Mathematics (MATH)

Courses

MATH 1A Calculus 4 Units
This sequence is intended for majors in engineering and the physical sciences. An introduction to differential and integral calculus of functions of one variable, with applications and an introduction to transcendental functions.
Rules & Requirements

Prerequisites: Three and one-half years of high school math, including trigonometry and analytic geometry, plus a satisfactory grade in one of the following: CEEB MAT test, an AP test, the UC/CSU math diagnostic test, or 32. Consult the mathematics department for details. Students with AP credit should consider choosing a course more advanced than 1A

Credit Restrictions: Students will receive no credit for 1A after taking 16B and 2 units after taking 16A.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of discussion per week

Summer: 8 weeks - 5 hours of lecture and 5 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 1B Calculus 4 Units
Continuation of 1A. Techniques of integration; applications of integration. Infinite sequences and series. First-order ordinary differential equations. Second-order ordinary differential equations; oscillation and damping; series solutions of ordinary differential equations.
Rules & Requirements

Prerequisites: 1A

Credit Restrictions: Students will receive 2 units of credit for 1B after taking 16B.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of discussion per week

Summer: 8 weeks - 5 hours of lecture and 5 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH H1B Honors Calculus 4 Units
Honors version of 1B. Continuation of 1A. Techniques of integration; applications of integration. Infinite sequences and series. First-order ordinary differential equations. Second-order ordinary differential equations; oscillation and damping; series solutions of ordinary differential equations.
Rules & Requirements

Prerequisites: 1A

Credit Restrictions: Students will receive 2 units of credit for H1B after taking 16B.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of discussion per week

Summer: 8 weeks - 5 hours of lecture and 5 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 10A Methods of Mathematics: Calculus, Statistics, and Combinatorics 4 Units
This sequence is intended for majors in the life sciences. Introduction to differential and integral calculus of functions of one variable. Representation of data, elementary probability theory, statistical models, and testing.
Rules & Requirements

Prerequisites: Three and one-half years of high school math, including trigonometry and analytic geometry

Credit Restrictions: Students will receive 2 units for 10A after taking 1A.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 3 hours of discussion per week

Summer: 8 weeks - 5 hours of lecture and 5 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 10B Methods of Mathematics: Calculus, Statistics, and Combinatorics 4 Units
Elementary combinatorics and discrete probability theory. Introduction to graphs, matrix algebra, linear equations, difference equations, and differential equations.
Rules & Requirements

Prerequisites: Continuation of 10A

Credit Restrictions: Students will receive 2 units for 10B after taking 55.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 3 hours of discussion per week

Summer: 8 weeks - 5 hours of lecture and 5 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 16A Analytic Geometry and Calculus 3 Units
This sequence is intended for majors in the life and social sciences. Calculus of one variable; derivatives, definite integrals and applications, maxima and minima, and applications of the exponential and logarithmic functions.
Rules & Requirements

Prerequisites: Three years of high school math, including trigonometry, plus a satisfactory grade in one of the following: CEEB MAT test, an AP test, the UC/CSU math diagnostic exam, or 32. Consult the mathematics department for details

Credit Restrictions: Students will receive no credit for 16A after taking 1A. Two units of 16A may be used to remove a deficient grade in 1A.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Summer: 8 weeks - 4 hours of lecture and 4 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 16B Analytic Geometry and Calculus 3 Units
Continuation of 16A. Application of integration of economics and life sciences. Differential equations. Functions of many variables. Partial derivatives, constrained and unconstrained optimization.
Rules & Requirements

Prerequisites: 16A

Credit Restrictions: Students will receive no credit for 16B after 1B, 2 units after 1A. Two units of 16B may be used to remove a deficient grade in 1A.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 1 hour of discussion per week

Summer: 8 weeks - 4 hours of lecture and 4 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 24 Freshman Seminars 1 Unit
The Berkeley Seminar Program has been designed to provide new students with the opportunity to explore an intellectual topic with a faculty member in a small-seminar setting. Berkeley Seminars are offered in all campus departments, and topics vary from department to department and semester to semester.
Rules & Requirements

Repeat rules: Course may be repeated for credit as topic varies. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of seminar per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: The grading option will be decided by the instructor when the class is offered. Final exam required.

MATH 32 Precalculus 4 Units
Polynomial and rational functions, exponential and logarithmic functions, trigonometry and trigonometric functions. Complex numbers, fundamental theorem of algebra, mathematical induction, binomial theorem, series, and sequences.
Rules & Requirements

Prerequisites: Three years of high school mathematics, plus satisfactory score on one of the following: CEEB MAT test, math SAT, or UC/CSU diagnostic examination

Credit Restrictions: Students will receive no credit for 32 after taking 1A-1B or 16A-16B and will receive 3 units after taking 96.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 2 hours of discussion per week

Summer:
6 weeks - 5 hours of lecture and 5 hours of discussion per week
8 weeks - 5 hours of lecture and 5 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH N32 Precalculus 4 Units
Polynomial and rational functions, exponential and logarithmic functions, trigonometry and trigonometric functions. Complex numbers, fundamental theorem of algebra, mathematical induction, binomial theorem, series, and sequences.
Rules & Requirements

Prerequisites: Three years of high school mathematics, plus satisfactory score on one of the following: CEEB MAT test, math SAT, or UC/CSU diagnostic examination

Credit Restrictions: Students will receive no credit for N32 after taking 1A-1B or 16A-16B and will receive 3 units after taking 96.

Hours & Format

Summer: 8 weeks - 12.5 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Gibson

MATH 39A Freshman/Sophomore Seminar 2 - 4 Units
Freshman and sophomore seminars offer lower division students the opportunity to explore an intellectual topic with a faculty member and a group of peers in a small-seminar setting. These seminars are offered in all campus departments; topics vary from department to department and from semester to semester.
Rules & Requirements

Prerequisites: Priority given to freshmen and sophomores

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2-4 hours of seminar per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 49 Supplementary Work in Lower Division Mathematics 1 - 3 Units
Students with partial credit in lower division mathematics courses may, with consent of instructor, complete the credit under this heading.
Rules & Requirements

Prerequisites: Some units in a lower division Mathematics class

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Summer:
6 weeks - 1-5 hours of independent study per week
8 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

MATH 53 Multivariable Calculus 4 Units
Parametric equations and polar coordinates. Vectors in 2- and 3-dimensional Euclidean spaces. Partial derivatives. Multiple integrals. Vector calculus. Theorems of Green, Gauss, and Stokes.
Rules & Requirements

