

Mathematics (M)

M 301 College Algebra 3 Hours

Subjects include a brief review of elementary algebra; linear, quadratic, exponential, and logarithmic functions; polynomials; systems of linear equations; applications.

M 302 Introduction to Mathematics 3 Hours

Intended primarily for general liberal arts students seeking knowledge of the nature of mathematics as well as training in mathematical thinking and problem solving. Topics include number theory and probability; additional topics are chosen by the instructor.

M 303D Applicable Mathematics 3 Hours

An entry-level course for the nontechnical student, dealing with some of the techniques that allow mathematics to be applied to a variety of problems. Topics include linear and quadratic equations, systems of linear equations, matrices, probability, statistics, exponential and logarithmic functions, and mathematics of finance.

M 303F Mathematics of Investment 3 Hours

Simple and compound interest, equivalent rates, equivalent values, annuities, amortization, sinking funds, bonds, depreciation.

M 403K Calculus I for Business and Economics 4 Hours

Differential and integral calculus of algebraic, logarithmic, and exponential functions with applications.

M 403L Calculus II for Business and Economics 4 Hours

Differential and integral calculus of functions of several variables with applications, infinite series, improper integrals; introductions to probability, differential equations, matrices, systems of linear equations, and linear programming.

M 305E Analytic Geometry 3 Hours

Combines development of methods (including adequate treatment of theory) and acquisition of skills with applications.

M 305G Preparation for Calculus 3 Hours

Study of advanced functions and their graphs and applications, including exponential, logarithmic, and trigonometric functions. Introduction to rates, slopes, and derivatives.

M 408C Differential and Integral Calculus 4 Hours

Introduction to the theory and applications of differential and integral calculus of functions of one variable; topics include limits, continuity, differentiation, the mean value theorem and its applications, integration, the fundamental theorem of calculus, and transcendental functions.

M 408D Sequences, Series, and Multivariable Calculus 4 Hours

This is the second semester of the accelerated calculus sequence. The theory and applications of sequences and infinite series, including those involving functions of one variable, and an introduction to the theory and applications of differential and integral calculus of functions of several variables; subjects include methods of integration, parametric equations, sequences, infinite series, power series, functions of several variables, partial derivatives, and multiple integrals.

M 408K Differential Calculus 4 Hours

Introduction to the theory and applications of differential calculus of functions of one variable; topics include limits, continuity, differentiation, and the mean value theorem and its applications.

M 308L, 408L Integral Calculus 3-4 Hours

Introduction to the theory and applications of integral calculus of functions of one variable; topics include integration, the fundamental theorem of calculus, transcendental functions, sequences, and infinite series.

M 308M, 408M Multivariable Calculus 3-4 Hours

Introduction to the theory and applications of differential and integral calculus of functions of several variables. Includes parametric equations, polar coordinates, vectors, vector calculus, functions of several variables, partial derivatives, gradients, and multiple integrals.

M 408N Differential Calculus for Science 4 Hours

Introduction to the theory of differential calculus of functions of one variable, and its application to the natural sciences. Subjects may include limits and differentiation, with applications to rates of change, extremes, graphing, and exponential growth and decay.

M 408Q Differential and Integral Calculus for Business 4 Hours

Focus on the key concepts of calculus. These include: using successive approximations to solve problems that cannot be solved directly (Euler's Method), tracking the rate at which quantities are changing (derivatives) using rates of change to find optimal solutions to real-world problems (max/min), computing bulk quantities by adding up the pieces (integration), and understanding functions of several variables by studying one variable at a time. Designed for business students.

M 408R Differential and Integral Calculus for the Sciences 4 Hours

A calculus course for students in the life sciences. Emphasizes representations and analysis of data. Subjects include functions, rates, and derivatives and their applications to problems in biology; differential equations; Riemann integrals; the Euler method; and fundamental theorems of calculus.

M 408S Integral Calculus for Science 4 Hours

Introduction to the theory of integral calculus of functions of one variable, and its applications to the natural sciences. Subjects may include integration and its application to area and volume, and transcendental functions, sequences, and series and their application to numerical methods.

