MATHEMATICS

Not all courses are offered every semester. Refer to the schedule of courses for each term's specific offerings.
More Info (http://registrar.ufl.edu/soc/)

Unless otherwise indicated in the course description, all courses at the University of Florida are taught in English, with the exception of specific foreign language courses.

Department Information

Graduates from the Department of Mathematics might take a job that uses their math major in an area like statistics, biomathematics, operations research, actuarial science, mathematical modeling, cryptography, or mathematics education. Or they might continue into graduate school leading to a research career. Professional schools in business, law, and medicine appreciate mathematics majors because of the analytical and problem solving skills developed in the math courses. Website (https://math.ufl.edu/)

CONTACT

Email (undergraduatecoordinator@math.ufl.edu) | 352.294.2350

358 LITTLE HALL
GAINESVILLE FL 32611
Map (http://campusmap.ufl.edu/#/index/0655)

Curriculum

- Combination Degrees
- Mathematics
- Mathematics Minor

About Precalculus and Calculus

A student can receive, at most:

- Four credits for MAC 1147 and MAC 1140
- Four credits for MAC 1147 and MAC 1114
- Five credits for MAC 1140 and MAC 1114
- Five credits for MAC 1147, MAC 1140, and MAC 1114
- If both MAC 2233 and MAC 2311 (or MAC 3472) are taken, credit will be given only for MAC 2311 (or MAC 3472).

Courses

MAA 4102 Introduction to Advanced Calculus for Engineers and Physical Scientists 1 3 Credits
Grading Scheme: Letter Grade
Theory of real numbers, functions of one variable, sequences, limits, continuity and differentiation; continuity and differentiability of functions of several variables. Those who plan to do graduate work in mathematics should take MAA 4211. Credit will be given for, at most, one of MAA 4102, MAA 4211, or MAA 5104.
Prerequisite: (MAC 2313 or MAC 3474) and (MAS 4105 or MAS 3114) with minimum grades of C.

MAA 4103 Introduction to Advanced Calculus for Engineers and Physical Scientists 2 3 Credits
Grading Scheme: Letter Grade
Continues the advanced calculus for engineers and physical scientists sequence. Theory of integration, transcendental functions and infinite series. MAA 4102 is not recommended for those who plan to do graduate work in mathematics; these students should take MAA 4212. Credit will be given for, at most, one of MAA 4103, MAA 4212 and MAA 5105.
Prerequisite: MAA 4102 with minimum grade of C.

MAA 4211 Advanced Calculus 1 3 Credits
Grading Scheme: Letter Grade
Advanced treatment of limits, differentiation, integration and series. Includes calculus of functions of several variables. Credit will be given for, at most, one of MAA 4211, MAA 4102 and MAA 5104.
Prerequisite: MAS 4105 with minimum grade of C.

MAA 4212 Advanced Calculus 2 3 Credits
Grading Scheme: Letter Grade
Continues the advanced calculus sequence in limits, differentiation, integration and series. Credit will be given for, at most, one of MAA 4212, MAA 4103 and MAA 5105.
Prerequisite: MAA 4211 with minimum grade of C, taken the previous semester.

MAA 4226 Introduction to Modern Analysis 1 3 Credits
Grading Scheme: Letter Grade
Topology of metric spaces, numerical sequences and series, continuity, differentiation, the Riemann-Stieltjes integral, sequences and series of functions, the Stone-Weierstrass theorem, functions of several variables, Stokes' theorem and the Lebesgue theory. Credit will be given for, at most, MAA 4226 or MAA 5228.
Prerequisite: MAA 4212 with minimum grade of C.

MAA 4227 Introduction to Modern Analysis 2 3 Credits
Grading Scheme: Letter Grade
Continues the modern analysis sequence discussing the topology of metric spaces, numerical sequences and series, continuity, differentiation, the Riemann-Stieltjes integral, sequences and series of functions, the Stone-Weierstrass theorem, functions of several variables, Stokes' theorem and the Lebesgue theory. Credit will be given for, at most, MAA 4227 or MAA 5229.
Prerequisite: MAA 4226 with minimum grade of C, taken the previous semester.

