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
Also Offered As: MATH 410
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, Cononical forms; Scalar products: Euclidean, unitary and
symplectic spaces; Orthogonal and Unitary operators; Tensor products
and polylinear maps; Symmetric and skew-symmetric tensors and
exterior algebra.
Also Offered As: MATH 314, MATH 514
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
Also Offered As: MATH 420
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
Also Offered As: MATH 425
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, MATH 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 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.
Course not offered every year
Activity: Lecture
1 Course Unit
AMCS 608 Analysis
Course not offered every year
Also Offered As: MATH 608
Prerequisite: Math 508-509
Activity: Lecture
1 Course Unit

AMCS 609 Analysis
Course not offered every year
Also Offered As: MATH 609
Prerequisites: Math 608 or permission of the instructor.
Activity: Lecture
1 Course Unit

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

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