M 110C, 210C, 310C, 410C Conference Course 1-4 Hours

M 210E Emerging Scholars Seminar 2 Hours

Supplemental problem-solving laboratory for precalculus, calculus, or advanced calculus courses for students in the Emerging Scholars Program.

M 310P Modern Mathematics: Plan II 3 Hours

Significant developments in modern mathematics. Topics may include fractals, the fourth dimension, statistics and society, and techniques for thinking about quantitative problems.

M 110T, 210T, 310T, 410T Topics in Mathematics 1-4 Hours

M 315C Foundations, Functions, and Regression Models 3 Hours

In-depth study of topics from secondary school mathematics. Emphasizes the development of the concept of function, exploring function patterns in data sets, and the connections between the main topics of mathematics associated with a secondary school curriculum. Use of appropriate technology is explored.

M 316K Foundations of Arithmetic 3 Hours

An analysis, from an advanced perspective, of the concepts and algorithms of arithmetic, including sets; numbers; numeration systems; definitions, properties, and algorithms of arithmetic operations; and percents, ratios, and proportions. Problem solving is stressed.

M 316L Foundations of Geometry, Statistics, and Probability 3 Hours

An analysis, from an advanced perspective, of the basic concepts and methods of geometry, statistics, and probability, including representation and analysis of data; discrete probability, random events, and conditional probability; measurement; and geometry as approached through similarity and congruence, through coordinates, and through transformations. Problem solving is stressed.

M 119S, 219S, 319S, 419S, 519S, 619S, 719S, 819S, 919S Topics in Mathematics 1-9 Hours

This course is used to record credit the student earns while enrolled at another institution in a program administered by the University's Study Abroad Office. Credit is recorded as assigned by the study abroad adviser in the Department of Mathematics. University credit is awarded for work in an exchange program; it may be counted as coursework taken in residence. Transfer credit is awarded for work in an affiliated studies program.

M 321M History of Mathematics 3 Hours

Survey major mathematical developments beginning with the ancient Greeks and tracing those developments through Hindu-Indian mathematics, Arabic mathematics, and European mathematics up to the nineteenth century.

M 325K Discrete Mathematics 3 Hours

Provides a transition from the problem-solving approach of Mathematics 408C and 408D to the rigorous approach of advanced courses. Subjects include logic, set theory, relations and functions, combinatorics, and graph theory and graph algorithms.

M 326K Foundations of Number Systems 3 Hours

Study of number-related topics in middle-grade and secondary school mathematics. Topics include place value; meanings of arithmetic operations; analysis of computation methods; historical development of number concepts and notation; and rational, irrational, algebraic, transcendental, and complex numbers. Emphasis is on communicating mathematics, developing pedagogical understanding of concepts and notation, and using both informal reasoning and proof.

M 427J Differential Equations with Linear Algebra 4 Hours

Ordinary differential equations, introduction to vector spaces, linear operators and eigenvalues, systems of linear differential equations, introduction to partial differential equations and Fourier series.

M 427K Advanced Calculus for Applications I 4 Hours

Ordinary and partial differential equations and Fourier series.

M 427L Advanced Calculus for Applications II 4 Hours

Matrices, elements of vector analysis and calculus of functions of several variables, including gradient, divergence, and curl of a vector field, multiple integrals and chain rules, length and area, line and surface integrals, Green's theorems in the plane and space, and, if time permits, complex analysis.

M 328K Introduction to Number Theory 3 Hours

Provides a transition from the problem-solving approach of Mathematics 408C and 408D to the rigorous approach of advanced courses.

Properties of the integers, divisibility, linear and quadratic forms, prime numbers, congruences and residues, quadratic reciprocity, number theoretic functions.

M 329F Theory of Interest 3 Hours

Measurement of interest, present and accumulated value, amortization, sinking funds, bonds, duration, and immunization. Covers the interest-theory portion of an exam of the Society of Actuaries and the Casualty Actuarial Society.

