MATHEMATICS (MATH)

MATH 5000. Mathematical Pedagogy. (1 Credit)
The theory and practice of teaching mathematics at the college level. Basic skills, grading methods, cooperative learning, active learning, use of technology, classroom problems, history of learning theory, reflective practice. Open to graduate students in Mathematics, others with consent of instructor. May not be used to satisfy degree requirements in mathematics.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205000)

MATH 5005. Advanced Content Knowledge for Math Teacher Leadership. (3 Credits)
Exploration of some of the major ideas and concepts of the school mathematics curriculum from the advanced perspective of a teacher. Emphasis on mathematical reasoning and deep conceptual understanding. Main focus: Proportional reasoning as it constitutes the backbone structure for higher-level mathematical ideas, and mathematical modeling which provides a solid foundation for learning through meaningful problem solving.
Enrollment Requirements: Instructor consent.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205005)

MATH 5010. Topics in Analysis I. (3 Credits)
Advanced topics in analysis.
May be repeated for credit
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205010)

MATH 5016. Topics in Probability. (3 Credits)
Advanced topics in probability theory, theory of random processes, mathematical statistics, and related fields.
May be repeated for credit
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205016)

MATH 5020. Topics in Algebra. (3 Credits)
Advanced topics chosen from group theory, ring theory, number theory, Lie theory, combinatorics, commutative algebra, algebraic geometry, homological algebra, and representation theory.
Enrollment Requirements: MATH 5211.
May be repeated for credit
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205020)

MATH 5026. Topics in Mathematical Logic. (3 Credits)
Topics include, but are not restricted to, Computability Theory, Model Theory, and Set Theory.
Enrollment Requirements: MATH 5260.
May be repeated for credit
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205026)

MATH 5030. Topics in Geometry and Topology I. (3 Credits)
Advanced topics in geometry and topology. May be repeated for credit with a change of topic.
May be repeated for credit
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205030)

MATH 5031. Topics in Geometry and Topology II. (3 Credits)
Advanced topics in Geometry and Topology.
May be repeated for credit
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205031)

MATH 5040. Topics in Applied Analysis I. (3 Credits)
Advanced topics from the theory of ordinary or partial differential equations. Other possible topics: integral equations, optimization theory, the calculus of variations, advanced approximation theory.
May be repeated for credit
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205040)

MATH 5070. Topics in Scientific Computation. (3 Credits)
May be repeated for credit
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205070)

MATH 5110. Introduction to Modern Analysis. (3 Credits)
Metric spaces, sequences and series, continuity, differentiation, the Riemann-Stielties integral, functions of several variables.
Enrollment Requirements: Instructor consent. Recommended preparation: Bachelor's degree in mathematics.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205110)

MATH 5111. Measure and Integration. (3 Credits)
General theory of measure and Lebesgue integration, L^p-spaces.
Enrollment Requirements: MATH 5110.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205111)

MATH 5120. Complex Function Theory I. (3 Credits)
An introduction to the theory of analytic functions, with emphasis on modern points of view.
Enrollment Requirements: MATH 5110.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205120)

MATH 5121. Topics in Complex Function Theory. (3 Credits)
Advanced topics of contemporary interest. These include Riemann surfaces, Kleinian groups, entire functions, conformal mapping, several complex variables, and automorphic functions, among others.
Enrollment Requirements: MATH 5120.
May be repeated for a total of 12 credits
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205121)

MATH 5130. Functional Analysis I. (3 Credits)
Normed linear spaces and algebras, the theory of linear operators, spectral analysis.
Enrollment Requirements: MATH 5111.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205130)

MATH 5131. Functional Analysis II. (3 Credits)
Normed linear spaces and algebras, the theory of linear operators, spectral analysis.
Enrollment Requirements: MATH 5111.
May be repeated for a total of 6 credits
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205131)

MATH 5140. Fourier Analysis. (3 Credits)
Foundations of harmonic analysis developed through the study of Fourier series and Fourier transforms.
Enrollment Requirements: MATH 5111.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205140)

