MATHEMATICS (MATH)

MATH 1011 Precalculus **3 Credits**
Topics in this course include: algebra; linear, rational, exponential, logarithmic and trigonometric functions from a descriptive, algebraic, numerical and graphical point of view; limits and continuity. Primary emphasis is on techniques needed for calculus. This course does not count toward the mathematics core requirement, and is meant to be taken only by students who are required to take MATH 1121, MATH 1141, or MATH 1171 for their majors, but who do not have a strong enough mathematics background. Previously MA 0011.

MATH 1015 Mathematics: An Exploration **3 Credits**
This course introduces various ideas in mathematics at an elementary level. It is meant for the student who would like to fulfill a core mathematics requirement, but who does not need to take mathematics for their major. Topics will vary, depending upon the instructor, but in general will include topics of both historical and current interest. Previously MA 0015.

MATH 1016 Concepts of Calculus **3 Credits**
This course introduces differentiation and integration, and shows how these ideas are related. The course illustrates how important and interesting applied questions, when expressed in the language of mathematical functions, turn out to be questions about derivatives and integrals and, thus, can be solved using calculus. The basic concepts of calculus are numerically, algebraically, and geometrically investigated, using graphing technology to illustrate many of the underlying geometrical ideas. This is a terminal core course and is not a prerequisite for any other course. Please note that MATH 1011 is not an appropriate course to take before taking this course. Previously MA 0016.

MATH 1017 Elementary Probability and Statistics **3 Credits**
This introduction to the theory of statistics includes measures of central tendency, variance, Chebyshev's theorem, probability theory, binomial distribution, normal distribution, the central limit theorem, and estimating population means for large samples. Students who have received credit for any higher-level mathematics course may not take this course for credit without the permission of the department chair. Previously MA 0017.

MATH 1121 Applied Calculus I **3 Credits**
Prerequisite: Precalculus.
Topics in this course include: foundations of the calculus, differentiation of algebraic, exponential and logarithmic functions, extrema and curve sketching, applications of derivatives, antiderivatives, the Fundamental Theorem of Calculus, and integration of algebraic functions. A graphing calculator and Wolfram Alpha are among the technologies that may be used. Students who received credit for MATH 1141 or MATH 1171 may not take this course for credit. Previously MA 0119.

MATH 1122 Applied Calculus II **3 Credits**
Prerequisite: MATH 1121.
Topics in this course include: applications of the derivative, including implicit differentiation, related rates and linear approximation; integration of algebraic, transcendental and trigonometric functions; differentiation of trigonometric functions; techniques of integration; applications of the definite integral; infinite series. A graphing calculator and Wolfram Alpha are among the technologies that may be used. Students who receive credit for MATH 1142 or MATH 1172 may not receive credit for this course. Previously MA 0120.

MATH 1123 Intermediate Calculus **3 Credits**
This course is designed for students majoring in Physics, Engineering, Chemistry and Biochemistry and/or Mathematics, who have taken the Applied Calculus sequence (MATH 1121/1122), to prepare them for MATH 2243. This course will revisit the typical calculus 1 and 2 concepts from a more formal point of view and will offer applications to Physics and Engineering. The course will cover study of continuity, differentiation and integration of real functions. In this course students will learn the theory of sequences and series.

MATH 1141 Calculus I for Chemistry, Engineering, and Physics Majors **4 Credits**
Prerequisite: Precalculus.
This course covers analytic geometry, continuous functions, derivatives of algebraic and trigonometric functions, product and chain rules, implicit functions, extrema and curve sketching, indefinite and definite integrals, applications of derivatives and integrals, exponential, logarithmic and inverse trig functions, hyperbolic trig functions, and their derivatives and integrals. It is recommended that students not enroll in this course unless they have a solid background in high school algebra and precalculus. Previously MA 0145.

MATH 1142 Calculus II for Chemistry, Engineering, and Physics Majors **4 Credits**
Prerequisite: MATH 1141 or MATH 1171.
This course covers applications of the integral to area, arc length, and volumes of revolution; integration by substitution and by parts; indeterminate forms and improper integrals: Infinite sequences and infinite series, tests for convergence, power series, and Taylor series; geometry in three-space. Previously MA 0146.