M 129S, 229S, 329S, 429S, 529S, 629S, 729S, 829S, 929S Topics in Mathematics 1-9 Hours

This course is used to record credit the student earns while enrolled at another institution in a program administered by the University's Study Abroad Office. Credit is recorded as assigned by the study abroad adviser in the Department of Mathematics. University credit is awarded for work in an exchange program; it may be counted as coursework taken in residence. Transfer credit is awarded for work in an affiliated studies program.

M 329W Cooperative Mathematics 3 Hours

This course covers the work period of mathematics students in the Cooperative Education program, which provides supervised work experience by arrangement with the employer and the supervising instructor.

M 333L Structure of Modern Geometry 3 Hours

Axiom systems, transformational geometry, introduction to non-Euclidean geometries, and other topics in geometry; use of these ideas in teaching geometry.

M 339C Actuarial Case Studies 3 Hours

Introduces aspects of basic ratemaking, reserving, catastrophe modeling, and rate classification in a property & casualty actuarial context. Explores loss & premium trending, loss triangles, loss development, loss ratios, on-level premium, and accident year vs. calendar year vs. policy year data.

M 339D Introduction to Financial Mathematics for Actuaries 3 Hours

Covers the financial derivative subjects on the Society of Actuary FM/2 exam: general derivatives, options, hedging, investment strategies, forwards, futures, and swaps. Covers option pricing techniques in the MFE/3F exam: binomial option pricing, Monte Carlo Valuation using risk neutral probabilities, and Black-Scholes.

M 339G Predictive Analytics 3 Hours

Designed for students in mathematics and actuarial science. Explore an introduction to predictive modeling that starts with least squares as a foundation and takes a modern approach applicable to classification and prediction in the presence of large datasets.

M 339J Probability Models with Actuarial Applications 3 Hours

Introductory actuarial models for life insurance, property insurance, and annuities. With Mathematics 349P, covers the syllabus for the professional actuarial exam on model construction.

M 139S Seminar on Actuarial Practice 1 Hour

Presentations by working actuaries on current issues in actuarial practice.

M 339U Actuarial Contingent Payments I 3 Hours

Intermediate actuarial models for life insurance, property insurance, and annuities.

M 339V Actuarial Contingent Payments II 3 Hours

Advanced actuarial models for life insurance, property insurance, and annuities.

M 340L Matrices and Matrix Calculations 3 Hours

Techniques of matrix calculations and applications of linear algebra.

M 341 Linear Algebra and Matrix Theory 3 Hours

Vector spaces, linear transformations, matrices, linear equations, determinants. Some emphasis on rigor and proofs.

M 343K Introduction to Algebraic Structures 3 Hours

Elementary properties of groups and rings, including symmetric groups, properties of the integers, polynomial rings, elementary field theory.

M 343L Applied Number Theory 3 Hours

Basic properties of integers, including properties of prime numbers, congruences, and primitive roots. Introduction to finite fields and their vector spaces with applications to encryption systems and coding theory.

M 343M Error-Correcting Codes 3 Hours

Introduction to applications of algebra and number theory to error-correcting codes, including finite fields, error-correcting codes, vector spaces over finite fields, Hamming norm, coding, and decoding.

M 344K Intermediate Symbolic Logic 3 Hours

A second-semester course in symbolic logic: formal syntax and semantics, basic metatheory (soundness, completeness, compactness, and Loewenheim-Skolem theorems), and further topics in logic.

M 346 Applied Linear Algebra 3 Hours

Emphasis on diagonalization of linear operators and applications to dynamical systems and ordinary differential equations. Other subjects include inner products and orthogonality, normal mode expansions, vibrating strings and the wave equation, and Fourier series.

M 348 Scientific Computation in Numerical Analysis 3 Hours

Introduction to mathematical properties of numerical methods and their applications in computational science and engineering. Introduction to object-oriented programming in an advanced language. Study and use of numerical methods for solutions of linear systems of equations; nonlinear least-squares data fitting; numerical integration; and solutions of multidimensional nonlinear equations and systems of initial value ordinary differential equations.

M 349P Actuarial Statistical Estimates 3 Hours

Statistical estimation procedures for random variables and related quantities in actuarial models. With Mathematics 339J, covers the syllabus for the professional actuarial exam on model construction.