MAA 4402 Functions of a Complex Variable 3 Credits
Grading Scheme: Letter Grade
Complex numbers, analytic functions, Cauchy-Riemann equations, harmonic functions, elementary functions, integration, Cauchy-Goursat theorem, Cauchy integral formula, infinite series, residues and poles, conformal mapping. Credit will be given for, at most, MAA 4402 or MAA 5404.
Prerequisite: (MAC 2313 or MAC 3474) and MAP 2302 with minimum grades of C.

MAC 1105 Basic College Algebra 3 Credits
Grading Scheme: Letter Grade
Online entry-level algebra course for college students. (M)
Prerequisite: completion of the ALEKS placement exam.
Attributes: General Education - Mathematics

MAC 1114 Trigonometry 2 Credits
Grading Scheme: Letter Grade
Exponential and logarithmic functions, trigonometry and analytic and additional applications of trigonometry. (M)
Attributes: General Education - Mathematics

MAC 1140 Precalculus Algebra 3 Credits
Grading Scheme: Letter Grade
College algebra, functions, coordinate geometry, exponential and logarithmic functions. (M)
Prerequisite: completion of the ALEKS placement exam.
Attributes: General Education - Mathematics

MAC 1147 Precalculus Algebra and Trigonometry 4 Credits
Grading Scheme: Letter Grade
College algebra, functions, coordinate geometry, exponential and logarithmic functions, and trigonometry. Fast-paced review of algebra and trigonometry to prepare for calculus. Assumes prior knowledge of intermediate algebra (Algebra 2) and trigonometry. (M)
Prerequisite: ALEKS >=61%, if taken January 1, 2020 or later, or ALEKS >= 50, if taken before January 1, 2020.
Attributes: General Education - Mathematics

MAC 2233 Survey of Calculus 1 3 Credits
Grading Scheme: Letter Grade
Geometric and heuristic approach to calculus; differentiation and integration of simple algebraic and exponential functions; applications to graphing, marginal analysis, optimization, areas and volumes. (M)
Prerequisite: Any of the following: minimal acceptable score on the online mathematics placement exam; a minimum grade of C in a MAC course numbered 1140 or higher; AP credit for MAC 2311; IB credit for a MAC course numbered 1140 or higher. Any course grades, AP or IB scores used to meet this prerequisite must be on file at UF by registration.
Attributes: General Education - Mathematics

MAC 2234 Survey of Calculus 2 3 Credits
Grading Scheme: Letter Grade
Sequences, geometric and Taylor series; systems of linear equations, Gaussian elimination, matrices, determinants and vectors; partial differentiation, multiple integrals; applications to marginal analysis, least-squares and Lagrange multipliers. (M)
Prerequisite: MAC 2233 with minimum grade of C, or the equivalent.
Attributes: General Education - Mathematics

MAC 2311 Analytic Geometry and Calculus 1 4 Credits
Grading Scheme: Letter Grade
Introduces analytic geometry; limits; continuity; differentiation of algebraic, trigonometric, exponential and logarithmic functions; applications of the derivative; inverse trigonometric functions; differentials; introduction to integration; and the fundamental theorem of calculus. (M) Credit will be given for, at most, one of MAC 2233, MAC 2311 and MAC 3472.
Prerequisite: Any of the following: minimal acceptable score on the online mathematics placement exam; a grade of C in a MAC course numbered 1147 or higher; AP credit for MAC 2311; IB credit for a MAC course numbered 1147 or higher. Any course grades, AP or IB scores used to meet this prerequisite must be on file at UF by registration.
Attributes: General Education - Mathematics

MAC 2312 Analytic Geometry and Calculus 2 4 Credits
Grading Scheme: Letter Grade
Techniques of integration; applications of integration; differentiation and integration of inverse trigonometric, exponential and logarithmic functions; sequences and series. (M) Credit will be given for, at most, one of MAC 2312, MAC 2512 and MAC 3473.
Prerequisite: MAC 2311 or MAC 3472 with a minimum grade of C.
Attributes: General Education - Mathematics