MATH 1171 Calculus I **4 Credits**
Prerequisite: Precalculus.
This is our most rigorous first-year calculus sequence. However, students are not expected to have had calculus before taking this course. Topics include functions; limits (including the epsilon-delta definition), continuity, and derivatives; trigonometric functions and their derivatives; applications; relative and absolute extrema, and curve sketching; related rates; Rolle's Theorem and the mean value theorem; antiderivatives, definite integrals and area, and the fundamental theorem of calculus. It is recommended that students not enroll in this course unless they have a solid background in high school algebra and precalculus. Students who have received credit for MATH 1121 or MATH 1141 may not take this course for credit. Previously MA 0171.

MATH 1172 Calculus II **4 Credits**
Prerequisite: MATH 1141 or MATH 1171.
Topics include integration by substitution and by parts; areas between curves; volumes of revolution; inverse functions; logarithms and exponential functions; inverse trigonometric functions; indeterminate forms and l'Hospital's rule; improper integrals; and infinite sequences and series, including convergence tests, absolute and conditional convergence, power series, and Taylor series. Students who have received credit for MATH 1122 or MATH 1142 may not take this course for credit. Previously MA 0172.

MATH 2211 Applied Matrix Theory **3 Credits**
Students majoring in the sciences, economics, and business learn the basic techniques and applications of linear algebra, including solving linear systems of equations, determinants, linear geometry, eigenvalues, and eigenvectors. Closed to mathematics majors. Students may not receive credit for both MATH 2211 and MATH 2235. Previously MA 0211.

MATH 2217 Statistics I **3 Credits**
Attributes: EVAP Environmental Studies: Applied Professional Skills
Prerequisite: MATH 1121 or MATH 1122 or MATH 1141 or MATH 1142 or MATH 1171 or MATH 1172.
This introductory, calculus-based statistics course focuses on applications in business, statistics, and everyday events. Topics include descriptive statistics including mean, median, mode, standard deviation, histograms, distributions, box plots, and scatter plots; probability theory including counting rules, random variables, probability distributions, expected values, binomial and normal distributions, and the central limit theorem; inferential statistics including point estimates, confidence intervals, and hypothesis testing; and regression theory. Students learn to analyze data with the aid of common software packages. Mathematics majors may not take this course as a mathematics elective. Students who have received credit for MATH 3317 or MATH 3352 may not take this course for credit. Previously MA 0217.

MATH 2223 Applied Calculus III **3 Credits**
Prerequisite: MATH 1122 or MATH 1142 or MATH 1172.
This course covers first order differential equations, vectors in 2-D and 3-D, partial differentiation and multiple integrals. This is the third course in the three-course sequence MATH 1121, MATH 1122, MATH 2223. Previously MA 0221.

MATH 2231 Discrete Mathematics **3 Credits**
Topics in this course include logic, sets, functions, equivalence relations and partitions, mathematical induction, and countability. Previously MA 0231.

MATH 2235 Linear Algebra **3 Credits**
Prerequisite: MATH 2231.
Students examine linear spaces and subspaces, linear independence and dependence, bases and dimension, linear operators, matrix theory, determinants and systems of linear equations, eigenvalues and eigenvectors. Students may not receive credit for both MATH 2211 and MATH 2235. Previously MA 0235.

MATH 2243 Calculus III for Chemistry, Engineering, and Physics Majors **4 Credits**
Prerequisite: MATH 1142 or MATH 1172.
Topics include partial differentiation; chain rule, exact differentials, maxima and minima; multiple integration; application to volumes, center of gravity; and polar, cylindrical, and spherical coordinates; vector arithmetic and algebra, dot and cross products, parametric equations, lines and planes; gradient, directional derivative, curl, divergence; line integrals, work, Green's theorem, surface integrals; Stokes's and divergence theorems. Previously MA 0245.