M 349R Applied Regression and Time Series 3 Hours

Introduction to simple and multiple linear regression and to elementary time-series models, including auto-regressive and moving-average models. Emphasizes fitting models to data, evaluating models, and interpreting results.

M 349S Actuarial Modeling and Simulation 3 Hours

Apply Bayesian modeling and Markov-chain Monte Carlo simulations to Actuarial applications. Use R to carry out computations, simulations, and statistical analysis.

M 349T Time Series and Survival-Model Estimation 3 Hours

Introduction to the probabilistic and statistical properties of time series; parameter estimation and hypothesis testing for survival models. Covers 30 percent of the syllabus for exam #4 of the Society of Actuaries and the Casualty Actuarial Society.

M 358K Applied Statistics 3 Hours

Exploratory data analysis, correlation and regression, data collection, sampling distributions, confidence intervals, and hypothesis testing.

M 360M Mathematics as Problem Solving 3 Hours

Discussion of heuristics, strategies, and methods of evaluating problem solving, and extensive practice in both group and individual problem solving. Communicating mathematics, reasoning, and connections among topics in mathematics are emphasized.

M 361 Theory of Functions of a Complex Variable 3 Hours

Elementary theory and applications of analytic functions, series, contour integration, and conformal mappings.

M 361K Introduction to Real Analysis 3 Hours

A rigorous treatment of the real number system, of real sequences, and of limits, continuity, derivatives, and integrals of real-valued functions of one real variable.

M 362K Probability I 3 Hours

An introduction to the mathematical theory of probability, fundamental to further work in probability and statistics, includes basic probability properties, conditional probability and independence, various discrete and continuous random variables, expectation and variance, central limit theorem, and joint probability distributions.

M 362M Introduction to Stochastic Processes 3 Hours

Introduction to Markov chains, birth and death processes, and other topics.

M 364K Vector and Tensor Analysis I 3 Hours

Invariance, vector algebra and calculus, integral theorems, general coordinates, introductory differential geometry and tensor analysis, applications.

M 364L Vector and Tensor Analysis II 3 Hours

Continuation of Mathematics 364K, with emphasis on tensor and extensor analysis. Riemannian geometry and invariance.

M 365C Real Analysis I 3 Hours

A rigorous treatment of the real number system, Euclidean spaces, metric spaces, continuity of functions in metric spaces, differentiation and Riemann integration of real-valued functions of one real variable, and uniform convergence of sequences and series of functions.

M 365D Real Analysis II 3 Hours

A rigorous treatment of selected topics in real analysis, such as Lebesgue integration, or multivariate integration and differential forms.

M 365G Curves and Surfaces 3 Hours

Calculus applied to curves and surfaces in three dimensions: curvature and torsion of space curves, Gauss map and curvature of surfaces, Gauss theorem, geodesics, and the Gauss-Bonnet theorem.

M 367K Topology I 3 Hours

An introduction to topology, including sets, functions, cardinal numbers, and the topology of metric spaces.

M 367L Topology II 3 Hours

Various topics in topology, primarily of a geometric nature.

M 368K Numerical Methods for Applications 3 Hours

Continuation of Mathematics 348. Topics include splines, orthogonal polynomials and smoothing of data, iterative solution of systems of linear equations, approximation of eigenvalues, two-point-boundary value problems, numerical approximation of partial differential equations, signal processing, optimization, and Monte Carlo methods.

M 371E Learning Assistant Experience in Mathematics 3 Hours

Students assist instructors and TAs in mathematics courses. This is a hands-on experience in what it is like to teach and support students in the learning of mathematics in undergraduate courses. Students must attend classroom training and discussions and work in Calculus discussion sections or undergraduate classrooms where mathematics is being taught.

M 372 Fourier Series and Boundary Value Problems 3 Hours

Discussion of differential equations of mathematical physics and representation of solutions by Green's functions and eigenfunction expansions.

