm, congruences, Fermat's theorem), group theory (subgroups, cyclic groups, generators, Lagrange's theorem, normal groups, homomorphisms, quotients), ring theory (domains, fields, polynomials, homomorphisms).

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall, Summer

Pre-Requisite(s): MA 2320 or MA 2321 or MA 2330

MA 3450 - Introduction to Real Analysis

Why calculus works: a careful study of the logical basis of calculus, with an emphasis on how to read and write proofs. Topics include set theory, real numbers, infinite sequences, continuity, derivatives and integrals for functions of one variable, sequences of functions, infinite series.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring

Pre-Requisite(s): MA 2160

MA 3520 - Elementary Differential Equations

First order equations, linear equations, and systems of equations. Not open to students with credit in MA3521, MA3530 or MA3560.

Credits: 2.0

Lec-Rec-Lab: (0-2-0)

Semesters Offered: Fall, Spring, Summer

Restrictions: May not be enrolled in one of the following Major(s): Mathematics, Computer Science

Pre-Requisite(s): MA 2160 and (MA 2320 or MA 2321 or MA 2330)

MA 3521 - Elementary Differential Equations

Offered second half of semester, to be taken concurrently with MA2321. Topics include first order equations, linear equations and systems of equations. Not open to students with credit in MA3520, MA3530 or MA3560.

Credits: 2.0

Lec-Rec-Lab: (0-4-0)

Semesters Offered: Fall, Spring

Restrictions: May not be enrolled in one of the following Major(s): Mathematics, Computer Science

Co-Requisite(s): MA 2321

Pre-Requisite(s): MA 2160

MA 3530 - Introduction to Differential Equations

First order equations, linear equations, systems of equations, and Laplace transforms. May include elementary separation of variables for partial differential equations. Not open to students with credit in MA3520, MA3521, or MA3560.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Pre-Requisite(s): MA 2160 and (MA 2320 or MA 2321 or MA 2330)

MA 3560 - Mathematical Modeling with Differential Equations

Creating differential equation models for physical problems such as population dynamics, kinetics, mass-spring systems. Topics include nondimensionalization, numerical methods, phase-plane analysis, first-order systems, linearization, and stability. Includes modeling case studies, using a computer algebra system, and a modeling project. Not open to students with credit in MA3520, MA3521, or MA3530.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring

Pre-Requisite(s): MA 2160 and (MA 2320 or MA 2321 or MA 2330)

MA 3710 - Engineering Statistics

Introduction to the design, conduct, and analysis of statistical studies aimed at solving engineering problems. Topics include methods of data collection, descriptive and graphical methods, probability and probability models, statistical inference, control charts, design of experiments. Not open to students with credit in MA2720.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall, Spring, Summer

Pre-Requisite(s): MA 2160

MA 3720 - Probability

Introduction to probabilistic methods. Topics include probability laws, distribution theory, and limit theorems; elementary statistics, parameter estimation, reliability; introduction to random processes and their properties.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall, Spring

Pre-Requisite(s): MA 3160

MA 3810 - Introduction to Actuarial Mathematics

Covers measurement of interest, including accumulated and present values, nominal and effective rates of interest and discount. Annuities certain, including continuous increasing and decreasing cases. Calculation of yield rates, amortization schedules, and sinking funds. Introduction to life contingencies.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Pre-Requisite(s): MA 3160

MA 3811 - Actuarial Exam Workshop

Some probability and financial mathematics for the Society of Actuaries professional examinations. Review, preparation, and practice using SOA exams and other materials.

Credits: 1.0; Repeatable to a Max of 3; Graded Pass/Fail Only

Lec-Rec-Lab: (0-1-0)

Semesters Offered: Fall, Spring

Pre-Requisite(s): MA 3160

MA 3910 - Techniques for Teaching Mathematics

Teaching strategies focus on the use of history, math manipulatives, problem solving, models, and technology in the secondary mathematics classroom.

Credits: 2.0

Lec-Rec-Lab: (0-1-2)

Semesters Offered: Spring

Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

Pre-Requisite(s): MA 3924

MA 3924 - College Geometry with Technology

Review of Euclidean geometry. Introduction to geometric constructions, conjecturing of theorems, methods of proof, 3-D geometry, finite geometries, and non-Euclidean geometries. Integrates computer software (e.g. Geometer's Sketchpad) throughout the course.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Fall

Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

Pre-Requisite(s): MA 2160 or MA 2330

MA 3930 - Theory of Games

Optimal and best strategies for finite 2-person games of strategy. Psychology of game playing. Bluffing, bargaining, threats, coalitions. Applications to warfare, economics, sociology, politics, and everyday life.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: On Demand

Pre-Requisite(s): MA 2320 or MA 2321 or MA 2330

MA 3990 - Math Sciences Teach Experience

Development of teaching skills through assisting in the instruction of a section of an entry-level undergraduate mathematics course. Students gain experience in leadership, group work, organization skills, cooperative exercise preparation, and class instruction.

