APPLIED MATH & COMPUTATIONAL SCIENCE (AMCS)

AMCS 510 Complex Analysis
Complex numbers, DeMoivre’s theorem, complex valued functions of a complex variable, the derivative, analytic functions, the Cauchy-Riemann equations, complex integration, Cauchy’s integral theorem, residues, computation of definite integrals by residues, and elementary conformal mapping.
Taught by: Staff.
One-term course offered either term
Activity: Lecture
1 Course Unit

AMCS 514 Advanced Linear Algebra
Topics will include: Vector spaces, Basis and dimension, quotients; Linear maps and matrices; Determinants, Dual spaces and maps; Invariant subspaces, Canonical forms; Scalar products: Euclidean, unitary and sympletic spaces; Orthogonal and Unitary operators; Tensor products and polylinear maps; Symmetric and skew-symmetric tensors and exterior algebra.
Prerequisite: Math 114 or Math 115
Activity: Lecture
1 Course Unit

AMCS 520 Ordinary Differential Equations
After a rapid review of the basic techniques for solving equations, the course will discuss one or more of the following topics: stability of linear and nonlinear systems, boundary value problems and orthogonal functions, numerical techniques, Laplace transform methods.
One-term course offered either term
Prerequisite: Math 240
Activity: Lecture
1 Course Unit

AMCS 525 Partial Dif Equations
Method of separation of variables will be applied to solve the wave, heat, and Laplace equations. In addition, one or more of the following topics will be covered: qualitative properties of solutions of various equations (characteristics, maximum principles, uniqueness theorems), Laplace and Fourier transform methods, and approximation techniques.
Course usually offered in fall term
Prerequisites: MATH 240 or permission of instructor. Knowledge of PHYS 150-151 will be helpful.
Activity: Lecture
1 Course Unit

AMCS 567 Mathematical and Computational Modeling of Biological Systems.
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.
Course not offered every year
Also Offered As: BE 567
Prerequisites: BE 324 and BE 350
Activity: Lecture
1 Course Unit

AMCS 584 Math of Med Imag&Measure
Course not offered every year
Also Offered As: BE 584
Activity: Lecture
1 Course Unit

AMCS 599 Independent Study
Activity: Independent Study
1 Course Unit

AMCS 602 Algebraic Techniques for Applied Mathematics and Computational Science, I.
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.
Course not offered every year
Activity: Lecture
1 Course Unit

AMCS 603 Algebraic Techniques for Applied Mathematics and Computational Science, II.
We begin with an introduction to group theory. The emphasis is on groups as symmetries 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.
Course not offered every year
Activity: Lecture
1 Course Unit

AMCS 608 Analysis
Complex analysis: analyticity, Cauchy theory, meromorphic functions, isolated singularities, analytic continuation, Runge’s theorem, d-bar equation, Mittltag-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 Euclidean spaces, Borel measures and convergence theorems, C0 and the Riesz-Markov theorem, Lp-spaces, Fubini’s Theorem.
Course not offered every year
Prerequisite: Math 508-509
Activity: Lecture
1 Course Unit
AMCS 609 Analysis
Course not offered every year
Prerequisites: Math 608 or permission of the instructor.
Activity: Lecture
1 Course Unit

AMCS 610 Functional Analysis
Prerequisites: Math 608 or 609, some elementary complex analysis is essential.
Activity: Lecture
1 Course Unit

AMCS 990 Masters Reg Tuition
Activity: Masters Thesis
1 Course Unit

AMCS 999 Independent Study & Research
Study under the direction of a faculty member.
Activity: Independent Study
1 Course Unit