Prerequisites: Mathematics 1B

Credit Restrictions: Students will receive no credit for Mathematics 53 after completing Mathematics W53, 53M; 3 units for Mathematics 50A and 1 unit for Mathematics 50B. A deficient grade in 53 may be removed by completing Mathematics W53.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of discussion per week

Summer: 8 weeks - 5 hours of lecture and 5 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH H53 Honors Multivariable Calculus 4 Units
Honors version of 53. Parametric equations and polar coordinates. Vectors in 2- and 3-dimensional Euclidean spaces. Partial derivatives. Multiple integrals. Vector calculus. Theorems of Green, Gauss, and Stokes.
Rules & Requirements

Prerequisites: 1B

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH W53 Multivariable Calculus 4 Units
Parametric equations and polar coordinates. Vectors in 2- and 3-dimensional Euclidean spaces. Partial derivatives. Multiple integrals. Vector calculus. Theorems of Green, Gauss, and Stokes.
Rules & Requirements

Prerequisites: Mathematics 1B or equivalent

Credit Restrictions: Students will receive no credit for Mathematics W53 after taking Mathematics 53. A deficient grade in Mathematics W53 may be removed by completing Mathematics 53.

Hours & Format

Summer: 8 weeks - 5 hours of web-based lecture and 5 hours of web-based discussion per week

Online: This is an online course.

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Instructor: Hutchings

MATH 54 Linear Algebra and Differential Equations 4 Units
Basic linear algebra; matrix arithmetic and determinants. Vector spaces; inner product as spaces. Eigenvalues and eigenvectors; linear transformations. Homogeneous ordinary differential equations; first-order differential equations with constant coefficients. Fourier series and partial differential equations.
Rules & Requirements

Prerequisites: 1B

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of discussion per week

Summer: 8 weeks - 5 hours of lecture and 5 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH H54 Honors Linear Algebra and Differential Equations 4 Units
Honors version of 54. Basic linear algebra: matrix arithmetic and determinants. Vectors spaces; inner product spaces. Eigenvalues and eigenvectors; linear transformations. Homogeneous ordinary differential equations; first-order differential equations with constant coefficients. Fourier series and partial differential equations.
Rules & Requirements

Prerequisites: 1B

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 55 Discrete Mathematics 4 Units
Logic, mathematical induction sets, relations, and functions. Introduction to graphs, elementary number theory, combinatorics, algebraic structures, and discrete probability theory.
Rules & Requirements

Prerequisites: Mathematical maturity appropriate to a sophomore math class. 1A-1B recommended

Credit Restrictions: Students will receive no credit for 55 after taking Computer Science 70.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of discussion per week

Summer: 8 weeks - 5 hours of lecture and 5 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 74 Transition to Upper Division Mathematics 3 Units
The course will focus on reading and understanding mathematical proofs. It will emphasize precise thinking and the presentation of mathematical results, both orally and in written form. The course is intended for students who are considering majoring in mathematics but wish additional training.
Rules & Requirements

Prerequisites: 53 and 54

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of discussion per week

Summer: 8 weeks - 6 hours of lecture and 0-2 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 91 Special Topics in Mathematics 4 Units
Topics to be covered and the method of instruction to be used will be announced at the beginning of each semester that such courses are offered. See department bulletins.
Rules & Requirements

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Summer: 8 weeks - 6 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 96 College Algebra 2 Units
Elements of college algebra. Designed for students who do not meet the prerequisites for 32. Offered through the Student Learning Center.
Rules & Requirements

Repeat rules: Students will receive no credit for 96 after taking P, PS, or 32. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 4 hours of workshop per week

Summer:
6 weeks - 10 hours of workshop per week
8 weeks - 10 hours of workshop per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 98 Supervised Group Study 1 - 4 Units
Directed Group Study, topics vary with instructor.
Rules & Requirements

Repeat rules: Course may be repeated for a maximum of 4 units.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of directed group study per week

Summer: 8 weeks - 1.5-7.5 hours of directed group study per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

MATH 98BC Berkeley Connect 1 Unit
Berkeley Connect is a mentoring program, offered through various academic departments, that helps students build intellectual community. Over the course of a semester, enrolled students participate in regular small-group discussions facilitated by a graduate student mentor (following a faculty-directed curriculum), meet with their graduate student mentor for one-on-one academic advising, attend lectures and panel discussions featuring department faculty and alumni, and go on field trips to campus resources. Students are not required to be declared majors in order to participate.
Rules & Requirements

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

MATH 99 Supervised Independent Study 1 - 4 Units
Supervised independent study by academically superior, lower division students. 3.3 GPA required and prior consent of instructor who is to supervise the study. A written proposal must be submitted to the department chair for pre-approval.
Rules & Requirements

Prerequisites: Restricted to freshmen and sophomores only. Consent of instructor

Credit Restrictions: Enrollment is restricted; see the Introduction to Courses and Curricula section of this catalog.

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of independent study per week

Summer: 8 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

MATH C103 Introduction to Mathematical Economics 4 Units
Selected topics illustrating the application of mathematics to economic theory. This course is intended for upper-division students in Mathematics, Statistics, the Physical Sciences, and Engineering, and for economics majors with adequate mathematical preparation. No economic background is required.
Rules & Requirements

Prerequisites: MATH 53 (http://guide.berkeley.edu/search/?P=MATH%2053) and 54

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

Formerly known as: 103

Also listed as: ECON C103

MATH 104 Introduction to Analysis 4 Units
The real number system. Sequences, limits, and continuous functions in R and R. The concept of a metric space. Uniform convergence, interchange of limit operations. Infinite series. Mean value theorem and applications. The Riemann integral.
Rules & Requirements

Prerequisites: 53 and 54

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 0-2 hours of discussion per week

Summer: 8 weeks - 6 hours of lecture and 0-2 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH H104 Honors Introduction to Analysis 4 Units
Honors section corresponding to 104. Recommended for students who enjoy mathematics and are good at it. Greater emphasis on theory and challenging problems.
Rules & Requirements

Prerequisites: 53 and 54

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 105 Second Course in Analysis 4 Units
Differential calculus in Rn: the derivative as a linear map; the chain rule; inverse and implicit function theorems. Lebesgue integration on the line; comparison of Lebesgue and Riemann integrals. Convergence theorems. Fourier series, L2 theory. Fubini's theorem, change of variable.
Rules & Requirements