M 372K Partial Differential Equations and Applications 3 Hours

Partial differential equations as basic models of flows, diffusion, dispersion, and vibrations. Topics include first- and second-order partial differential equations and classification (particularly the wave, diffusion, and potential equations), and their origins in applications and properties of solutions. Includes the study of characteristics, maximum principles, Green's functions, eigenvalue problems, and Fourier expansion methods.

M 373K Algebraic Structures I 3 Hours

A study of groups, rings, and fields, including structure theory of finite groups, isomorphism theorems, polynomial rings, and principal ideal domains.

M 373L Algebraic Structures II 3 Hours

Topics from vector spaces and modules, including direct sum decompositions, dual spaces, canonical forms, and multilinear algebra.

M 374 Fourier and Laplace Transforms 3 Hours

Operational properties and application of Laplace transforms; some properties of Fourier transforms.

M 374G Linear Regression Analysis 3 Hours

Fitting of linear models to data by the method of least squares, choosing best subsets of predictors, and related materials.

M 374K Fourier and Laplace Transforms 3 Hours

Continuation of Mathematics 374. Introduction to other integral transforms, such as Hankel, Laguerre, Mellin, Z.

M 374M Mathematical Modeling in Science and Engineering 3 Hours
Tools for studying differential equations and optimization problems that arise in the engineering and physical sciences. Includes dimensional analysis and scaling, regular and singular perturbation methods, optimization and calculus of variations, and stability.

M 175, 275, 375, 475 Conference Course 1-4 Hours
Supervised study in mathematics, with hours to be arranged.

M 375C Topics in Conference Course: Computer-Assisted 3 Hours
Supervised study in mathematics on material requiring use of computing resources, with hours to be arranged.

M 375D Discovery: An Introduction to Advanced Study in Mathematics 3 Hours
Capstone course designed primarily for UTeach pre-service mathematics majors considering discovery teaching methodology and/or graduate work in mathematics or mathematics education. Ties together foundational topics in the primary strands of mathematics present in a typical graduate mathematics program; included are selected topics from analysis, algebra, number theory, and topology.

M 175S Seminar in Instruction of Mathematics 1 Hour
An exploration of subjects in mathematics instruction as taught at the secondary educational level. Practice learning and teaching through use of proofs, explorations, and connections. Subjects include foundational mathematics concepts, numbers, constructibility, and development of key mathematics topics.

M 175T, 275T, 375T, 475T Topics in Mathematics 1-4 Hours

M 376C Topics in Methods of Applied Mathematics 3 Hours
Variational methods and related concepts from classical and modern applied mathematics. Models of conduction and vibration that lead to systems of linear equations and ordinary differential equations, eigenvalue problems, initial and boundary value problems for partial differential equations. Topics may include a selection from diagonalization of matrices, eigenfunctions and minimization, asymptotics of eigenvalues, separation of variables, generalized solutions, and approximation methods.

M 378K Introduction to Mathematical Statistics 3 Hours
Sampling distributions of statistics, estimation of parameters (confidence intervals, method of moments, maximum likelihood, comparison of estimators using mean square error and efficiency, sufficient statistics), hypothesis tests (p-values, power, likelihood ratio tests), and other topics.

M 378N Generalized Linear Models 3 Hours
Extensions to ordinary least-squares regression, including Poisson regression, the lasso, mixed models, and ridge regression.

M 378P Decision Analytics 3 Hours
Examine decision theory with utility functions, including the use of probability, optimization, constrained optimization, and linear algebra.

M 379H Honors Tutorial Course 3 Hours
Directed reading, research, and/or projects, under the supervision of a faculty member, leading to an honors thesis.

M 380C Algebra 3 Hours
A survey of algebraic structures, including groups, fields, rings, and modules.

M 380D Algebra 3 Hours
Continuation of Mathematics 380C.

M 381C Real Analysis 3 Hours
Measure and integration over abstract spaces; Lebesgue's theory of integration and differentiation on the real line.

M 381D Complex Analysis 3 Hours
Introduction to complex analysis.

M 381E Functional Analysis 3 Hours
Introduction to functional analysis.

M 382C Algebraic Topology 3 Hours
Surfaces, covering spaces, fundamental group, and homology.