MATH 2251 Ordinary Differential Equations **3 Credits**
Prerequisite: MATH 2223 or MATH 2243 or MATH 2273.
This course presents the solution of first order differential equations and of higher order linear differential equations, power series solutions, Laplace transforms, and a multitude of applications. Mathematics majors may not take this course as a mathematics elective. Students who have received credit for MATH 3331 may not take this course for credit. Previously MA 0251.

MATH 2253 Applied Probability Theory **3 Credits**
Prerequisites: A calculus II course (MATH 1172 or MATH 1142 or MATH 1122).
This is an applied, calculus-based probability theory course. The emphasis of the course will be on understanding and applying the theories and main tools of probability. Students will learn about and use common discrete and continuous probability models. There will be heavy emphasis on applications and computer simulations. Differential and integral calculus will be used throughout the course. [Does not count towards the Math Major or Mathematical Statistics minor. This course can count towards either the Mathematics Minor or the Applied Statistics minor, not both.]

MATH 2273 Multivariable Calculus **4 Credits**
Prerequisite: MATH 1142 or MATH 1172.
Topics in this course include vectors in the plane and in three-space; equations of lines and planes; vector functions; arc length; functions of several variables, limits, continuity, differentiability and partial derivatives, the gradient, directional derivatives; tangent planes; relative and absolute extrema; multiple integration in cartesian, cylindrical, and spherical coordinates; vector fields; line integrals; Green's theorem. Previously MA 0273.

MATH 3301 Topics in Discrete Mathematics **3 Credits**
Prerequisite: MATH 2231.
Topics include basic combinatorics (permutations, combinations, counting complicated sets, binomial coefficients), elementary number theory (divisors, Euclid's algorithm, modular arithmetic), and elementary graph theory (connectivity, circuits, cycles, planar graphs, graph isomorphisms). Previously MA 0300.

MATH 3317 Applied Statistics I **3 Credits**
Prerequisite: MATH 2243 or MATH 2273.
This course introduces students to applied statistical methods used in the physical sciences, social sciences and business. Topics include probability, descriptive and exploratory statistics using analytic and graphical tools, basic statistical testing (sampling techniques, theory of estimation and standard hypothesis tests), regression analysis (simple linear regression, multivariate regression, and model building, as time permits), correlation techniques, and analysis of variance and factorial designs, if time permits. Students will be required to bring a laptop to class, and a statistical software package such as R, SPSS, or Minitab, will be used extensively, though no prior experience will be assumed. Students who have received credit for MATH 2217 may not receive credit for this course. Previously MA 0317.

MATH 3331 Applied Mathematics **3 Credits**
Prerequisites: MATH 2235, MATH 2273.
This course covers the theory and solution of ordinary differential equations: first-order equations, linear equations of arbitrary order, and linear systems; power series solutions; Laplace transforms; and existence and uniqueness of solutions. Students who have received credit for MATH 2251 may not take this course for credit. Previously MA 0331.

MATH 3332 Partial Differential Equations **3 Credits**
Prerequisites: MATH 2243 or MATH 2273; MATH 2251 or MATH 3331.
Topics in this course include first order PDEs and the method of characteristics; separation of variables for linear homogeneous PDEs; eigenvalue problems; Fourier series; solution of the 1-D heat equation, the 1-D wave equation, and the 2-D Laplace equation, both homogeneous and non-homogeneous; and Fourier transforms. Previously MA 0332.

MATH 3336 Abstract Algebra **3 Credits**
Prerequisites: MATH 2231, MATH 2235.
Students will study group theory, rings and ideals, integral domains, and fields. Previously MA 0334.

MATH 3337 Number Theory **3 Credits**
Attributes: EDCG Educational Studies Cognate
Prerequisite: MATH 2231.
This study of the integers includes but is not limited to: primes and their distribution, divisibility and congruences, quadratic reciprocity, special numerical functions such as Euler's one-function, and Diophantine equations. Students consider the influence number theory has had on the development of algebra and the interplay between the two. Previously MA 0337.