Prerequisites: 104

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 110 Linear Algebra 4 Units
Matrices, vector spaces, linear transformations, inner products, determinants. Eigenvectors. QR factorization. Quadratic forms and Rayleigh's principle. Jordan canonical form, applications. Linear functionals.
Rules & Requirements

Prerequisites: 54 or a course with equivalent linear algebra content

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of discussion per week

Summer: 8 weeks - 6 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH H110 Honors Linear Algebra 4 Units
Honors section corresponding to course 110 for exceptional students with strong mathematical inclination and motivation. Emphasis is on rigor, depth, and hard problems.
Rules & Requirements

Prerequisites: 54 or a course with equivalent linear algebra content

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 113 Introduction to Abstract Algebra 4 Units
Sets and relations. The integers, congruences, and the Fundamental Theorem of Arithmetic. Groups and their factor groups. Commutative rings, ideals, and quotient fields. The theory of polynomials: Euclidean algorithm and unique factorizations. The Fundamental Theorem of Algebra. Fields and field extensions.
Rules & Requirements

Prerequisites: 54 or a course with equivalent linear algebra content

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 0-2 hours of discussion per week

Summer: 8 weeks - 6 hours of lecture and 0-2 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH H113 Honors Introduction to Abstract Algebra 4 Units
Honors section corresponding to 113. Recommended for students who enjoy mathematics and are good at it. Greater emphasis on theory and challenging problems.
Rules & Requirements

Prerequisites: 54 or a course with equivalent linear algebra content

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 114 Second Course in Abstract Algebra 4 Units
Further topics on groups, rings, and fields not covered in Math 113. Possible topics include the Sylow Theorems and their applications to group theory; classical groups; abelian groups and modules over a principal ideal domain; algebraic field extensions; splitting fields and Galois theory; construction and classification of finite fields.
Rules & Requirements

Prerequisites: 110 and 113, or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 115 Introduction to Number Theory 4 Units
Divisibility, congruences, numerical functions, theory of primes. Topics selected: Diophantine analysis, continued fractions, partitions, quadratic fields, asymptotic distributions, additive problems.
Rules & Requirements

Prerequisites: 53 and 54

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 0-2 hours of discussion per week

Summer: 8 weeks - 6 hours of lecture and 0-4 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 116 Cryptography 4 Units
Construction and analysis of simple cryptosystems, public key cryptography, RSA, signature schemes, key distribution, hash functions, elliptic curves, and applications.
Rules & Requirements

Prerequisites: 55

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 0-2 hours of discussion per week

Summer: 8 weeks - 6 hours of lecture and 0-4 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 118 Fourier Analysis, Wavelets, and Signal Processing 4 Units
Introduction to signal processing including Fourier analysis and wavelets. Theory, algorithms, and applications to one-dimensional signals and multidimensional images.
Rules & Requirements

Prerequisites: 53 and 54

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 121A Mathematical Tools for the Physical Sciences 4 Units
Intended for students in the physical sciences who are not planning to take more advanced mathematics courses. Rapid review of series and partial differentiation, complex variables and analytic functions, integral transforms, calculus of variations.
Rules & Requirements

Prerequisites: 53 and 54

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 121B Mathematical Tools for the Physical Sciences 4 Units
Intended for students in the physical sciences who are not planning to take more advanced mathematics courses. Special functions, series solutions of ordinary differential equations, partial differential equations arising in mathematical physics, probability theory.
Rules & Requirements

Prerequisites: 53 and 54

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 123 Ordinary Differential Equations 4 Units
Existence and uniqueness of solutions, linear systems, regular singular points. Other topics selected from analytic systems, autonomous systems, Sturm-Liouville Theory.
Rules & Requirements

Prerequisites: 104

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 125A Mathematical Logic 4 Units
Sentential and quantificational logic. Formal grammar, semantical interpretation, formal deduction, and their interrelation. Applications to formalized mathematical theories. Selected topics from model theory or proof theory.
Rules & Requirements

Prerequisites: MATH 113 (http://guide.berkeley.edu/search/?P=MATH%20113) or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 126 Introduction to Partial Differential Equations 4 Units
Waves and diffusion, initial value problems for hyperbolic and parabolic equations, boundary value problems for elliptic equations, Green's functions, maximum principles, a priori bounds, Fourier transform.
Rules & Requirements

Prerequisites: 53 and 54

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Summer: 8 weeks - 6 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 127 Mathematical and Computational Methods in Molecular Biology 4 Units
Introduction to mathematical and computational problems arising in the context of molecular biology. Theory and applications of combinatorics, probability, statistics, geometry, and topology to problems ranging from sequence determination to structure analysis.
Rules & Requirements

Prerequisites: 53, 54, and 55; Statistics 20 recommended

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 128A Numerical Analysis 4 Units
Programming for numerical calculations, round-off error, approximation and interpolation, numerical quadrature, and solution of ordinary differential equations. Practice on the computer.
Rules & Requirements

Prerequisites: 53 and 54

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer: 8 weeks - 6 hours of lecture, 2 hours of discussion, and 6 hours of laboratory per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 128B Numerical Analysis 4 Units
Iterative solution of systems of nonlinear equations, evaluation of eigenvalues and eigenvectors of matrices, applications to simple partial differential equations. Practice on the computer.
Rules & Requirements

Prerequisites: 110 and 128A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Summer: 8 weeks - 6 hours of lecture and 1.5 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 130 The Classical Geometries 4 Units
A critical examination of Euclid's Elements; ruler and compass constructions; connections with Galois theory; Hilbert's axioms for geometry, theory of areas, introduction of coordinates, non-Euclidean geometry, regular solids, projective geometry.
Rules & Requirements

Prerequisites: 110 and 113

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 135 Introduction to the Theory of Sets 4 Units
Set-theoretical paradoxes and means of avoiding them. Sets, relations, functions, order and well-order. Proof by transfinite induction and definitions by transfinite recursion. Cardinal and ordinal numbers and their arithmetic. Construction of the real numbers. Axiom of choice and its consequences.
Rules & Requirements

Prerequisites: 113 and 104

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 136 Incompleteness and Undecidability 4 Units
Functions computable by algorithm, Turing machines, Church's thesis. Unsolvability of the halting problem, Rice's theorem. Recursively enumerable sets, creative sets, many-one reductions. Self-referential programs. Godel's incompleteness theorems, undecidability of validity, decidable and undecidable theories.
Rules & Requirements