M 382D Differential Topology 3 Hours
Continuation of Mathematics 382C. Manifolds and maps, differential forms, transversality, and intersection theory.

M 382E Advanced Algebraic Topology 3 Hours
Continuation of Mathematics 382C.

M 382F Algebraic Topology 3 Hours
Continuation of Mathematics 382E.

M 382G Differential Geometry 3 Hours
Continuation of Mathematics 382D.

M 383C Methods of Applied Mathematics 3 Hours
Topics include basic normed linear space theory; fixed-point theorems and applications to differential and integral equations; Hilbert spaces and the spectral theorem; applications to Sturm-Liouville problems; approximation and computational methods such as the Galerkin, Rayleigh-Ritz, and Newton procedures.

M 383D Methods of Applied Mathematics 3 Hours
Topics include distributions, fundamental solutions of partial differential equations, the Schwartz space and tempered distributions, Fourier transform, Plancherel theorem, Green's functions, Sobolev spaces, weak solutions, differential calculus in normed spaces, implicit function theorems, applications to nonlinear equations, smooth variational problems, applications to classical mechanics, constrained variational problems.

M 383E Numerical Analysis: Linear Algebra 3 Hours
Survey of numerical methods in linear algebra: floating-point computation, solution of linear equations, least squares problems, algebraic eigenvalue problems.

M 383F Numerical Analysis: Interpolation, Approximation, Quadrature, and Differential Equations 3 Hours
Survey of numerical methods for interpolation, functional approximation, integration, and solution of differential equations.

M 384C Mathematical Statistics I 3 Hours
The general theory of mathematical statistics. Includes distributions of functions of random variables, properties of a random sample, principles of data reduction, an overview of hierarchical models, decision theory, Bayesian statistics, and theoretical results relevant to point estimation, interval estimation, and hypothesis testing.

M 384D Mathematical Statistics II 3 Hours
Continuation of Computational Science, Engineering, and Mathematics 384R and Mathematics 384C.

M 384E Design and Analysis of Experiments 3 Hours
Design and analysis of experiments, including one-way and two-way layouts; components of variance; factorial experiments; balanced incomplete block designs; crossed and nested classifications; fixed, random, and mixed models; and split plot designs.

M 384F Design of Experiments 3 Hours
Design of experiments, including $2n$ and $3n$ factorial experiments, confounding, fractional factorials, sequential experimentation, orthogonal arrays, D-optimal experiments, and response surface methodology.

M 384G Regression Analysis 3 Hours
Simple and multiple linear regression, inference in regression, prediction of new observations, diagnosis and remedial measures, transformations, and model building. Emphasis on both understanding the theory and applying theory to analyze data.

M 384H Multivariate Statistical Analysis 3 Hours

Introduction to the general multivariate linear model; a selection of techniques, such as principle component, factor, and discriminant analysis.

M 385C Theory of Probability 3 Hours

M 385D Theory of Probability 3 Hours

Continuation of Computational Science, Engineering, and Mathematics 384K and Mathematics 385C.

M 387C Numerical Analysis: Algebra and Approximation 3 Hours

Advanced introduction to scientific computing, theory and application of numerical linear algebra, solution of nonlinear equations, and numerical approximation of functions.

M 387D Numerical Analysis: Differential Equations 3 Hours

Advanced introduction to the theory and practice of commonly used numerical algorithms for the solution of ordinary differential equations, and elliptic, parabolic, and hyperbolic partial differential equations.

M 389C Actuarial Case Studies 3 Hours

Explores aspects of basic ratemaking, reserving, catastrophe modeling, and rate classification in a property & casualty actuarial context. Covers loss & premium trending, loss triangles, loss development, loss ratios, on-level premium, accident year vs. calendar year vs. policy year data.

M 389D Introduction to Financial Mathematics for Actuaries 3 Hours

Covers the financial derivative topics on the Society of Actuary FM/2 exam: general derivatives, options, hedging, investment strategies, forwards, futures, and swaps. Covers option pricing techniques in the MFE/3F exam: binomial option pricing, Monte Carlo Valuation using risk neutral probabilities, and Black-Scholes.

