APPLIED MATHEMATICS & COMPUTATIONAL SCI. (AS) {AMCS}

510. (MATH410) Complex Analysis.

514. (MATH314, MATH514) ADVANCED LINEAR ALGEBRA.

520. (MATH420) Ordinary Differential Equations.

525. (MATH425) Partial Dif Equations.

530. (MATH430) Intro to Probability.

532. (MATH432) Game Theory.

567. (BE 567) Mathematical and Computational Modeling of Biological Systems. (M) Prerequisite(s): BE 324 and BE 350.

This is an introductory course in mathematical biology. The emphasis will be on the use of mathematical and computational tools for modeling physical phenomena which arise in the study biological systems. Possible topics include random walk models of polymers, membrane elasticity, electrodiffusion and excitable systems, single-molecule kinetics, and stochastic models of biochemical networks.

599. Independent Study.

602. Algebraic Techniques for Applied Mathematics and Computational Science, I.. (M) Staff.

We turn to linear algebra and the structural properties of linear systems of equations relevant to their numerical solution. In this context we introduce eigenvalues and the spectral theory of matrices. Methods appropriate to the numerical solution of very large systems are discussed. We discuss modern techniques using randomized algorithms for fast matrix-vector multiplication, and fast direct solvers. Topics covered include the classical Fast Multipole Method, the interpolative decomposition, structured matrix algebra, randomized methods for low-rank approximation, and fast direct solvers for sparse matrices. These techniques are of central importance in applications of linear algebra to the numerical solution of PDE, and in Machine Learning. The theoretical content of this course is illustrated and supplemented throughout the year with substantial computational examples and assignments.

603. ALGEBRAIC TECHIQUES II. (M) Staff.

We begin with an introduction to group theory. The emphasis is on groups as symetries and transformations of space. After an introduction to abstract groups, we turn our attention to compact Lie groups, in particular SO(3), and their representations. We explore the connections between orthogonal polynomials, classical transcendental functions and group representations. This unit is completed with a discussion of finite groups and their applications in coding theory.

608. (MATH608) Analysis. (M) Staff.Prerequisite(s): Math 508-509.

Complex analysis: analyticity, Cauchy theory, meromorphic functions, isolated singularities, analytic continuation, Runge's theorem, d-bar equation, Mittlag-Leffler theorem, harmonic and sub-harmonic functions, Riemann mapping theorem, Fourier transform from the analytic perspective. Introduction to Real Analysis: Weierstrass approximation, Lebesgue measure and integration Euclideanspaces, Borel measures and convergence theorems, C0 and the Riesz-Markov theorem, Lp-spaces, Fubini's Theorem.

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609. (MATH609) Analysis. (M) Staff.Prerequisite(s): Math 608 or permission of the instructor.

Real analysis continued: general measure theory, outer measures and Cartheodoryconstruction, Hausdorff measures, Radon-Nikodym theorem, the general Fubini theorem. Functional Analysis: Hilbert space and L2-theory of the Fourier transform, normed linear spaces, convexity, the Hahn-Banach theorem, duality for Banach spaces, weak convergence, bounded linear operators, Baire category theorem, uniform boundedness principle, open mapping theorem, closed graph theorem, compact operators, Fredholm theory, interpolation theorems, Lp-theory for the Fourier transform, functional calculus and spectral theory.

637. (MEAM637, MSE 637) MESOSCALE MODEL AND SIM.

701. (MATH582) Topics in Applied Math.

990. Masters Reg Tuition.

999. Independent Study & Research.