Prerequisites: 53, 54, and 55

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 140 Metric Differential Geometry 4 Units
Frenet formulas, isoperimetric inequality, local theory of surfaces in Euclidean space, first and second fundamental forms. Gaussian and mean curvature, isometries, geodesics, parallelism, the Gauss-Bonnet-Von Dyck Theorem.
Rules & Requirements

Prerequisites: 104

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 141 Elementary Differential Topology 4 Units
Manifolds in n-dimensional Euclidean space and smooth maps, Sard's Theorem, classification of compact one-manifolds, transversality and intersection modulo 2.
Rules & Requirements

Prerequisites: 104 or equivalent and linear algebra

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 142 Elementary Algebraic Topology 4 Units
The topology of one and two dimensional spaces: manifolds and triangulation, classification of surfaces, Euler characteristic, fundamental groups, plus further topics at the discretion of the instructor.
Rules & Requirements

Prerequisites: 104 and 113

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 143 Elementary Algebraic Geometry 4 Units
Introduction to basic commutative algebra, algebraic geometry, and computational techniques. Main focus on curves, surfaces and Grassmannian varieties.
Rules & Requirements

Prerequisites: 113

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 151 Mathematics of the Secondary School Curriculum I 4 Units
Theory of rational numbers based on the number line, the Euclidean algorithm and fractions in lowest terms. The concepts of congruence and similarity, equation of a line, functions, and quadratic functions.
Rules & Requirements

Prerequisites: 1A-1B, 53, or equivalent

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 0-1 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 152 Mathematics of the Secondary School Curriculum II 4 Units
Complex numbers and Fundamental Theorem of Algebra, roots and factorizations of polynomials, Euclidean geometry and axiomatic systems, basic trigonometry.
Rules & Requirements

Prerequisites: 151; 54, 113, or equivalent

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 0-1 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 153 Mathematics of the Secondary School Curriculum III 4 Units
The real line and least upper bound, limit and decimal expansion of a number, differentiation and integration, Fundamental Theorem of Calculus, characterizations of sine, cosine, exp, and log.
Rules & Requirements

Prerequisites: 151, 152

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 0-1 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 160 History of Mathematics 4 Units
History of algebra, geometry, analytic geometry, and calculus from ancient times through the seventeenth century and selected topics from more recent mathematical history.
Rules & Requirements

Prerequisites: 53, 54, and 113

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 170 Mathematical Methods for Optimization 4 Units
Linear programming and a selection of topics from among the following: matrix games, integer programming, semidefinite programming, nonlinear programming, convex analysis and geometry, polyhedral geometry, the calculus of variations, and control theory.
Rules & Requirements

Prerequisites: 53 and 54

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 172 Combinatorics 4 Units
Basic combinatorial principles, graphs, partially ordered sets, generating functions, asymptotic methods, combinatorics of permutations and partitions, designs and codes. Additional topics at the discretion of the instructor.
Rules & Requirements

Prerequisites: 55

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 185 Introduction to Complex Analysis 4 Units
Analytic functions of a complex variable. Cauchy's integral theorem, power series, Laurent series, singularities of analytic functions, the residue theorem with application to definite integrals. Some additional topics such as conformal mapping.
Rules & Requirements

Prerequisites: 104

Hours & Format

Fall and/or spring: 15 weeks - 3-3 hours of lecture and 0-2 hours of discussion per week

Summer: 8 weeks - 6-6 hours of lecture and 0-2 hours of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH H185 Honors Introduction to Complex Analysis 4 Units
Honors section corresponding to Math 185 for exceptional students with strong mathematical inclination and motivation. Emphasis is on rigor, depth, and hard problems.
Rules & Requirements

Prerequisites: 104

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 189 Mathematical Methods in Classical and Quantum Mechanics 4 Units
Topics in mechanics presented from a mathematical viewpoint: e.g., hamiltonian mechanics and symplectic geometry, differential equations for fluids, spectral theory in quantum mechanics, probability theory and statistical mechanics. See department bulletins for specific topics each semester course is offered.
Rules & Requirements

Prerequisites: 104, 110, 2 semesters lower division Physics

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 191 Experimental Courses in Mathematics 1 - 4 Units
The topics to be covered and the method of instruction to be used will be announced at the beginning of each semester that such courses are offered. See departmental bulletins.
Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of seminar per week

Summer:
6 weeks - 2.5-10 hours of seminar per week
8 weeks - 1.5-7.5 hours of seminar per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 195 Special Topics in Mathematics 4 Units
Lectures on special topics, which will be announced at the beginning of each semester that the course is offered.
Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam required.

MATH 196 Honors Thesis 4 Units
Independent study of an advanced topic leading to an honors thesis.
Rules & Requirements

Prerequisites: Admission to the Honors Program; an overall GPA of 3.3 and a GPA of 3.5 in the major

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Summer:
6 weeks - 1-5 hours of independent study per week
8 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Letter grade. Final exam not required.

MATH 197 Field Study 1 - 4 Units
For Math/Applied math majors. Supervised experience relevant to specific aspects of their mathematical emphasis of study in off-campus organizations. Regular individual meetings with faculty sponsor and written reports required. Units will be awarded on the basis of three hours/week/unit.
Rules & Requirements

Prerequisites: Upper division standing. Written proposal signed by faculty sponsor and approved by department chair

Credit Restrictions: Enrollment is restricted; see the Course Number Guide in the Bulletin.

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3-3 hours of fieldwork per week

Summer: 8 weeks - 3-3 hours of fieldwork per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

MATH 198 Directed Group Study 1 - 4 Units
Topics will vary with instructor.
Rules & Requirements

Prerequisites: Must have completed 60 units and be in good standing

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-4 hours of directed group study per week

Summer: 8 weeks - 1-4 hours of directed group study per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

MATH 198BC Berkeley Connect 1 Unit
Berkeley Connect is a mentoring program, offered through various academic departments, that helps students build intellectual community. Over the course of a semester, enrolled students participate in regular small-group discussions facilitated by a graduate student mentor (following a faculty-directed curriculum), meet with their graduate student mentor for one-on-one academic advising, attend lectures and panel discussions featuring department faculty and alumni, and go on field trips to campus resources. Students are not required to be declared majors in order to participate.
Rules & Requirements

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1 hour of discussion per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

MATH 199 Supervised Independent Study and Research 1 - 4 Units
Rules & Requirements

Prerequisites: The standard college regulations for all 199 courses

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Summer:
6 weeks - 1-5 hours of independent study per week
8 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Mathematics/Undergraduate

Grading/Final exam status: Offered for pass/not pass grade only. Final exam not required.