MATH 5141. Abstract Harmonic Analysis. (3 Credits)
Harmonic analysis on Abelian and non-Abelian locally compact groups, Pontryagin duality, the Peter-Weyl theorem, various Fourier transforms and connections to unitary representation theory.
Enrollment Requirements: MATH 5111.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205141)

MATH 5160. Probability Theory and Stochastic Processes I. (3 Credits)
Convergence of random variables and their probability laws, maximal inequalities, series of independent random variables and laws of large numbers, central limit theorems, martingales, Brownian motion.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205160)

MATH 5161. Probability Theory and Stochastic Processes II. (3 Credits)
Contemporary theory of stochastic processes, including stopping times, stochastic integration, stochastic differential equations and Markov processes, Gaussian processes, and empirical and related processes with applications in asymptotic statistics.
Enrollment Requirements: MATH 5160.
May be repeated for a total of 12 credits
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205161)

MATH 5210. Abstract Algebra I. (3 Credits)
Group theory, ring theory and modules, and universal mapping properties.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205210)

MATH 5211. Abstract Algebra II. (3 Credits)
Linear and multilinear algebra, Galois theory, category theory, and commutative algebra.
Enrollment Requirements: MATH 5210.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205211)

MATH 5220. Introduction to Representation Theory. (3 Credits)
Semi-simple rings, Jacobson radical, density theory, Wedderburn's Theorem, representations and characters of groups, orthogonality relations, Burnside's theorem.
Enrollment Requirements: MATH 5210.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205220)

MATH 5230. Algebraic Number Theory. (3 Credits)
Algebraic integers, ideal class group, ramification, Frobenius elements in Galois groups, Dirichlet's unit theorem, localization, and completion. Further topics (zeta-functions, function fields, non-maximal orders) as time permits.
Enrollment Requirements: MATH 5211.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205230)

MATH 5250. Modern Matrix Theory and Linear Algebra. (3 Credits)
The LU, QR, symmetric, polar, and singular value matrix decompositions. Schur and Jordan normal forms. Symmetric, positive-definite, normal and unitary matrices. Perron-Frobenius theory and graph criteria in the theory of non-negative matrices.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205250)

MATH 5260. Mathematical Logic I. (3 Credits)
Predicate calculus, completeness, compactness, Lowenheim-Skolem theorems, formal theories with applications to algebra, Godel's incompleteness theorem. Further topics chosen from: axiomatic set theory, model theory, recursion theory, computational complexity, automata theory and formal languages.
Enrollment Requirements: MATH 5210.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205260)

MATH 5310. Introduction to Geometry and Topology I. (3 Credits)
Topological spaces, maps, induced topologies, separation axioms, compactness, connectedness, classification of surfaces, the fundamental group and its applications, covering spaces.
Enrollment Requirements: MATH 5110, which may be taken concurrently.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205310)

MATH 5311. Introduction to Geometry and Topology II. (3 Credits)
Smooth manifolds, vector fields, differential forms, de Rham cohomology, homology theory, singular (co)homology, Poincaré duality.
Enrollment Requirements: MATH 5310.
May be repeated for a total of 12 credits
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205311)

MATH 5320. Algebraic Geometry I. (3 Credits)
This course is an introduction to algebraic varieties: affine and projective varieties, dimension of varieties and subvarieties, algebraic curves, singular points, divisors and line bundles, differentials, intersections.
Enrollment Requirements: MATH 5211 and MATH 5310, which may be taken concurrently.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205320)

MATH 5321. Algebraic Geometry II. (3 Credits)
This course introduces further concepts and methods of modern algebraic geometry, including schemes and cohomology.
Enrollment Requirements: MATH 5320.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205321)

MATH 5360. Differential Geometry. (3 Credits)
This course is an introduction to the study of differentiable manifolds on which various differential and integral calculi are developed. The topics include covariant derivatives and connections, geodesics and exponential map, Riemannian metrics, curvature tensor, Ricci and scalar curvature.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205360)