MAC 2313 Analytic Geometry and Calculus 3 4 Credits
Grading Scheme: Letter Grade
Solid analytic geometry, vectors, partial derivatives and multiple integrals. (M) Credit will be given for, at most, MAC 2313 or MAC 3474.
Prerequisite: MAC 2312 or MAC 2512 or MAC 3473 with a minimum grade of C.
Attributes: General Education - Mathematics

MAC 2512 Calculus 2 for Advanced Placement Students 4 Credits
Grading Scheme: Letter Grade
For entering freshmen who have Advanced Placement Calculus AB credit for MAC 2311. MAC 2512 covers those topics in MAC 2311 and MAC 2312, which is not included or only partially covered in the AP Calculus AB curriculum. Some topics from the AP curriculum are reviewed briefly in the first part of the semester. The combination of AP Calculus AB and MAC 2512 has the same content as the MAC 2311/2312 sequence. Calculus 2 topics to which the student has been exposed in AP Calculus AB are covered more quickly in MAC 2512 than in MAC 2312. (M) Credit will be given for, at most, one of MAC 2312, MAC 2512 and MAC 3473.
Prerequisite: AP credit for MAC 2311.
Attributes: General Education - Mathematics

MAC 3472 Honors Calculus 1 4 Credits
Grading Scheme: Letter Grade
Topics covered in the MAC 3472/MAC 3473/MAC 3474 sequence closely parallel those covered in MAC 2311/MAC 2312/MAC 2313, but are treated in greater depth. Credit will be given for, at most, MAC 2311 or MAC 3472. (M)
Prerequisite: strong background in precalculus.
Attributes: General Education - Mathematics

MAC 3473 Honors Calculus 2 4 Credits
Grading Scheme: Letter Grade
Continues the honors calculus sequence. (M) Credit will be given for, at most, one of MAC 2312, MAC 2512 and MAC 3473.
Prerequisite: MAC 3472 or MAC 2311 with a minimum grade of C.
Attributes: General Education - Mathematics

MAC 3474 Honors Calculus 3 4 Credits
Grading Scheme: Letter Grade
Continues the honors calculus sequence. (M) Credit will be given for, at most, MAC 2313 or MAC 3474.
Prerequisite: MAC 2312 or MAC 2512 or MAC 3473 with a minimum grade of C.
Attributes: General Education - Mathematics

MAD 2502 Intro to Computational Math 3 Credits
Grading Scheme: Letter Grade
Introduces mathematical computation and the Python programming language. Emphasizes using mathematical algorithms to solve problems in analysis, number theory, combinatorics, algebra, linear algebra, numerical analysis, and probability.
Prerequisite: MAC 2311 or MAC 3472, minimum grade of C.

MAD 3107 Discrete Mathematics 3 Credits
Grading Scheme: Letter Grade
Logic, sets, functions; algorithms and complexity; integers and algorithms; mathematical reasoning and induction; counting principles; permutations and combinations; discrete probability. Advanced counting techniques and inclusion-exclusion.
Prerequisite: MAC 2312 or MAC 2512 or MAC 3473 with a minimum grade of C.

MAD 4203 Introduction to Combinatorics 1 3 Credits
Grading Scheme: Letter Grade
Permutations and combinations, binomial coefficients, inclusion-exclusion, recurrence relations, Fibonacci sequences, generating functions and graph theory.
Prerequisite: (MAC 2312 or MAC 2512 or MAC 3473) and (MAS 3300 or MHF 3202) with minimum grades of C.

MAD 4204 Introduction to Combinatorics 2 3 Credits
Grading Scheme: Letter Grade
Matching theory, block designs, finite projective planes and error-correcting codes. Does not require MAD 4203.
Prerequisite: (MAC 2312 or MAC 2512 or MAC 3473) and (MAS 3300 or MHF 3202) with minimum grades of C.

MAD 4401 Introduction to Numerical Analysis 3 Credits
Grading Scheme: Letter Grade
Numerical integration, nonlinear equations, linear and nonlinear systems of equations, differential equations and interpolation.
Prerequisite: MAS 3114 or MAS 4105 with a minimum grade of C and experience with a scientific programming language.