MATH 3342 Theory of Computation **3 Credits**
Prerequisite: MATH 2231.
This course explores what computers can and can't do, although it does not require any background in computer science or programming. Topics include finite state machines, push-down automata, Turing machines and recursive functions; mechanisms for formal languages, such as regular grammars, context-free grammars, context-sensitive grammars; and decidable versus undecidable problems. Previously MA 0342.

MATH 3345 Functional Programming **3 Credits**
Prerequisites: CPSC 1101, MATH 2231.
This course provides an introduction to the theory and practice of programming in the functional paradigm. Functional programming is based on a view of computing as calculation. This approach facilitates the development of programs that are concise, elegant, and free of broad classes of errors. Topics covered will include basic calculation in the functional style, recursion, data types, higher-order functions, and user interactions. This course is intended for students with some imperative programming experience who wish to expand their knowledge.

MATH 3351 Probability Theory **3 Credits**
Attributes: EDCG Educational Studies Cognate
Prerequisites: MATH 2231 or CPEG 2245; MATH 2243 or MATH 2273.
Topics in this course include counting techniques; axiomatic probability theory; discrete and continuous sample spaces; random variables, cumulative distribution functions, probability density and mass functions; joint distributions; expected value and moments; common distributions like the normal, binomial, and Poisson distributions; and limit laws. Previously MA 0351.

MATH 3352 Mathematical Statistics **3 Credits**
Attributes: EDCG Educational Studies Cognate
Prerequisite: MATH 3351.
This course covers transformations of random variables; statistical application of probability; theory of sampling and the Central Limit Theorem; variances of sums and averages; estimation and hypothesis testing; and least squares, curve-fitting, and regression. Previously MA 0352.

MATH 3354 Actuarial Problem Solving **1 Credit**
Prerequisite: MATH 3352 (may be taken concurrently).
This course explores the methods and techniques of solving problems in actuarial mathematics for students interested in the actuary field. This course covers, via student led problem sessions and lectures, the tools for quantitatively assessing risk as presented on Society of Actuaries Exam P. Previously MA 0354.

MATH 3361 Topics in Algebra **3 Credits**
Prerequisite: MATH 3336.
This course investigates three topics in greater depth than can be done in the first linear or abstract algebra course. Topics may include canonical forms for matrices, metric linear algebra, ideal theory, finite non-abelian groups, and Galois Theory. The course typically includes one linear and one abstract algebra topic. Previously MA 0361.

MATH 3371 Real Analysis **3 Credits**
Prerequisites: MATH 2231, MATH 2273.
This course examines the set of real numbers as a complete, ordered, archimedean field; R as a linear vector space equipped with inner product and norm; metrics, particularly Euclidean, on R, topological concepts: continuity, connectedness, and compactness; the intermediate value, extreme value, monotone convergence, Bolzano/Weierstrass and Heine/Borel theorems; convergence and uniform convergence of sequences of continuous functions; differentiation. Previously MA 0371.

MATH 3373 Complex Analysis **3 Credits**
Prerequisites: MATH 2231, MATH 2273.
Topics in this course include algebra of complex numbers, Cauchy-Riemann equations and analytic functions, complex differentiation, integration in the complex plane, Cauchy's Theorem and integral formula, conformal mapping, Laurent series and residue theory, and applications. Previously MA 0373.

MATH 3377 Numerical Analysis **3 Credits**
Prerequisites: MATH 1172, MATH 2235, proficiency in a computer language.
This course investigates computer arithmetic, round-off errors, the solution of nonlinear equations, polynomial approximation, numerical differentiation and integration, and the solution of systems of linear equations via student-written code to implement the algorithms and/or the use of available software. Previously MA 0377.

MATH 3383 Modern Geometry **3 Credits**
Attributes: EDCG Educational Studies Cognate
Prerequisites: MATH 2231, MATH 2235.
Topics in this course include: foundation for plane geometries; theorems of Menelaus, Ceva, Desargues, Pascal, Brianchon, and Feuerbach; inversion and reciprocation transformations; projective, Riemannian and Lobachevskian geometries; and Poincaré models. Previously MA 0383.