MATH 202A Introduction to Topology and Analysis 4 Units
Metric spaces and general topological spaces. Compactness and connectedness. Characterization of compact metric spaces. Theorems of Tychonoff, Urysohn, Tietze. Complete spaces and the Baire category theorem. Function spaces; Arzela-Ascoli and Stone-Weierstrass theorems. Partitions of unity. Locally compact spaces; one-point compactification. Introduction to measure and integration. Sigma algebras of sets. Measures and outer measures. Lebesgue measure on the line and Rn. Construction of the integral. Dominated convergence theorem.
Rules & Requirements

Prerequisites: 104

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 202B Introduction to Topology and Analysis 4 Units
Measure and integration. Product measures and Fubini-type theorems. Signed measures; Hahn and Jordan decompositions. Radon-Nikodym theorem. Integration on the line and in Rn. Differentiation of the integral. Hausdorff measures. Fourier transform. Introduction to linear topological spaces, Banach spaces and Hilbert spaces. Banach-Steinhaus theorem; closed graph theorem. Hahn-Banach theorem. Duality; the dual of LP. Measures on locally compact spaces; the dual of C(X). Weak and weak-* topologies; Banach-Alaoglu theorem. Convexity and the Krein-Milman theorem. Additional topics chosen may include compact operators, spectral theory of compact operators, and applications to integral equations.
Rules & Requirements

Prerequisites: 202A and 110

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 203 Asymptotic Analysis in Applied Mathematics 4 Units
Asymptotic methods for differential equations, with emphasis upon many physical examples. Topics will include matched asymptotic expansions, Laplace's method, stationary phase, boundary layers, multiple scales, WKB approximations, asymptotic Lagrangians, bifurcation theory.
Rules & Requirements

Prerequisites: 104

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 204 Ordinary Differential Equations 4 Units
Rigorous theory of ordinary differential equations. Fundamental existence theorems for initial and boundary value problems, variational equilibria, periodic coefficients and Floquet Theory, Green's functions, eigenvalue problems, Sturm-Liouville theory, phase plane analysis, Poincare-Bendixon Theorem, bifurcation, chaos.
Rules & Requirements

Prerequisites: 104

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 205 Theory of Functions of a Complex Variable 4 Units
Normal families. Riemann Mapping Theorem. Picard's theorem and related theorems. Multiple-valued analytic functions and Riemann surfaces. Further topics selected by the instructor may include: harmonic functions, elliptic and algebraic functions, boundary behavior of analytic functions and HP spaces, the Riemann zeta functions, prime number theorem.
Rules & Requirements

Prerequisites: 185

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 206 Banach Algebras and Spectral Theory 4 Units
Banach algebras. Spectrum of a Banach algebra element. Gelfand theory of commutative Banach algebras. Analytic functional calculus. Hilbert space operators. C*-algebras of operators. Commutative C*-algebras. Spectral theorem for bounded self-adjoint and normal operators (both forms: the spectral integral and the "multiplication operator" formulation). Riesz theory of compact operators. Hilbert-Schmidt operators. Fredholm operators. The Fredholm index. Selected additional topics.
Rules & Requirements

Prerequisites: 202A-202B

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 208 C*-algebras 4 Units
Basic theory of C*-algebras. Positivity, spectrum, GNS construction. Group C*-algebras and connection with group representations. Additional topics, for example, C*-dynamical systems, K-theory.
Rules & Requirements

Prerequisites: 206

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 209 Von Neumann Algebras 4 Units
Basic theory of von Neumann algebras. Density theorems, topologies and normal maps, traces, comparison of projections, type classification, examples of factors. Additional topics, for example, Tomita Takasaki theory, subfactors, group actions, and noncommutative probability.
Rules & Requirements

Prerequisites: 206

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 212 Several Complex Variables 4 Units
Power series developments, domains of holomorphy, Hartogs' phenomenon, pseudo convexity and plurisubharmonicity. The remainder of the course may treat either sheaf cohomology and Stein manifolds, or the theory of analytic subvarieties and spaces.
Rules & Requirements

Prerequisites: 185 and 202A-202B or their equivalents

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 214 Differentiable Manifolds 4 Units
Smooth manifolds and maps, tangent and normal bundles. Sard's theorem and transversality, Whitney embedding theorem. Morse functions, differential forms, Stokes' theorem, Frobenius theorem. Basic degree theory. Flows, Lie derivative, Lie groups and algebras. Additional topics selected by instructor.
Rules & Requirements

Prerequisites: 202A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 215A Algebraic Topology 4 Units
Fundamental group and covering spaces, simplicial and singular homology theory with applications, cohomology theory, duality theorem. Homotopy theory, fibrations, relations between homotopy and homology, obstruction theory, and topics from spectral sequences, cohomology operations, and characteristic classes. Sequence begins fall.
Rules & Requirements

Prerequisites: 113 and point-set topology (e.g. 202A)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Instructors: 113C, 202A, and 214

MATH 215B Algebraic Topology 4 Units
Fundamental group and covering spaces, simplicial and singular homology theory with applications, cohomology theory, duality theorem. Homotopy theory, fibrations, relations between homotopy and homology, obstruction theory, and topics from spectral sequences, cohomology operations, and characteristic classes. Sequence begins fall.
Rules & Requirements

Prerequisites: 215A, 214 recommended (can be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Instructors: 113C, 202A, and 214

MATH C218A Probability Theory 4 Units
The course is designed as a sequence with Statistics C205B/ Mathematics C218B with the following combined syllabus. Measure theory concepts needed for probability. Expection, distributions. Laws of large numbers and central limit theorems for independent random variables. Characteristic function methods. Conditional expectations, martingales and martingale convergence theorems. Markov chains. Stationary processes. Brownian motion.
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Also listed as: STAT C205A

MATH C218B Probability Theory 4 Units
The course is designed as a sequence with with Statistics C205A/ Mathematics C218A with the following combined syllabus. Measure theory concepts needed for probability. Expection, distributions. Laws of large numbers and central limit theorems for independent random variables. Characteristic function methods. Conditional expectations, martingales and martingale convergence theorems. Markov chains. Stationary processes. Brownian motion.
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Also listed as: STAT C205B

MATH 219 Dynamical Systems 4 Units
Diffeomorphisms and flows on manifolds. Ergodic theory. Stable manifolds, generic properties, structural stability. Additional topics selected by the instructor.
Rules & Requirements