MAE 3811 Mathematics for Elementary School Teachers 2 3 Credits
Grading Scheme: Letter Grade
Properties of and operations with rational numbers; ratio; proportion; percentages; an introduction to real numbers; elementary algebra; informal geometry and measurement; and introduces probability and descriptive statistics.
Prerequisite: College of Education major.

MAP 2302 Elementary Differential Equations 3 Credits
Grading Scheme: Letter Grade
First-order ordinary differential equations, theory of linear ordinary differential equations, solution of linear ordinary differential equations with constant coefficients, the Laplace transform and its application to solving linear ordinary differential equations. (M)
Prerequisite: MAC 2312 or MAC 2512 or MAC 3473 with a minimum grade of C.
Attributes: General Education - Mathematics

MAP 2483 Mathematical Methods for Natural Sciences 4 Credits
Grading Scheme: Letter Grade
Introduces basic mathematical methods and computer modeling used in the natural sciences, including data representation and analysis, basic statistics and probability, linear algebra, stochastic and deterministic processes and optimization. Theoretical concepts are integrated with real-life applications and computer modeling projects.
Prerequisite: MAC 2311.

MAP 4102 Probability Theory and Stochastic Processes 2 3 Credits
Grading Scheme: Letter Grade
Random walks and Poisson processes, martingales, Markov chains, Brownian motion, stochastic integrals and Ito's formula.
Prerequisite: STA 4321 with a minimum grade of C.

MAP 4305 Differential Equations for Engineers and Physical Scientists 3 Credits
Grading Scheme: Letter Grade
The second course in differential equations. Topics include systems of linear differential equations, stability theory and phase plane analysis, power series solutions of differential equations, Sturm-Liouville boundary-value problems and special functions. Credit will be given for, at most, MAP 4305 or MAP 5304.
Prerequisite: MAP 2302 and (MAS 3114 or MAS 4105 or EGM 3344) with minimum grades of C.

MAP 4341 Elements of Partial Differential Equations 3 Credits
Grading Scheme: Letter Grade
Introduces second-order linear partial differential equations (heat, wave and Laplace equations), separation of variables in PDEs, Sturm-Liouville eigenvalue problems, method of eigenfunction expansions (Fourier analysis) and Green's functions. Possible introduction to first-order PDEs and the method of characteristics. Credit will be given for, at most, MAP 4341 or MAP 5345.
Prerequisite: MAP 2302 and MAP 4305 with minimum grades of C.

MAP 4413 Fourier Analysis 3 Credits
Grading Scheme: Letter Grade
Introduces linear systems and transforms; Laplace, Fourier and Z transforms and their mutual relationship; convolutions. Operational calculus; computational methods including the fast Fourier transform; second-order stationary processes and their autocorrelation functions; and problems of interpolation, extrapolation, filtering and smoothing of second-order stationary processes.
Prerequisite: (MAC 2313 or MAC 3474) and MAP 2302 and (MAS 3114 or MAS 4105) with minimum grades of C.

MAP 4484 Modeling in Mathematical Biology 3 Credits
Grading Scheme: Letter Grade
Mathematical models of biological systems. Topics include models of growth, predator-prey populations, competition, the chemostat, epidemics, excitable systems and analytical tools such as linearization, phase-plane analysis, Poincare-Bendixson theory, Lyapunov functions and bifurcation analysis.
Prerequisite: MAP 2302 and (MAS 3114 or MAS 4105) with minimum grades of C.

MAS 3114 Computational Linear Algebra 3 Credits
Grading Scheme: Letter Grade
Linear equations, matrices and determinants. Vector spaces and linear transformations. Inner products and eigenvalues. Emphasizes computational aspects of linear algebra.
Prerequisite: MAC 2312, MAC 2512 or MAC 3473 with a minimum grade of C and experience with a scientific programming language.

