

MATHEMATICS (MATH)

Courses

MATH 5230. Adv Ordinary Diff Equations. 3 Credits.

Linear and nonlinear systems, approximate solutions, existence, uniqueness, dependence on initial conditions, stability, asymptotic behavior, singularities, self-adjoint problems. Prerequisite: MATH 3230.

MATH 5360. Foundations of Geometry. 3 Credits.

Complex numbers as tool to solve problems in Euclidean geometry. Two models of hyperbolic (non-Euclidean) geometry: Poincare and upper-half plane. Invariants and Moebius transformations. Prerequisites: MATH 2055 or CS 1640; MATH 2248, MATH 2522, or MATH 2544; or Instructor permission.

MATH 5678. Combinatorial Graph Theory. 3 Credits.

Paths and trees, connectivity, Eulerian and Hamiltonian cycles, matchings, edge and vertex colorings, planar graphs, Euler's formula and the Four Color Theorem, networks. Prerequisite: MATH 2055.

MATH 5737. Gr Intro to Numerical Anlyl. 3 Credits.

Error analysis, root-finding, interpolation, least squares, quadrature, linear equations, numerical solution of ordinary differential equations. Prerequisite: Graduate student or Instructor permission. Cross-listed with: CS 5737.

MATH 5766. Gr Chaos,Fractals&Dynamcl Systm. 3 Credits.

Discrete and continuous dynamical systems, Julia sets, the Mandelbrot set, period doubling, renormalization, Henon map, phase plane analysis and Lorenz equations. Prerequisites: Graduate student or Instructor permission. Cross-listed with: CSYS 5766.

MATH 5775. Mathematical Models&Anlysis. 3 Credits.

Techniques of calculus and linear algebra are applied for mathematical analysis of models of natural and human-created phenomena. Students are coached to give presentations. Prerequisites: MATH 2248; MATH 2522, MATH 2544, MATH 3230, or MATH 3201.

MATH 5788. Mathematical Biology&Ecol. 3 Credits.

Mathematical modeling in the life sciences. Topics include population modeling, dynamics of infectious diseases, reaction kinetics, wave phenomena in biology, and biological pattern formation. Prerequisites: MATH 2522 or MATH 2544; MATH 3230 or MATH 3201; or Instructor permission.

MATH 5990. Special Topics. 1-18 Credits.

See Schedule of Courses for specific titles.

MATH 6230. Partial Differential Equations. 3 Credits.

Classification of equations, linear equations, first order equations, second order elliptic, parabolic, and hyperbolic equations, uniqueness and existence of solutions. Prerequisite: MATH 3230.

MATH 6249. Nonlinear Partial Diff Eqs. 3 Credits.

This course covers modern mathematical theories and numerical methods for nonlinear partial differential equations. Topics include: inverse scattering transform; solitons; bilinear method; Darboux transformation; solitary waves; Vakhitov-Kolokolov stability criterion; transverse instability; virial theorem; wave collapse; pseudo-spectral method; split-step method. Prerequisite: MATH 5230 (or equivalent) or Instructor permission.

MATH 6344. Algebraic Topology. 3 Credits.

Homotopy, Seifert-van Kampen Theorem; simplicial, singular, and Cech homology. Prerequisite: MATH 3468 or MATH 4344.

MATH 6391. Master's Thesis Research. 1-18 Credits.

Research for the Master's Thesis.

MATH 6441. Theory of Func of Complex Var. 3 Credits.

Complex functions, differentiation and the Cauchy-Riemann equations, power and Laurent series, integration, calculus of residues, contour integration, isolated singularities, conformal mapping, harmonic functions. Prerequisite: MATH 3472.

MATH 6444. Thry Functions Real Variables. 3 Credits.

Lebesgue measure and integration theory, Monotone and Dominated Convergence Theorems and applications, product measures, basic theory of LP-spaces. Prerequisite: MATH 3472.

MATH 6551. Abstract Algebra III. 3 Credits.

Advanced group theory and field theory. Prerequisite: MATH 3555 or Graduate student.

MATH 6555. Abstract Algebra IV. 3 Credits.

Ring theory and module theory at the graduate level, with emphasis on commutative algebra. Prerequisite: MATH 6551.

MATH 6678. Topics in Combinatorics. 3 Credits.

Topics will vary each semester and may include combinatorial designs, coding theory, topological graph theory, cryptography. Prerequisite: MATH 3551 or MATH 5678.

MATH 6701. Principles of Complex Systems. 3 Credits.

Introduction to fundamental concepts of complex systems. Topics include: emergence, scaling phenomena, and mechanisms, multi-scale systems, failure, robustness, collective social phenomena, complex networks. Students from all disciplines welcomed. Pre/co-requisites: Calculus and statistics required; linear algebra, differential equations, and computer programming recommended but not required. Cross-listed with: CSYS 6701.

MATH 6713. Complex Networks. 3 Credits.

Detailed exploration of distribution, transportation, small-world, scale-free, social, biological, organizational networks; generative mechanisms; measurement and statistics of network properties; network dynamics; contagion processes. Students from all disciplines welcomed. Pre/co-requisites: MATH 6701, CSYS 6701, calculus, and statistics required. Cross-listed with: CSYS 6713.

MATH 6737. Numerical Diff Equations. 3 Credits.

Numerical solution and analysis of differential equations: initial-value and boundary-value problems; finite difference and finite element methods. Prerequisites: MATH 2248; MATH 2522 or MATH 2544; MATH 3230, MATH 3201, or MATH 3737 recommended.

MATH 6990. Special Topics. 1-18 Credits.

Subject will vary from year to year. May be repeated for credit.

MATH 6991. Internship. 1-18 Credits.

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

MATH 6993. Independent Study. 1-18 Credits.

A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

MATH 6995. Graduate Independent Research. 1-18 Credits.

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

MATH 7491. Doctoral Dissertation Research. 1-18 Credits.

Research for the Doctoral Dissertation.

MATH 7990. Special Topics. 1-18 Credits.

See Schedule of Courses for specific titles.

MATH 7991. Internship. 1-18 Credits.

On-site supervised work experience combined with a structured academic learning plan directed by a faculty member or a faculty-staff team in which a faculty member is the instructor of record, for which academic credit is awarded. Offered at department discretion.

MATH 7995. Graduate Independent Research. 1-18 Credits.

Graduate student work on individual or small team research projects under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.