Mathematics [MAT] Courses

Students wishing to major in Biology or Mathematics must take a placement test to determine if MAT 107 is required prior to MAT 202. Liberal arts students and others wishing to take MAT 103, MAT 104, or MAT 301 must take a placement test (elementary algebra) to determine the student's eligibility to take any of these courses, or whether MAT 050 is first required. All students required to complete MAT 050 as prerequisite to other courses must do so before the completion of 60 credits. For accounting, business, economics, management, or science students, and others wishing to take MAT 107 or MAT 109, a placement test (intermediate algebra) will be administered to determine if MAT 105 or MAT 070 is first required. For specific course information, contact the Mathematics department in room 3204 or call (718) 489-5396.

MAT 050 Elementary Algebra

A remedial course designed to develop and/or strengthen basic topics in algebra that a student should master before taking a first course in mathematics. Prerequisite: Placement by examination. 3 lecture hours per week. No credits. Every semester; day and evening.

MAT 070 Intermediate Algebra

A review of topics in elementary algebra and an extended treatment of some topics such as equations and inequalities in one and two variables as well as linear systems. Other topics include relations, functions, exponents, logarithms, exponentials, quadratic equations, and applications. Prerequisite: Placement by examination or MAT 050. 3 lecture hours per week. No credits. Every semester; day and evening.

MAT 103 Foundations of Mathematics

A liberal arts mathematics course for non-mathematics and non-science majors. Explores several ideas of mathematics to give the student an appreciation of the significance of mathematics. The course covers mathematical patterns and problem solving, numeration and mathematical systems, other number bases, the binary number system, modular arithmetic, the Fibonacci sequence and the Golden ration, and real numbers and their representation. Prerequisite: Placement by examination or MAT 050. 3 credits. Every semester; day and evening.

MAT 104 Discrete Mathematics

Basic concepts of set theory, symbolic logic, counting methods, permutations and combinations, discrete probability and elementary statistics, graphs, graph theory, Euler circuits, and trees. Prerequisite: Placement by examination or MAT 050. 3 credits. Every semester; day.

MAT 105 College Algebra

A review of topics in intermediate algebra and an extended treatment of some topics such as relations, functions, and graphs to include polynomial, rational, algebraic, exponential, and logarithmic functions and graphs. Additional topics include linear systems of equations and inequalities in two variables, determinants, and matrices with applications to business and economics. This course is recommended for students with a weak to moderate knowledge of intermediate algebra. Prerequisite: Placement by examination or MAT 070. 3 credits. Every semester; day and evening.

MAT 107 Algebra and Trigonometry for Science Majors

A course for mathematics and science majors designed to develop and strengthen those topics in algebra and trigonometry that a student should master before taking a first standard course in calculus. Prerequisite: Placement by examination or MAT 105. Graphing calculator is optional. 4 credits. Every semester; day.

MAT 109 Mathematics for Managerial Science I

The study of matrices and their application. Examples include the Leontief model and solution of systems in linear equations, inequalities in linear programming (graphical and algebraic approach), dual problems, and economic interpretation. Prerequisite: Placement by examination or MAT 105. 3 credits. Fall semester; day and evening. Spring semester; day.

MAT 110 Mathematics for Managerial Science II

Introduces the basic concepts of functional relationships, the basic skills of differentiation and integration, maxima and minima problems, and several other applications of calculus, especially models in business and economics, exponential models, and mathematics of finance. Prerequisite: MAT 109. 3 credits. Spring semester; day and evening. Fall semester; day.

MAT 202 Calculus I

Emphasis given to calculus, including differentiation and integration of algebraic forms, areas, applications of the derivative, differentials, Rolle's theorem, the mean value theorem, and the fundamental theorem of calculus. Prerequisite: MAT 107 or placement by examination. Students may purchase a graphing calculator. 4 credits. Every semester; day.

MAT 203 Calculus II

Applications of integration, logarithmic, exponential, inverse, hyperbolic, and trigonometric functions. Methods of integration, including integration by parts, trigonometric substitutions, conic sections, rotation of axes and the general second degree equation, polar coordinates, improper integrals, L'Hôpital's rules, sequences and infinite series. Prerequisite: MAT 202. 4 credits. Every semester; day.

MAT 301 Statistics

Organization, description, and interpretation of data. Probability and probability distributions. Sampling distributions and estimation of population parameters. Testing hypotheses, linear regression, correlation analysis, and index numbers. Prerequisite: Placement by examination or MAT 104 or higher. 3 credits. Every semester; day and evening.

MAT 304 Calculus III

Vectors and vector functions. Functions of several variables. Double and triple integrals, partial derivatives, chain-rule, cylindrical and spherical coordinates and change of variable, applications. Prerequisite: MAT 203. 4 credits. Every semester; day.

MAT 309 College Geometry

Topics of higher Euclidean geometry and geometric constructions. Geometrical transformations and different kinds of geometries. Projective and hyperbolic geometries. Prerequisite: MAT 107. 3 credits. Offered as needed; day.

MAT 310 Vector Analysis

The algebra and calculus of vectors, scalar and vector product, coordinate systems, space geometry, vector differential operators, divergence and curl of vector fields, curvilinear coordinates, line and surface integrals. Green's theorem, Stokes' theorem, and divergence theorem. Prerequisite: MAT 304. 3 credits. Offered as needed; day.

MAT 311 Introduction to Set Theory

The algebra of propositions and quantifiers; sets, relations, functions, equivalence relations, partial and total orders, and product sets; Cantor hypothesis, cardinal and ordinal numbers, and well-ordered sets; Axiom of Choice, Zorn's dilemma, and well ordering axiom. Prerequisite: MAT 203. 3 credits. Offered as needed; day.