MATH 3385 Point Set Topology **3 Credits**
Prerequisite: MATH 3371.
This course considers topological spaces, continuous functions; product, metric, and quotient spaces; countability and separation axioms; existence and extension of continuous functions; compactification; metrization theorems and complete metric spaces. Previously MA 0385.

MATH 4391 Honors Seminar I **3 Credits**
This course is open to senior mathematics majors with a mathematics GPA of 3.5 or higher and invited junior and senior mathematics majors with demonstrated ability who have been recommended by the mathematics faculty. This seminar provides talented students with an opportunity to undertake individualized study under faculty direction. Participants present several lectures before a group of peers. The seminar's subject matter varies each semester. Previously MA 0390.

MATH 4392 Honors Seminar II **3 Credits**
This course is open to senior mathematics majors with a mathematics GPA of 3.5 or higher and invited junior and senior mathematics majors with demonstrated ability who have been recommended by the mathematics faculty. This seminar provides talented students with an opportunity to undertake individualized study under faculty direction. Participants present several lectures before a group of peers. The seminar's subject matter varies each semester. Previously MA 0391.

MATH 4900 Special Topics (Shell) **3 Credits**
Prerequisites: MATH 2231, additional mathematics courses depending on the topic.
Mathematical topics not currently among the department's offerings can be offered one-time or to allow a professor the opportunity to "test drive" a course for the first time. Previously MA 0395.

MATH 4980 Internship **1-3 Credits**
Prerequisite: Senior standing.
The internship program provides senior mathematics majors with opportunities to gain practical, career-related experience in a variety of supervised field settings. Student interns select from a variety of placements, especially those requiring applications of mathematics, numerical methods, and statistics. Interns spend a minimum of 10 hours per week working at the placement site and complete the required academic component specified by their faculty advisor. Internship credits vary; interns may register for a summer session and/or one or two semesters for an overall maximum of six credits. In addition, an internship must satisfy the requirements outlined in the University Internship Policy, which is available from the Career Center. An internship may not take the place of a mathematics elective. Enrollment by permission only. Previously MA 0397-0398.

MATH 4990 Independent Study **1-3 Credits**
Independent study provides students with the opportunity to examine areas not covered in the undergraduate curriculum. Under the guidance of a faculty member, advanced students learn about an area in mathematics through reading and research. Independent study includes written work in the form of exercises or papers. Students apply to a professor under whose direction they wish to study and obtain the approval of the department chair. This course may not replace a mathematics elective to fulfill the requirements for the major unless special permission is given by the department chair. Previously MA 0399.

MATH 5401 Introduction to Applied Mathematics **3 Credits**
This course provides an introduction to essential techniques in the study of ordinary differential equations, including separation of variables, characteristic equations for linear equations, variation of parameters and Laplace transforms. The course also includes an introduction to fundamentals of applied linear algebra, including solutions of systems of linear equations, vector spaces, matrices, determinants, eigenvalues and eigenvectors. Students should have a solid undergraduate background through multivariable calculus. Previously MA 0401.

MATH 5417 Applied Statistics I **3 Credits**
This course introduces students to the techniques in applied statistical methods as used in the physical sciences, social sciences and business. Topics include probability (reliability, discrete and continuous distributions); descriptive and exploratory statistics using analytic and graphical tools; basic statistical testing (sampling techniques, theory of estimation and standard hypothesis testing); regression analysis (normal linear model, multivariate regression, and model building as time permits); correlation techniques; analysis of variance and factorial designs if time permits; proportion tests, chi-squared analysis and other discrete data techniques as time permits. Included is the use of computer software, such as R, SPSS, and Minitab. Students should have a solid undergraduate background through multivariable calculus. Previously MA 0417.