MAS 3300 Numbers and Polynomials 3 Credits
Grading Scheme: Letter Grade
Emphasizes theorems and proofs. Topics include algebraic and order properties of the real numbers; introduction to number theory; rational numbers and their decimal expansions; uncountability of the real numbers; complex numbers, irreducible polynomials over the integral, rational, real and complex numbers; and elementary theory of equations. Taking one, but not both, of MAS 3300 or MHF 3202 is required of mathematics majors. MAS 3300 is also particularly useful for prospective secondary-school mathematics teachers. (M)
Prerequisite: a UF math course at the 2000 level or above with a minimum grade of C; this requirement is waived for transfer students with junior standing.
Attributes: General Education - Mathematics

MAS 4105 Linear Algebra 1 4 Credits
Grading Scheme: Letter Grade
Linear equations, matrices, vector spaces, linear transformations, determinants, eigenvalues and inner-product spaces. Includes both theory and computational skills. Develops the ability to reason through, and coherently write, proofs of theorems. For math majors, this course serves as a transition from a study of techniques into more conceptual math; for engineering and science majors, it serves also as a coherent foundation in linear algebra.
Prerequisite: (MAC 2313 or MAC 3474) and (MAS 3300 or MHF 3202) with minimum grades of C.

MAS 4115 Linear Algebra for Data Science 3 Credits
Grading Scheme: Letter Grade
A second course in linear algebra, focusing on topics that are the most essential for data science. Introduces theory and numerical methods required for large data-sets and machine learning. Topics include LU, QR, and singular-value decompositions; conditioning and stability; the DFT and filters; deep learning; fully connected and convolutional nets.
Prerequisite: (MAS 3114 or MAS 4105) and MAC 2313.

MAS 4124 Introduction to Numerical Linear Algebra 3 Credits
Grading Scheme: Letter Grade
Topics in linear algebra most useful in applications with emphasis on the numerical methods involved: direct and iterative solutions to systems of linear equations; matrix norms; Householder transformations; singular value decomposition; least squares and the generalized inverse; QR method for computing eigenvalues; condition number of linear systems and eigensystems.
Prerequisite: MAS 3114 or MAS 4105 with a minimum grade of C and experience with a scientific programming language.

MAS 4203 Introduction to Number Theory 3 Credits
Grading Scheme: Letter Grade
Introduces elementary number theory and its applications to computer science and cryptology. Divisibility, primes, Euclidean Algorithm, congruences, Chinese Remainder Theorem, Euler-Fermat Theorem and primitive roots. Selected applications to decimal fractions, continued fractions, computer file storage and hashing functions, and public-key cryptography.
Prerequisite: MAC 2312 and (MAC 2512 or MAC 3473) with a minimum grade of C; MAS 3300 recommended.

MAS 4301 Abstract Algebra 1 3 Credits
Grading Scheme: Letter Grade
Sets and mappings, groups and subgroups, homomorphisms and isomorphisms, permutations, rings and domains, arithmetic properties of domains, and fields. Requires facility in writing proofs.
Prerequisite: (MAS 3300 or MHF 3202 with a minimum grade of B) or MAS 4105 with a minimum grade of C.

MAS 4302 Abstract Algebra 2 3 Credits
Grading Scheme: Letter Grade
A second course in Abstract Algebra, focusing on Galois Theory, the algebraic theory of fields and polynomial equations. Introduces concepts of abstract algebra used in settling famous historical problems including the problems of angle trisection and duplication of cubes by ruler and compass constructions, and the insolubility of polynomial equations of the fifth degree by radicals.
Prerequisite: MAS 4301.

MAT 3503 Functions and Modeling 3 Credits
Grading Scheme: Letter Grade
Group activities strengthen knowledge of secondary mathematics, especially topics from precalculus and the transition to calculus, including contexts that can be modeled using linear, exponential, polynomial or trigonometric functions. Topics include conic sections, parametric equations and polar equations. Explorations involve multiple representations, transformations and data analysis techniques, and are facilitated by various technologies.
Prerequisite: MAC 2311 and UFTeach Step 1.
Corequisite: MAC 2312.