Prerequisites: 214

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 220 Introduction to Probabilistic Methods in Mathematics and the Sciences 4 Units
Brownian motion, Langevin and Fokker-Planck equations, path integrals and Feynman diagrams, time series, an introduction to statistical mechanics, Monte Carlo methods, selected applications.
Rules & Requirements

Prerequisites: Some familiarity with differential equations and their applications

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 221 Advanced Matrix Computations 4 Units
Direct solution of linear systems, including large sparse systems: error bounds, iteration methods, least square approximation, eigenvalues and eigenvectors of matrices, nonlinear equations, and minimization of functions.
Rules & Requirements

Prerequisites: Consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Summer: 8 weeks - 6 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 222A Partial Differential Equations 4 Units
The theory of boundary value and initial value problems for partial differential equations, with emphasis on nonlinear equations. Laplace's equation, heat equation, wave equation, nonlinear first-order equations, conservation laws, Hamilton-Jacobi equations, Fourier transform, Sobolev spaces.
Rules & Requirements

Prerequisites: 105 or 202A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 222B Partial Differential Equations 4 Units
The theory of boundary value and initial value problems for partial differential equations, with emphasis on nonlinear equations. Second-order elliptic equations, parabolic and hyperbolic equations, calculus of variations methods, additional topics selected by instructor.
Rules & Requirements

Prerequisites: 105 or 202A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH C223A Advanced Topics in Probability and Stochastic Process 3 Units
The topics of this course change each semester, and multiple sections may be offered. Advanced topics in probability offered according to students demand and faculty availability.
Rules & Requirements

Prerequisites: Statistics C205A-C205B or consent of instructor

Repeat rules: Course may be repeated for credit with a different instructor. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Also listed as: STAT C206A

MATH C223B Advanced Topics in Probability and Stochastic Processes 3 Units
The topics of this course change each semester, and multiple sections may be offered. Advanced topics in probability offered according to students demand and faculty availability.
Rules & Requirements

Repeat rules: Course may be repeated for credit with a different instructor. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Also listed as: STAT C206B

MATH 224A Mathematical Methods for the Physical Sciences 4 Units
Introduction to the theory of distributions. Fourier and Laplace transforms. Partial differential equations. Green's function. Operator theory, with applications to eigenfunction expansions, perturbation theory and linear and non-linear waves. Sequence begins fall.
Rules & Requirements

Prerequisites: Graduate status or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Instructors: 112 or 113C; 104A and 185, or 121A-121B-121C, or 120A-120B-120C.

MATH 224B Mathematical Methods for the Physical Sciences 4 Units
Introduction to the theory of distributions. Fourier and Laplace transforms. Partial differential equations. Green's function. Operator theory, with applications to eigenfunction expansions, perturbation theory and linear and non-linear waves. Sequence begins fall.
Rules & Requirements

Prerequisites: Graduate status or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 225A Metamathematics 4 Units
Metamathematics of predicate logic. Completeness and compactness theorems. Interpolation theorem, definability, theory of models. Metamathematics of number theory, recursive functions, applications to truth and provability. Undecidable theories. Sequence begins fall.
Rules & Requirements

Prerequisites: 125B and 135

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Instructor: 125B and 135.

MATH 225B Metamathematics 4 Units
Metamathematics of predicate logic. Completeness and compactness theorems. Interpolation theorem, definability, theory of models. Metamathematics of number theory, recursive functions, applications to truth and provability. Undecidable theories. Sequence begins fall.
Rules & Requirements

Prerequisites: 125B and 135

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Instructor: 125B and 135.

MATH 227A Theory of Recursive Functions 4 Units
Recursive and recursively enumerable sets of natural numbers; characterizations, significance, and classification. Relativization, degrees of unsolvability. The recursion theorem. Constructive ordinals, the hyperarithmetical and analytical hierarchies. Recursive objects of higher type. Sequence begins fall.
Rules & Requirements

Prerequisites: Mathematics
225B

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Instructor: 225C.

MATH 228A Numerical Solution of Differential Equations 4 Units
Ordinary differential equations: Runge-Kutta and predictor-corrector methods; stability theory, Richardson extrapolation, stiff equations, boundary value problems. Partial differential equations: stability, accuracy and convergence, Von Neumann and CFL conditions, finite difference solutions of hyperbolic and parabolic equations. Finite differences and finite element solution of elliptic equations.
Rules & Requirements

Prerequisites: 128A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Instructor: 128A-128B.

MATH 228B Numerical Solution of Differential Equations 4 Units
Ordinary differential equations: Runge-Kutta and predictor-corrector methods; stability theory, Richardson extrapolation, stiff equations, boundary value problems. Partial differential equations: stability, accuracy and convergence, Von Neumann and CFL conditions, finite difference solutions of hyperbolic and parabolic equations. Finite differences and finite element solution of elliptic equations.
Rules & Requirements

Prerequisites: 128A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Instructor: 128A-128B.

MATH 229 Theory of Models 4 Units
Syntactical characterization of classes closed under algebraic operations. Ultraproducts and ultralimits, saturated models. Methods for establishing decidability and completeness. Model theory of various languages richer than first-order.
Rules & Requirements

Prerequisites: 225B

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 235A Theory of Sets 4 Units
Axiomatic foundations. Operations on sets and relations. Images and set functions. Ordering, well-ordering, and well-founded relations; general principles of induction and recursion. Ranks of sets, ordinals and their arithmetic. Set-theoretical equivalence, similarity of relations; definitions by abstraction. Arithmetic of cardinals. Axiom of choice, equivalent forms, and consequences. Sequence begins fall.
Rules & Requirements

Prerequisites: 125A and 135

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Instructor: 125A and 135.