MATH 5418 Applied Statistics II **3 Credits**
Prerequisite: MATH 5417.
This course is a continuation of MATH 5417 and covers additional statistical concepts used in the physical sciences, social sciences, business and health studies. Topics include, but are not limited to, confidence intervals, regression analysis (multiple regression, logistic regression and regression with categorical predictors), analysis of variance (two-way, factorial design, repeated measures and mixed models), analysis of categorical variables (measures of association, chi-squared tests, odds ratio, relative risk, McNemar's test) and non-parametric tests. One statistical package such as R, SPSS, and Minitab, will be used throughout the course. Students should have a laptop. Previously MA 0418.

MATH 5435 Linear Algebra **3 Credits**
This graduate-level treatment of linear algebra includes general vector spaces; basis and dimension; linear transformations; linear operators and the relationship to matrices; inner product spaces and orthonormalization, least squares approximations, Hilbert spaces; diagonalization and other canonical forms for matrices; eigenvalues, eigenvectors, and applications to ordinary differential equations; and Hermitian, unitary, and positive definite matrices. The course also incorporates a discussion of the historical development of linear algebra, the relationship of linear algebra to analysis, and a coordinated introduction to a symbolic algebra program such as Maple or Mathematica. Students should have a solid background in undergraduate linear algebra or applied matrix theory, which is well-covered by MATH 5401. Previously MA 0435.

MATH 5436 Abstract Algebra **3 Credits**
This graduate level treatment of abstract algebra with a focus on ring theory includes the integers, the division algorithm divisibility criteria, primes and unique factorization; equivalence relations and congruence classes, modular arithmetic; rings, basic properties of rings, ideals, ring homeomorphisms; ring of polynomials, divisibility algorithm, irreducible elements and unique factorization properties, roots and irreducibility; quotients rings, prime and maximal ideals; Euclidian domains, principal ideals domains, factorization domains, field of quotients of an integral domain; introduction to group theory. Students should have a solid background in theoretical mathematics and linear algebra at the undergraduate level. This is a proof-intensive course. Previously MA 0436.

MATH 5451 Probability Theory **3 Credits**
This graduate-level treatment of the theory of probability includes a brief review of probability spaces and finite counting techniques, random variables and distribution functions, density, mass functions, and expectation. The course also examines the standard random variables; multivariate distributions; functions and sums of random variables; limit theorems - weak and strong law of large numbers and the central limit theorem. The course also discusses the historical development of probability. Students should have a solid background in undergraduate mathematics through multivariable calculus, and some familiarity with theory and proof in mathematics. Previously MA 0451.

MATH 5452 Statistics Theory **3 Credits**
Prerequisite: MATH 5451.
This graduate-level treatment of the theory of mathematical statistics includes theory of estimators, maximum likelihood techniques; theory of estimation; hypothesis testing theory - decision analysis; and Bayesian methods. The course also discusses the historical development of statistics. This is a proof intensive course. Previously MA 0452.

MATH 5471 Real Analysis **3 Credits**
This graduate-level treatment of real analysis includes the completeness of the real numbers; the topology of Euclidean n-space and its generalizations to metric and topological spaces; convergence and continuous functions; sequences of functions; general differentiability; the theory of integration and the Lebesgue integral; infinite series and uniform convergence; and a discussion of the historical development of real analysis. Students should have a solid background in undergraduate mathematics through second-semester calculus and theoretical mathematics. Previously MA 0471.

MATH 5472 Complex Analysis **3 Credits**
This graduate-level treatment of complex analysis includes the complex number field and its properties; complex analytic functions and their differences with real functions; the complex integral; Cauchy's Theorem and consequences; and a discussion of the historical development of complex analysis. Students should have a solid background in undergraduate mathematics through multivariable calculus and some familiarity with theory in proof in mathematics. This is a proof-intensive course. Previously MA 0472.

MATH 5900 Special Topics (Shell) **3 Credits**
Mathematical topics not currently among the department's offerings may be offered once or to allow a professor the opportunity to "test drive" a course for the first time. Previously MA 0495.

MATH 6510 Foundations and Set Theory **3 Credits**
The foundations of modern mathematics lie in set theory and logic. This course provides a graduate-level treatment of these areas in the foundation of theoretical mathematics. It is also a good preparation for proof-intensive courses for those without a solid undergraduate foundation in theoretical mathematics. Students should have some familiarity with theory and proof in mathematics. Previously MA 0510.