MATH 5410. Introduction to Applied Mathematics I. (3 Credits)
Banach spaces, linear operator theory and application to differential equations, nonlinear operators, compact sets on Banach spaces, the adjoint operator on Hilbert space, linear compact operators, Fredholm alternative, fixed point theorems and application to differential equations, spectral theory, distributions.
Enrollment Requirements: MATH 5110 or instructor consent.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205410)

MATH 5420. Ordinary Differential Equations. (3 Credits)
Existence and uniqueness of solutions, stability and asymptotic behavior. If time permits: eigenvalue problems, dynamical systems, existence and stability of periodic solutions.
Enrollment Requirements: MATH 5111.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205420)

MATH 5440. Partial Differential Equations. (3 Credits)
Cauchy Kowalewsky Theorem, classification of second-order equations, systems of hyperbolic equations, the wave equation, the potential equation, the heat equation in Rn.
Enrollment Requirements: MATH 5110. Recommended preparation: MATH 5111 and 5410.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205440)

MATH 5510. Numerical Analysis and Approximation Theory I. (3 Credits)
The study of convergence, numerical stability, roundoff error, and discretization error arising from the approximation of differential and integral operators.
Enrollment Requirements: MATH 5110, which may be taken concurrently.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205510)

MATH 5520. Finite Element Solution Methods I. (3 Credits)
Numerical solution of elliptic, parabolic and hyperbolic partial differential equations by finite element solution methods. Applications.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205520)

MATH 5600. Fundamentals of Financial Mathematics. (3 Credits)
The risk-neutral model for pricing and hedging derivative financial instruments within the context of binomial and trinomial models of the stock price process.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205600)

MATH 5620. Financial Mathematics I. (3 Credits)
The mathematics of measurement of interest, accumulation and discount, present value, annuities, loans, bonds, and other securities.
Enrollment Requirements: Not open to students who have passed MATH 2620.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205620)

MATH 5630. Long-Term Actuarial Mathematics I. (4 Credits)
Long-term insurance products, survival and longevity models, life tables, life insurance, life annuities, premium calculations, reserves.
Enrollment Requirements: MATH 2620 or MATH 5620, which may be taken concurrently. Not open to students who have passed MATH 3630.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205630)

MATH 5631. Long-Term Actuarial Mathematics II. (4 Credits)
A continuation of Long-Term Actuarial Mathematics I. Topics include multiple state models, multiple decrements, multiple lives, profit and loss analysis, pension plans and funding, retirement benefits, long-term health and disability.
Enrollment Requirements: MATH 5630. Not open to students who have passed MATH 3631.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205631)

MATH 5637. Statistics for Actuarial Modeling. (4 Credits)
Data analysis for actuaries, linear models including generalized linear models, time series, principal component analysis, decision trees, cluster analysis, statistical computing with R, actuarial applications.
Enrollment Requirements: Not open to students who have passed MATH 3636 or 3637.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205637)

MATH 5638. Predictive Analytics for Actuaries. (3 Credits)
Models for predictive analytics, model building, selection, estimation, validation and diagnostics, and limitations; actuarial applications, and communication of results.
Enrollment Requirements: MATH 5637.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205638)

MATH 5639. Actuarial Loss Models. (3 Credits)
Loss distribution models for claim frequency and severity, aggregate risk models, coverage modifications, risk measures, construction and selection of parametric models, introduction to simulation.
Enrollment Requirements: Not open to students who have passed MATH 3639.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205639)

MATH 5640. Short-Term Insurance Ratemaking. (3 Credits)
Credibility theory, pricing for short-term insurance coverages, reinsurance, experience rating, risk classification, introduction to Bayesian statistics.
Enrollment Requirements: MATH 5639. Not open to students who have passed MATH 3640.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205640)

MATH 5641. Short-Term Insurance Reserving. (3 Credits)
Techniques for estimating unpaid claims, use of claims triangles, underlying statistical theory behind the techniques, basic adjustments to data and estimation techniques to account for internal and external environments, estimating recoveries, model adequacy and reasonableness.
Enrollment Requirements: MATH 5639. Not open to students who have passed MATH 3641.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205641)