MATH 236 Metamathematics of Set Theory 4 Units
Various set theories: comparison of strength, transitive, and natural models, finite axiomatizability. Independence and consistency of axiom of choice, continuum hypothesis, etc. The measure problem and axioms of strong infinity.
Rules & Requirements

Prerequisites: 225B and 235A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 239 Discrete Mathematics for the Life Sciences 4 Units
Introduction to algebraic statistics and probability, optimization, phylogenetic combinatorics, graphs and networks, polyhedral and metric geometry.
Rules & Requirements

Prerequisites: Statistics 134 or equivalent introductory probability theory course, or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH C239 Discrete Mathematics for the Life Sciences 4 Units
Introduction to algebraic statistics and probability, optimization, phylogenetic combinatorics, graphs and networks, polyhedral and metric geometry.
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Also listed as: MCELLBI C244

MATH 240 Riemannian Geometry 4 Units
Riemannian metric and Levi-Civita connection, geodesics and completeness, curvature, first and second variations of arc length. Additional topics such as the theorems of Myers, Synge, and Cartan-Hadamard, the second fundamental form, convexity and rigidity of hypersurfaces in Euclidean space, homogeneous manifolds, the Gauss-Bonnet theorem, and characteristic classes.
Rules & Requirements

Prerequisites: 214

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 241 Complex Manifolds 4 Units
Riemann surfaces, divisors and line bundles on Riemann surfaces, sheaves and the Dolbeault theorem on Riemann surfaces, the classical Riemann-Roch theorem, theorem of Abel-Jacobi. Complex manifolds, Kahler metrics. Summary of Hodge theory, groups of line bundles, additional topics such as Kodaira's vanishing theorem, Lefschetz hyperplane theorem.
Rules & Requirements

Prerequisites: 214 and 215A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 242 Symplectic Geometry 4 Units
Basic topics: symplectic linear algebra, symplectic manifolds, Darboux theorem, cotangent bundles, variational problems and Legendre transform, hamiltonian systems, Lagrangian submanifolds, Poisson brackets, symmetry groups and momentum mappings, coadjoint orbits, Kahler manifolds.
Rules & Requirements

Prerequisites: 214

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH C243 Seq: Methods and Applications 3 Units
A graduate seminar class in which a group of students will closely examine recent computational methods in high-throughput sequencing followed by directly examining interesting biological applications thereof.
Rules & Requirements

Prerequisites: Graduate standing in Math, MCB, and Computational Biology; or consent of the instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Instructor: Pachter

Also listed as: MCELLBI C243

MATH 245A General Theory of Algebraic Structures 4 Units
Structures defined by operations and/or relations, and their homomorphisms. Classes of structures determined by identities. Constructions such as free objects, objects presented by generators and relations, ultraproducts, direct limits. Applications of general results to groups, rings, lattices, etc. Course may emphasize study of congruence- and subalgebra-lattices, or category-theory and adjoint functors, or other aspects.
Rules & Requirements

Prerequisites: MATH 113 (http://guide.berkeley.edu/search/?P=MATH%20113)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 249 Algebraic Combinatorics 4 Units
(I) Enumeration, generating functions and exponential structures, (II) Posets and lattices, (III) Geometric combinatorics, (IV) Symmetric functions, Young tableaux, and connections with representation theory. Further study of applications of the core material and/or additional topics, chosen by instructor.
Rules & Requirements

Prerequisites: 250A or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 250A Groups, Rings, and Fields 4 Units
Group theory, including the Jordan-Holder theorem and the Sylow theorems. Basic theory of rings and their ideals. Unique factorization domains and principal ideal domains. Modules. Chain conditions. Fields, including fundamental theorem of Galois theory, theory of finite fields, and transcendence degree.
Rules & Requirements

Prerequisites: 114 or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 250B Multilinear Algebra and Further Topics 4 Units
Tensor algebras and exterior algebras, with application to linear transformations. Commutative ideal theory, localization. Elementary specialization and valuation theory. Related topics in algebra.
Rules & Requirements

Prerequisites: 250A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 251 Ring Theory 4 Units
Topics such as: Noetherian rings, rings with descending chain condition, theory of the radical, homological methods.
Rules & Requirements

Prerequisites: 250A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 252 Representation Theory 4 Units
Structure of finite dimensional algebras, applications to representations of finite groups, the classical linear groups.
Rules & Requirements

Prerequisites: 250A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 253 Homological Algebra 4 Units
Modules over a ring, homomorphisms and tensor products of modules, functors and derived functors, homological dimension of rings and modules.
Rules & Requirements

Prerequisites: 250A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 254A Number Theory 4 Units
Valuations, units, and ideals in number fields, ramification theory, quadratic and cyclotomic fields, topics from class field theory, zeta-functions and L-series, distribution of primes, modular forms, quadratic forms, diophantine equations, P-adic analysis, and transcendental numbers. Sequence begins fall.
Rules & Requirements

Prerequisites: 250A for 254A; 254A for 254B

Repeat rules: 254B may be repeated with consent of instructor. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Instructor: 250A.

MATH 254B Number Theory 4 Units
Valuations, units, and ideals in number fields, ramification theory, quadratic and cyclotomic fields, topics from class field theory, zeta-functions and L-series, distribution of primes, modular forms, quadratic forms, diophantine equations, P-adic analysis, and transcendental numbers. Sequence begins fall.
Rules & Requirements

Prerequisites: 254A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Instructor: 250A.

MATH 255 Algebraic Curves 4 Units
Elliptic curves. Algebraic curves, Riemann surfaces, and function fields. Singularities. Riemann-Roch theorem, Hurwitz's theorem, projective embeddings and the canonical curve. Zeta functions of curves over finite fields. Additional topics such as Jacobians or the Riemann hypothesis.
Rules & Requirements

Prerequisites: 250A-250B or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 256A Algebraic Geometry 4 Units
Affine and projective algebraic varieties. Theory of schemes and morphisms of schemes. Smoothness and differentials in algebraic geometry. Coherent sheaves and their cohomology. Riemann-Roch theorem and selected applications. Sequence begins fall.
Rules & Requirements

Prerequisites: 250A-250B for 256A; 256A for 256B

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Instructor: 250A.

MATH 256B Algebraic Geometry 4 Units
Affine and projective algebraic varieties. Theory of schemes and morphisms of schemes. Smoothness and differentials in algebraic geometry. Coherent sheaves and their cohomology. Riemann-Roch theorem and selected applications. Sequence begins fall.
Rules & Requirements

Prerequisites: 256A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Instructor: 250A.

MATH 257 Group Theory 4 Units
Topics such as: generators and relations, infinite discrete groups, groups of Lie type, permutation groups, character theory, solvable groups, simple groups, transfer and cohomological methods.
Rules & Requirements

Prerequisites: 250A

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 258 Harmonic Analysis 4 Units
Basic properties of Fourier series, convergence and summability, conjugate functions, Hardy spaces, boundary behavior of analytic and harmonic functions. Additional topics at the discretion of the instructor.
Rules & Requirements

Prerequisites: 206 or a basic knowledge of real, complex, and linear analysis

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 261A Lie Groups 4 Units
Lie groups and Lie algebras, fundamental theorems of Lie, general structure theory; compact, nilpotent, solvable, semi-simple Lie groups; classification theory and representation theory of semi-simple Lie algebras and Lie groups, further topics such as symmetric spaces, Lie transformation groups, etc., if time permits. In view of its simplicity and its wide range of applications, it is preferable to cover compact Lie groups and their representations in 261A. Sequence begins Fall.
Rules & Requirements

Prerequisites: 214

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Instructor: 214.