M 389F Theory of Interest 3 Hours

Measurement of interest, present and accumulated value, amortization, sinking funds, bonds, duration, and immunization. Covers the interest theory portion of an exam of the Society of Actuaries and the Casualty Actuarial Society.

M 389G Predictive Analytics 3 Hours

Designed for students in mathematics and actuarial science. Explore an introduction to predictive modeling that starts with least squares as a foundation and takes a modern approach applicable to classification and prediction in the presence of large datasets.

M 389J Probability Models with Actuarial Applications 3 Hours

Introductory actuarial models for life insurance, property insurance, and annuities. With Mathematics 389P, covers the syllabus for the professional actuarial exam on model construction.

M 389P Actuarial Statistical Estimates 3 Hours

Statistical estimation procedures for random variables and related quantities in actuarial models. With Mathematics 389J, covers the syllabus for the professional actuarial exam on model construction.

M 189S Seminar on Actuarial Practice 1 Hour

Presentations by working actuaries on current issues in actuarial practice.

M 389T Time Series and Survival-Model Estimation 3 Hours

Introduction to the probabilistic and statistical properties of time series; parameter estimation and hypothesis testing for survival models. Covers 30 percent of the syllabus for exam #4 of the Society of Actuaries and the Casualty Actuarial Society.

M 389U Actuarial Contingent Payments I 3 Hours

Intermediate actuarial models for life insurance, property insurance, and annuities.

M 389V Actuarial Contingent Payments II 3 Hours

Advanced actuarial models for life insurance, property insurance, and annuities.

M 389W Financial Mathematics for Actuarial Applications 3 Hours

Subjects include pricing, stock price, and interest rate models for actuarial applications. Tools include lognormal distribution, Brownian motion, Black-Scholes, and delta hedging.

M 390C Topics in Algebra 3 Hours

Recent topics have included algebraic geometry, number theory, algebraic curves, algebraic number theory, algebraic functions, rational curves on varieties, homological algebra.

M 391C Topics in Analysis 3 Hours

Recent topics have included measure and integration, real variables, complex analysis, functional analysis, ordinary differential equations, partial differential equations, integral transforms, operator theory, approximation theory, abstract harmonic analysis.

M 392C Topics in Topology 3 Hours

Recent topics have included algebraic topology, differential topology, geometric topology, Lie groups.

M 393C Topics in Applied Mathematics 3 Hours

Recent topics have included quantum mechanics, statistical physics, ergodic theory, group representations, statistical mechanics, quantum field theory, introductory partial differential equations, monotone operators and partial differential equations, Hilbert space methods for partial differential equations, Hamiltonian dynamics, nonlinear functional analysis, Euler and Navier-Stokes equations, microlocal calculus and spectral asymptotics, calculus of variations.

M 393C.1 Neural Dynamics, Information Theory, and Machine Learning 3 Hours

M 393N Numerical Solution of Elliptic Partial Differential Equations 3 Hours

The numerical solution of large systems of linear algebraic equations arising in the solution of elliptic partial differential equations by discretization methods.

M 394C Topics in Probability and Statistics 3 Hours

Recent topics have included nonparametric statistics, advanced probability.

M 395C Topics in Logic and Foundations 3 Hours

Recent topics have included set theory, model theory, proof theory, axiomatic theorem proving, automatic theorem proving, foundations of mathematics, recursion theory.

M 196C, 296C, 396C, 696C, 996C Topics in Mathematics 1,2,3,6,9 Hours

Recent topics have included set theory, history of mathematics.

M 396D, 696D, 996D Conference Course 3,6,9 Hours

Supervised study in mathematics.

M 397C Topics in Numerical Analysis 3 Hours

Recent developments and advanced topics in the field of numerical analysis.

M 197S, 397S Topics in Mathematics: Seminar 1,3 Hours

M 698 Thesis 6 Hours

M 398R Master's Report 3 Hours

Preparation of a report to fulfill the requirement for the master's degree under the report option.

M 398T Supervised Teaching in Mathematics 3 Hours

M 399W, 699W, 999W Dissertation 3,6,9 Hours