MAT 4905 Individual Work 1-3 Credits
Grading Scheme: Letter Grade
Special topics not obtainable in regular course offerings.
Prerequisite: MAC 2313 or MAC 3474 with a minimum grade of C and undergraduate coordinator permission.

MAT 4911 Undergraduate Research in Mathematics 0-3 Credits
Grading Scheme: Letter Grade
Provides firsthand, supervised research in mathematics. Projects may involve inquiry, design, investigation, scholarship, discovery or application in mathematics.

MAT 4930 Special Topics in Mathematics 1-3 Credits
Grading Scheme: Letter Grade
Qualified undergraduates take part in seminars or classes on special topics.
Prerequisite: undergraduate coordinator permission.

MAT 4956 Overseas Studies 1-15 Credits
Grading Scheme: Letter Grade
Provides a mechanism by which coursework taken as part of an approved study abroad program can be recorded on the UF transcript and counted toward graduation.
Prerequisite: undergraduate advisor permission.

MGF 1106 Mathematics for Liberal Arts Majors 1 3 Credits
Grading Scheme: Letter Grade
For non-science and non-business majors who need to fulfill the writing and general education math requirements. Includes an introduction to set theory, logic, number theory, probability, statistics, graphing and linear programming. (M)
Attributes: General Education - Mathematics

MGF 1107 Mathematics for Liberal Arts Majors 2 3 Credits
Grading Scheme: Letter Grade
General-education course that demonstrates the beauty and utility of mathematics. Topics include financial management, linear and exponential growth, mathematics in the arts and discrete mathematics. Does not require MGF 1106. (M)
Attributes: General Education - Mathematics

MHF 3202 Sets and Logic 3 Credits
Grading Scheme: Letter Grade
Examples of sets, operations on sets, set algebra, Venn diagrams, truth tables, tautologies, applications to mathematical arguments and mathematical induction. Taking one, but not both, of MAS 3300 or MHF 3202 is required of mathematics majors. MHF 3202 can also be very useful for prospective and in-service secondary and middle school teachers. (M)
Prerequisite: a UF math course at the 2000 level or above with a minimum grade of C.
Attributes: General Education - Mathematics

MHF 4102 Elements of Set Theory 3 Credits
Grading Scheme: Letter Grade
Basic axioms and concepts of set theory. Students present proofs. Credit will be given for, at most, MHF 4102 or MHF 5107.
Prerequisite: MAS 4105 with a minimum grade of C.

MHF 4203 Foundations of Mathematics 3 Credits
Grading Scheme: Letter Grade
Models and proofs. Foundations of real and natural numbers, algorithms, Turing machines, undecidability and independence. Examples and applications in algebra, analysis, geometry and topology. Credit will be given for, at most, MHF 4203 or MHF 5207.
Prerequisite: MAS 4105 with a minimum grade of C.

MTG 3212 Geometry 3 Credits
Grading Scheme: Letter Grade
Axiomatic treatment of topics in Euclidean, non-Euclidean, projective geometry and (time permitting) fractal geometry. Particularly useful for prospective secondary-school mathematics teachers.
Prerequisite: MAC 2312 and (MAC 2512 or MAC 3473 with a minimum grade of C).

MTG 3214 Euclidean Geometry 3 Credits
Grading Scheme: Letter Grade
Axiomatic structure of Euclidean geometry: congruence, parallelism, area, similarity, circles, polygons, medians, constructions, solid geometry, spherical and hyperbolic geometry. Particularly useful for prospective secondary-school mathematics teachers.
Prerequisite: MAC 2312 and (MAC 2512 or MAC 3473 with a minimum grade of C).

MTG 4302 Elements of Topology 1 3 Credits
Grading Scheme: Letter Grade
Basic concepts of general topology. Credit will be given for, at most, MTG 4302 or MTG 5316.
Prerequisite: MAS 4105 with a minimum grade of C.

MTG 4303 Elements of Topology 2 3 Credits
Grading Scheme: Letter Grade
Continues the basic concepts of general topology. Credit will be given for, at most, MTG 4303 or MTG 5317.
Prerequisite: MTG 4302 with a minimum grade of C.