Credits: variable to 4.0; Repeatable to a Max of 4; Graded Pass/Fail Only

Semesters Offered: Fall, Spring, Summer

Restrictions: Permission of instructor required

MA 4208 - Optimization and Graph Algorithms

An introduction to linear and integer programming and related graph problems. Topics include simplex algorithm, duality, branch-and-bound and branch-and-cut, shortest paths, spanning trees, matchings, network flow, graph coloring, and perfect graphs.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring

Pre-Requisite(s): MA 3210

MA 4209 - Combinatorics and Graph Theory

An introductory course in combinatorics and graph theory. Topics include designs, enumeration, extremal set theory, finite geometry, graph coloring, inclusion-exclusion, network algorithms, permutations, and trees.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Pre-Requisite(s): MA 3210

MA 4211 - Information Theory and Data Compression

An introduction to information theory and data compression. Topics include information and entropy, channel and channel capacity, Kraft-McMillan inequality, maximum likelihood decoding, reliability, Shannon's theorem, lossless data compression, arithmetic coding, higher order modeling, adaptive methods, dictionary methods, transform methods, and image compression.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring - Offered alternate years beginning with the 2000-2001 academic year

Pre-Requisite(s): MA 3210

MA 4310 - Abstract Algebra

Detailed study of abstract algebra: elementary number theory (congruences, quadratic residues, arithmetic functions), group theory (monoids, permutation groups, homomorphisms, quotients, Lagrange's theorem, finite abelian groups, Sylow's theorems), ring theory (domains, prime and maximal ideals, quotients, PID's), splitting fields, finite fields.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring

Pre-Requisite(s): MA 3310

MA 4330 - Linear Algebra

A study of fundamental ideas in linear algebra and its applications. Includes review of basic operations, block computations; eigensystems of normal matrices; canonical forms and factorizations; singular value decompositions, pseudo inverses, least-square applications; matrix exponentials and linear systems of ODEs; quadratic forms, extremal properties, and bilinear forms.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Pre-Requisite(s): (MA 2320 or MA 2321 or MA 2330) and MA 3160

MA 4410 - Complex Variables

A study of complex numbers, functions of a complex variable, analytic functions, elementary functions, integrals, Taylor and Laurent series, residues and poles, and conformal mapping.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring

Pre-Requisite(s): MA 3160

MA 4450 - Real Analysis

Real analysis on Euclidean n -space. Topics include real and vector valued functions, metric and normed linear spaces; an introduction to Lebesgue measure and convergence theorems.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Pre-Requisite(s): (MA 2320 or MA 2321 or MA 2330) and MA 3160 and MA 3450

MA 4515 - Introduction to Partial Differential Equations

An introduction to solution techniques for linear partial differential equations. Topics include: separation of variables, eigenvalue and boundary value problems, spectral methods, Fourier series, and Green's functions. Studies applications in heat and mass transfer (diffusion eqn.) and mechanical vibrations (wave and beam eqns.).

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring, Summer

Pre-Requisite(s): (MA 3520 or MA 3521 or MA 3530 or MA 3560) and MA 3160

MA 4520 - Integral Transforms, Special Functions, and Series Solutions to ODEs and Asymptotics

Laplace, Fourier, and other integral transforms and methods; special functions; series methods to solve ordinary differential equations.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring - Offered alternate years beginning with the 2000-2001 academic year

Pre-Requisite(s): (MA 3520 or MA 3521 or MA 3530 or MA 3560) and MA 3160

MA 4525 - Applied Vector and Tensor Mathematics

Introduction to vector and tensor mathematics with applications. Topics include vectors; vector differential calculus, space curves; dyadic products and matrices; gradients, divergence, curl, Laplacians; Stokes' integral theorem, Gauss theorem, conservation laws; curvilinear coordinates; tensors, material derivatives; applications of potential theory in electricity and magnetism, heat transfer, solid and fluid mechanics.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Pre-Requisite(s): MA 3160 and (MA 2320 or MA 2321 or MA 2330)

MA 4535 - Dynamical Systems: Control and Chaos

Ordinary differential equations and dynamical systems via a modern geometric approach, including physical and engineering applications. May include chaotic phenomena and fractals or elements of control theory.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall - Offered alternate years beginning with the 2000-2001 academic year

Pre-Requisite(s): (MA 3520 or MA 3521 or MA 3530 or MA 3560) and MA 3160

MA 4610 - Numerical Linear Algebra

Derivation and analysis of algorithms for problems in linear algebra. Covers floating point arithmetic, condition numbers, error analysis; solution of linear systems (direct and iterative methods), eigenvalue problems, least squares, singular value decomposition. Includes a review of elementary linear algebra and the use of appropriate software.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring

Pre-Requisite(s): MA 2320 or MA 2321 or MA 2330

MA 4620 - Finite Difference Methods for PDEs

Derivation, analysis, and implementation of finite difference methods; applications to fluid mechanics, elasticity, heat conduction, acoustics, or electromagnetism. Difference equations, Taylor series, stability, and convergence. Finite difference methods for partial differential equations; alternate methods (spectral, finite element, or particle) for discretizing space.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Pre-Requisite(s): (MA 3520 or MA 3521 or MA 3530 or MA 3560) and MA 3160