MAT 312 Linear Algebra

Systems of linear equations, vector spaces, linear independence basis, and dimension; matrices and determinants, rank, and nullity; eigenvalues and eigenvectors; diagonalizable matrices; linear transformations; and matrices. Prerequisite: MAT 203. 4 credits. Fall semester; day.

MAT 401 Differential Equations I

Methods of solving ordinary differential equations with applications. Linear differential equations of first-, second-, and higher-order applications. Systems of linear differential equations. Prerequisite: MAT 203. 3 credits. Fall semester; day.

MAT 402 Differential Equations II

Fourier series and Laplace transformations: applications. Series solution of differential equations. Lengendre's and Bessel's equations. Partial differential equations. Prerequisite: MAT 401. 3 credits. Offered as needed; day.

MAT 403 Advanced Calculus I

Axiom of continuity, least upper bounds, and greatest lower bounds; open and closed sets; continuity differentiation; maxima and minima for functions of two or more variables; the method of Lagrange; implicit function theorems; and general theorems of partial differentiation. Prerequisite: MAT 304. 4 credits. Fall semester; day.

MAT 404 Advanced Calculus II

Transformations and mappings, point set theory, uniform continuity, and fundamental theorems of continuous functions, the theory of integration, infinite series and uniform convergence, power series, improper integrals, and a study of the gamma functions. Prerequisite: MAT 403. 4 credits. Spring semester; day.

MAT 406 Theory of Numbers

An introductory course dealing with divisibility, number theorems, theory and congruences, quadratic residues, and Diophantine equations. Quadratic residues and quadratic reciprocity law. Fermat's theory, Chinese remainder theorem, Euler's theorem, and Wilson's theorem. Prerequisite: MAT 202. 3 credits. Offered as needed; day.

MAT 408 Numerical Analysis

Numerical solutions of equations, difference tables, operator methods; numerical differentiation and integration; numerical solution of ordinary differential equations; systems of linear equations; solutions by iterative methods. Prerequisite: MAT 304 or MAT 401. 3 credits. Offered as needed; day.

MAT 409 Modern Algebra

Sets and mappings; theory of groups, rings, and fields; homomorphism, isomorphism, and the first isomorphism theorem; the field of real numbers and the field of complex numbers. Prerequisite: MAT 304. 3 credits. Every semester; day.

MAT 410 Functions of a Complex Variable

Complex numbers and the topology of the complex plane; analytic and elementary functions, contour integrals, conformal mappings, power series, Laurent series, Cauchy-Riemann partial differential equations; Cauchy-Goursat theorem. Prerequisite: MAT 304. 3 credits. Offered as needed; day.

MAT 411 Introduction to Real Analysis

Families of sets, countable and uncountable sets, metric spaces, the space of continuous functions on a compact set, the Stone-Weirstrass theorem, measure and measurable functions, the Lebesgue Integral, and dominated and monotone convergence theorem, L^p spaces. Prerequisite: MAT 404. 3 credits. Offered as needed; day.

MAT 413 Advanced Linear Algebra

Advanced course in linear algebra examining linear transformations and matrices, the characteristics and minimal polynomials, Caley-Hamilton theorem, diagonalization, unitary spaces, self-adjoint, normal matrices and the spectral theorem, Jordan canonical form, and quadratic form. Prerequisites: MAT 312. 3 credits. Offered as needed; day.

MAT 414 General Topology

Set-theoretic preliminaries, metric spaces, topological spaces, continuity and homomorphism, compactness and connectedness, separation axioms, complete metric spaces, and covering spaces. Prerequisite MAT 403. 3 credits. Offered as needed.

MAT 415 Probability Theory

Discrete and continuous random variables and their probability distributions. Mathematical expectation and moments. Chebyshev's Theorem, the Bernoulli, Poisson, Geometric, and Hypergeometric distributions; the Uniform, Exponential, Gamma, Chi-Square, and Normal distribution. Multivariate probability distributions. Functions of random variables. Central Limit theorems. Prerequisite: MAT 304. 3 credits. Fall semester; day.

MAT 416 Mathematical Statistics

Sampling distributions, methods of estimation and hypothesis, linear regression, and the method of least squares. Correlation and analysis of variance. Elements of decision theory, statistical games, and nonparametric tests. Prerequisite: MAT 415. 3 credits. Offered as needed; day.

MAT 418 Seminar in Actuarial Science

Advanced problem-solving seminar for students interested in careers as actuaries. This seminar covers material in calculus, advanced calculus, linear algebra, and probability theory. Examination given by the Society of Actuaries. Prerequisites: MAT 312, MAT 403, and MAT 415. 2 credits. Offered as needed; day and evening.

MAT 420 Topics in Advanced Mathematics

One of two courses that provide ideal preparation for students pursuing graduate studies in mathematics. Topic is announced in advance. Prerequisite: Chairperson's approval. 3 credits. Offered as needed, Spring semester.

Topics in Algebra: Solvability by radicals, Galois groups, and polynomial equations not solvable by radicals. The Sylow theorems and the fundamental theorem of Algebra. Prerequisite: MAT 409.

Topics in Analysis: Banach and Hilbert spaces, linear operators and special classes of operators, self-adjoint and normal operators. Elements of spectral theory. The Fourier transform. The Banach fixed-point theorem. Applications to differential and integral equations. Prerequisite: MAT 404.

MAT 500 Independent Study in Mathematics

Independent study under the direction of a faculty member in the Mathematics department. For students majoring in Mathematics Education, the independent study is on the history of mathematics. Prerequisites: senior standing, major in mathematics or mathematics education, and departmental approval. 1-3 credits. Every semester; day.