MATH 6531 Dynamical Systems **3 Credits**
This course provides an introduction to the study of dynamical systems from the point of view of both continuous time and discrete time systems. Topics include fixed point and stability analysis for linear and nonlinear flows in one and two dimensions, phase plane analysis, bifurcations and limit cycles, one-dimensional maps, chaos, and Lyapunov exponents. Students should have a solid background in undergraduate mathematics through multivariable calculus, ordinary differential equations, and applied matric theory or linear algebra, which is well-covered by MATH 5401. Previously MA 0531.

MATH 6532 Partial Differential Equations **3 Credits**
This graduate-level treatment of partial differential equations includes boundary value problems, Fourier series, and Fourier transforms. Students should have a solid background in undergraduate mathematics through multivariable calculus, ordinary differential equations, and applied matric theory or linear algebra, which is well-covered by MATH 5401. Previously MA 0532.

MATH 6535 Advanced Abstract Algebra **3 Credits**
Prerequisite: MATH 5436.
A collection of topics in advanced abstract algebra, this course includes group theory, field extensions and Galois. Students should have a solid background in theoretical mathematics at the undergraduate level and in linear algebra. This is a proof-intensive course. Previously MA 0535.

MATH 6537 Number Theory **3 Credits**
This graduate-level survey of the problems and techniques of number theory includes elementary number theory and introductions to analytic and algebraic number theory. Students should have some familiarity with theory and proof in mathematics. This is a proof-intensive course. Previously MA 0537.

MATH 6550 Classical Financial Mathematics **3 Credits**
This course covers the basic mathematics of classical financial investments. It will include the basic formulas for compound interest and effective yields, infinite series and exponential functions, annuities and perpetuities, amortization and sinking funds, time value of money, and bond and stock discounts. Students should have a solid background in undergraduate mathematics through second-semester calculus. Previously MA 0550.

MATH 6565 Use of Technology in the Classroom **3 Credits**
Designed for teachers, this course surveys various computer software mathematics packages suitable for use in the classroom, such as Maple, Mathematica, MATLAB, SKETCHPAD, and ISETL. The course includes a description of the programs and discusses how they can be integrated into a classroom setting. Students should have a solid background in undergraduate mathematics through second-semester calculus. Previously MA 0565.

MATH 6577 Numerical Analysis **3 Credits**
This course provides a graduate-level treatment of numerical analysis and the numerical solution of mathematical problems and includes an introduction to computer implementation of numerical algorithms. Students should have a solid background in undergraduate mathematics through multivariable calculus. Previously MA 0577.

MATH 6578 Math of Financial Derivatives **3 Credits**
Prerequisite: MATH 6550.
This course covers the theory of financial derivatives, including an explanation of option pricing theory and investments, the idea of financial derivatives, stochastic differential equations, and the Black-Scholes model. Previously MA 0578.

MATH 6583 Geometry **3 Credits**
This course offers a graduate-level treatment of Euclidean and non-Euclidean geometry and is highly recommended for teachers. Students should have some familiarity with theory and proof in mathematics. This is a proof-intensive course. Previously MA 0583.

MATH 6585 Topology **3 Credits**
Prerequisite: MATH 5471.
This course provides an introductory, graduate-level treatment of point-set and algebraic topology and topological methods. This is a proof-intensive course. Previously MA 0585.

MATH 6990 Independent Study **3 Credits**

The Master's Degree Program in Mathematics affords each student the opportunity to do an independent study course with a professor or mentor. This can either be an existing course in the program or a course on an advanced topic in mathematics. In the latter case the syllabus and requirements are developed by the student and the faculty mentor. Previously MA 0599.

MATH 6999 Capstone Project **0 Credits**

This is an independent project or presentation planned by the student with the help of a faculty mentor and produced by the student through original work. The project is typically based on the content of a course and is worked on in conjunction with that course, but students can also learn the necessary material in a three-credit independent study with their mentor. Previously MA 0590.