

San Francisco State University
Department of Mathematics
Course Syllabus

MATH 477
Partial Differential Equations

Prerequisites

MATH 376 with a grade of C or better and MATH 374 with a grade of C or better or consent of the instructor..

Bulletin Description

Fourier series, linear partial differential equations in rectangular, polar and cylindrical coordinates, boundary value problems for the heat equation, the wave equation, and Laplace's equation, Sturm-Liouville boundary value problems.

Course Objectives

The principal aim of Partial Differential Equations is for students to learn the fundamental techniques for solving boundary value problems for certain classes of first and second order linear partial differential equations.

Students who successfully complete Partial Differential Equations should

- Be able to solve first order linear partial differential equations with constant coefficients using characteristic coordinate transformations.
- Be able to use partial differential equation to model one-dimensional heat flow and one-dimensional wave motion and reduce these problems to ordinary differential equations using separation of variables. Using the solutions to these ordinary differential equations students will be able to solve the original problems by using Fourier series.
- Be able to understand the general theory of Sturm-Liouville problems and demonstrate how this theory is used to solve Dirichlet, Neumann, and Robin boundary value problems for the heat equation, the wave equation and Laplace's equation.

Evaluation of Students

Students will be graded on their ability to devise, organize and present in correct mathematical English solutions to problems. While instructors may design their own methods of evaluation student performance, these methods must include in-class examinations, graded homework assignments and a final exam.

Course Outline

Topics	Number of Weeks
Fourier Series	3
Partial Differential Equations in Rectangular, Polar, and Cylindrical, and Coordinates	2
First Order Linear Equations	1
Heat Diffusion and the One-dimensional Heat Equation	1
One-dimensional Wave Equation	1
Solving Boundary Value Problems for the One-dimensional Heat Equation and the One-dimensional Wave Equation	2
Theory of Sturm-Liouville Problems	2
The Fourier Transform	2

Textbooks and Software

Applied Partial Differential Equations, 4th Edition, by Richard Haberman
Partial Differential Equations and Boundary Value Problems, by Nakhle Asmar.
Mathematica, by Wolfram Research.

Submitted by: David Ellis Date: 29 May 2003