MATH 261B Lie Groups 4 Units
Lie groups and Lie algebras, fundamental theorems of Lie, general structure theory; compact, nilpotent, solvable, semi-simple Lie groups; classification theory and representation theory of semi-simple Lie algebras and Lie groups, further topics such as symmetric spaces, Lie transformation groups, etc., if time permits. In view of its simplicity and its wide range of applications, it is preferable to cover compact Lie groups and their representations in 261A. Sequence begins Fall.
Rules & Requirements

Prerequisites: 214

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

Instructor: 214.

MATH 265 Differential Topology 4 Units
Approximations, degrees of maps, vector bundles, tubular neighborhoods. Introduction to Morse theory, handlebodies, cobordism, surgery. Additional topics selected by instructor from: characteristic classes, classification of manifolds, immersions, embeddings, singularities of maps.
Rules & Requirements

Prerequisites: 214 plus 215A or some familiarity with algebraic topology

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 270 Hot Topics Course in Mathematics 2 Units
This course will give introductions to current research developments. Every semester we will pick a different topic and go through the relevant literature. Each student will be expected to give one presentation.
Rules & Requirements

Repeat rules: Course may be repeated for credit as topic varies. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1.5 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

MATH 274 Topics in Algebra 4 Units
Advanced topics chosen by the instructor. The content of this course changes, as in the case of seminars.
Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 275 Topics in Applied Mathematics 4 Units
Advanced topics chosen by the instructor. The content of this course changes, as in the case of seminars.
Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 276 Topics in Topology 4 Units
Advanced topics chosen by the instructor. The content of this course changes, as in the case of seminars.
Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 277 Topics in Differential Geometry 4 Units
Advanced topics chosen by the instructor. The content of this course changes, as in the case of seminars.
Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 278 Topics in Analysis 4 Units
Advanced topics chosen by the instructor. The content of this course changes, as in the case of seminars.
Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 279 Topics in Partial Differential Equations 4 Units
Advanced topics chosen by the instructor. The content of this course changes, as in the case of seminars.
Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 290 Seminars 1 - 6 Units
Topics in foundations of mathematics, theory of numbers, numerical calculations, analysis, geometry, topology, algebra, and their applications, by means of lectures and informal conferences; work based largely on original memoirs.
Rules & Requirements

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of seminar per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: Letter grade.

MATH 295 Individual Research 1 - 12 Units
Intended for candidates for the Ph.D. degree.
Rules & Requirements

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-12 hours of independent study per week

Summer:
3 weeks - 5 hours of independent study per week
6 weeks - 2.5-30 hours of independent study per week
8 weeks - 1.5-60 hours of independent study per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: The grading option will be decided by the instructor when the class is offered.

MATH 299 Reading Course for Graduate Students 1 - 6 Units
Investigation of special problems under the direction of members of the department.
Rules & Requirements

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Summer:
6 weeks - 1-5 hours of independent study per week
8 weeks - 1-4 hours of independent study per week

Additional Details

Subject/Course Level: Mathematics/Graduate

Grading: The grading option will be decided by the instructor when the class is offered.

MATH 301 Undergraduate Mathematics Instruction 1 - 2 Units
May be taken for one unit by special permission of instructor. Tutoring at the Student Learning Center or for the Professional Development Program.
Rules & Requirements

Prerequisites: Permission of SLC instructor, as well as sophomore standing and at least a B average in two semesters of calculus. Apply at Student Learning Center

Repeat rules: Course may be repeated once for credit.Course may be repeated for a maximum of 4 units.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of seminar and 4 hours of tutorial per week

Additional Details

Subject/Course Level: Mathematics/Professional course for teachers or prospective teachers

Grading: Offered for pass/not pass grade only.

MATH 302 Teaching Workshop 1 Unit
Mandatory for all graduate student instructors teaching summer course for the first time in the Department. The course consists of practice teaching, alternatives to standard classroom methods, guided group and self-analysis, classroom visitations by senior faculty member.
Hours & Format

Summer: 8 weeks - 1 hour of lecture per week

Additional Details

Subject/Course Level: Mathematics/Professional course for teachers or prospective teachers

Grading: Offered for satisfactory/unsatisfactory grade only.

MATH 303 Professional Preparation: Supervised Teaching of Mathematics 2 - 4 Units
Meeting with supervising faculty and with discussion sections. Experience in teaching under the supervision of Mathematics faculty.
Rules & Requirements

Prerequisites: 300, graduate standing and appointment as a Graduate Student Instructor

Repeat rules: Course may be repeated four times for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2-4 hours of independent study per week

Additional Details

Subject/Course Level: Mathematics/Professional course for teachers or prospective teachers

Grading: Offered for satisfactory/unsatisfactory grade only.

MATH 375 Teaching Workshop 4 Units
Mandatory for all graduate student instructors teaching for the first time in the Mathematics Department. The course consists of practice teaching, alternatives to standard classroom methods, guided group and self-analysis of videotapes, reciprocal classroom visitations, and an individual project.
Rules & Requirements

Prerequisites: 300, graduate standing and appointment as a Graduate Student Instructor

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture per week

Additional Details

Subject/Course Level: Mathematics/Professional course for teachers or prospective teachers

Grading: Offered for satisfactory/unsatisfactory grade only.

Formerly known as: Mathematics 300

MATH 600 Individual Study for Master's Students 1 - 6 Units
Individual study for the comprehensive or language requirements in consultation with the field adviser.
Rules & Requirements

Prerequisites: For candidates for master's degree

Credit Restrictions: Course does not satisfy unit or residence requirements for master's degree.

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-6 hours of independent study per week

Summer: 8 weeks - 1.5-10 hours of independent study per week

Additional Details

Subject/Course Level: Mathematics/Graduate examination preparation

Grading: Offered for satisfactory/unsatisfactory grade only.

MATH 602 Individual Study for Doctoral Students 1 - 8 Units
Individual study in consultation with the major field adviser intended to provide an opportunity for qualified students to prepare themselves for the various examinations required for candidates for the Ph.D. Course does not satisfy unit or residence requirements for doctoral degree.
Rules & Requirements

Prerequisites: For qualified graduate students

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 1-8 hours of independent study per week

Additional Details

Subject/Course Level: Mathematics/Graduate examination preparation

Grading: Offered for satisfactory/unsatisfactory grade only.