

Department: MATHEMATICAL SCIENCES

Semester Hours: 3

Course Title and Number: MATH 439 - Applied Mathematics for Sciences and Engineering

A course in applied mathematics designed mainly for science and engineering majors. Topics covered include the formulation of the basic partial differential equations from engineering and classical physics, separation of variables for the wave, heat, and Laplace equations, Fourier series and Sturm-Liouville theory, applications of Laplace and Fourier transform techniques to partial differential equation problems, eigenfunction expansions, method of characteristics, perturbation methods, Green's functions, orthogonal expansions, and numerical methods.

PRQ: MATH 232 and MATH 336.

Course Objectives:

- To reason rigorously in mathematical arguments
- To communicate mathematics clearly and efficiently
- To understand the concepts of continuum model construction
- To understand the advantages and limitations of analytical and numerical approaches to mathematical problems

Content:

- Green's, Stokes', and Divergence Theorems
- Derivation of Navier Stokes and Wave Equations
- Green's Functions and Fundamental Solutions
- Fourier Transform Methods
- Fourier Series Methods
- Numerical solutions techniques

Course Requirements: Discussion of new tools and strategies in problem solving. Understand the mathematical underpinnings of the equations of transport. Make connections and distinctions between solutions of ordinary and partial differential equations. Approach problems from multiple viewpoints emphasizing several analytical and numerical approaches. Solution of more advanced problems, and discussion of depth in mathematics. Use the computer in solving substantial problems. Regular homework involving both computer and non-computer work. Hour examinations. Final examination.

Assessment Instruments: In class quizzes. Homework problem solutions. Hour exams. Computer project work. A final examination.

Current textbook:

Stewart, **Calculus Vol. 3** or similar 3rd semester or vector calculus textbook.

Asmar, N **Partial Differential Equations with Fourier Series and Boundary Value Problems**, 2nd Ed. Pearson (2004)