MA 4625 - Finite Element Methods

Theory and practical applications of finite element methods in fluid mechanics, elasticity, heat transfer, and electricity and magnetism. Topics include variational principles, elementary function space concepts, finite element methodology, convergence, errors, and element selection.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring

Pre-Requisite(s): (MA 3520 or MA 3521 or MA 3530 or MA 3560) and MA 3160

MA 4630 - Numerical Methods

Solution of nonlinear equations in one variable, interpolation, polynomial approximation, numerical integration/differentiation, and numerical solution of initial-value problems.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Pre-Requisite(s): MA 3530

MA 4635 - Numerical Methods for Integral Equations

Includes quadrature and quadrature methods for solving integral equations that occur in many scientific disciplines (imaging, aerodynamics, etc.).

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall - Offered alternate years beginning with the 2000-2001 academic year

Pre-Requisite(s): (MA 3520 or MA 3521 or MA 3530 or MA 3560) and MA 3160

MA 4710 - Regression Analysis

Covers simple, multiple, and polynomial regression; estimation, testing, and prediction; weighted least squares, matrix approach, dummy variables, multicollinearity, model diagnostics and variable selection. A statistical computing package is an integral part of the course.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring

Pre-Requisite(s): MA 2720 or MA 3710

MA 4720 - Design and Analysis of Experiments

Covers construction and analysis of completely randomized, randomized block, incomplete block, Latin squares, factorial, fractional factorial, nested and split-plot designs. Also examines fixed, random and mixed effects models and multiple comparisons and contrasts. The SAS statistical package is an integral part of the course.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Pre-Requisite(s): MA 2710 or MA 2720 or MA 3710

MA 4730 - Nonparametric Statistics

Survey of distribution free statistical inference procedures. Topics include a review of probability and distribution theory, one sample, paired samples, multi-sample location tests, tests of independence and related measures of association, goodness-of-fit tests and tests based on the cumulative distribution function.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring

Pre-Requisite(s): MA 2710 or MA 2720 or MA 3710

MA 4740 - Sampling Methods

Topics include survey construction, sources of error in surveys, estimation of population parameters from simple random, stratified, systematic, and multi-stage samples, effects of and remedies for non-response, hypothesis testing survey data, and other topics as time permits. Students cannot receive credit for both MA4740 and MA5740.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: On Demand

MA 4750 - Applied Multivariate Statistics

An introduction to analysis of multidimensional data with emphasis on applications. Topics include inference for multivariate normal distribution, classification, cluster analysis, dimension reduction.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

MA 4760 - Mathematical Statistics I

Covers probability set functions and distributions, multivariate distributions, special distributions, distributions of functions of random variables, and limiting distributions.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Pre-Requisite(s): MA 3720

MA 4770 - Mathematical Statistics II

Point estimation, confidence intervals, sufficient statistics, Bayesian estimation, the Rao-Cramer inequality, hypothesis testing, including optimal tests, nonparametric methods.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring

Pre-Requisite(s): MA 4760

MA 4810 - Life Contingencies

Measurement of mortality, life tables, commutation functions. Covers all basic forms of life insurance and life annuities, including gross and net premiums, reserves, cash values, and expense loadings. Advanced topics may include stationary populations, joint and multiple life functions, multiple decrement tables and dividends.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring - Offered alternate years beginning with the 2004-2005 academic year

Pre-Requisite(s): MA 3720 or MA 3810

MA 4820 - Loss Distributions and Credibility Theory

Credibility theory addresses methods for updating statistical estimates as new data becomes available. Loss distribution studies probability distributions that are used for modeling the outcomes of insurance claims.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring - Offered alternate years beginning with the 2005-2006 academic year

Pre-Requisite(s): MA 3720

MA 4900 - Mathematical Sciences Project

Independent study in an area of mathematical sciences under the guidance of a faculty member.

Credits: variable to 4.0; Repeatable to a Max of 6

Semesters Offered: Fall, Spring, Summer

Restrictions: Permission of instructor required

MA 4908 - Theory of Numbers with Technology

Mathematical induction, Euclid's algorithm, prime and composite integers, algebra of congruences, Chinese remainder theorem, quadratic reciprocity law, number theoretic functions, first degree Diophantine equations, Pythagorean triples, Fermat and Mersenne numbers, factoring algorithms, tests for primality and various applications. Projects use Mathematica and EXCEL software packages.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Spring

Pre-Requisite(s): MA 3210 or MA 3310 or MA 3924

MA 4945 - History of Mathematics

Survey of the development of mathematics from ancient times to today. How cultural, mathematical, and technological developments have influenced one another throughout history. Course provides all necessary historical background.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

Pre-Requisite(s): UN 2002

MA 4990 - Topics in Mathematics

Students study in greater depth a particular area of mathematics not studied in existing courses.

Credits: variable to 4.0; Repeatable to a Max of 6

Semesters Offered: Fall, Spring, Summer

Restrictions: Permission of instructor required