MATH 5650. Financial Mathematics II. (4 Credits)
The continuation of Math 5620, focusing on the mathematics of finance: measurement of financial risk and the opportunity cost of capital, the mathematics of capital budgeting and securities valuation, mathematical analysis of financial decisions and capital structure, and option pricing theory. Provides VEE credit in the Corporate Finance subject area for Society of Actuaries and Casualty Actuarial Society requirements.
Enrollment Requirements: Not open to students who have passed MATH 3650.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205650)

MATH 5660. Advanced Financial Mathematics. (3 Credits)
An introduction to the standard models of modern financial mathematics including martingales, the binomial asset pricing model, Brownian motion, stochastic integrals, stochastic differential equations, continuous time financial models, completeness of the financial market, the Black-Scholes formula, the fundamental theorem of finance, American options, and term structure models.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205660)

MATH 5661. Yield Curve Models. (3 Credits)
The theory and practice of stochastic models to analyze and value interest rate derivatives, and practical issues in the markets where they are traded.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205661)

MATH 5670. Financial Programming and Modeling. (3 Credits)
Optimization; linear and non-linear programming; data mining and machine learning in a financial context.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205670)

MATH 5671. Financial Data Mining and Big Data Analytics. (3 Credits)
Data structures and algorithms; regression; classification; clustering; recommender systems; anomaly detection; Big Data tools; databases.
Enrollment Requirements: Recommended preparation: MATH 5670.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205671)

MATH 5698. Topics in Actuarial Science. (3 Credits)
Advanced topics in Actuarial Science.
Enrollment Requirements: Open to graduate students only.
May be repeated for credit
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205698)

MATH 5788. Variable Topics. (1-3 Credits)
Prerequisites and recommended preparation vary. With a change in content, may be repeated for credit. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).
May be repeated for a total of 30 credits
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205788)

MATH 5789. Independent Study. (1-6 Credits)
With a change in content, may be repeated for credit. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).
May be repeated for a total of 6 credits
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205789)

MATH 5798. Variable Topics. (1-3 Credits)
Prerequisites and recommended preparation vary. With a change in content, may be repeated for credit for a total of 30 credits.
May be repeated for a total of 30 credits
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205798)

MATH 5799. Independent Study. (1-6 Credits)
With a change in content, may be repeated for credit.
Enrollment Requirements: Instructor consent.
May be repeated for a total of 30 credits
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205799)

MATH 5800. Investigation of Special Topics. (1-6 Credits)
Students who have well defined mathematical problems worthy of investigation and advanced reading should submit to the department a semester work plan.
May be repeated for a total of 36 credits
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205800)

MATH 5850. Graduate Field Study Internship. (1-3 Credits)
Participation in internship and paper describing experiences. May be repeated for a total of six credits.
Enrollment Requirements: Instructor consent.
May be repeated for a total of 6 credits
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%205850)

MATH 6000. Seminar in Current Mathematical Literature. (1-6 Credits)
Participation and presentation of mathematical papers in joint student faculty seminars. Variable topics.
May be repeated for a total of 12 credits
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%206000)

MATH 6010. Seminar in Analysis. (1-6 Credits)
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%206010)

MATH 6020. Seminar in Algebra. (1-6 Credits)
Enrollment Requirements: MATH 5211.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%206020)

MATH 6026. Seminar in Mathematical Logic. (1-6 Credits)
Enrollment Requirements: MATH 5260.
May be repeated for a total of 12 credits
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%206026)

MATH 6030. Seminar in Topology. (1-6 Credits)
Enrollment Requirements: MATH 5321.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%206030)

MATH 6036. Seminar in Geometry. (1-6 Credits)
Enrollment Requirements: MATH 5360.
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%206036)

MATH 6040. Seminar in Applied Mathematics. (1-6 Credits)
View Classes (https://catalog.uconn.edu/course-search/?details&code=MATH%206040)