MATHEMATICS 302
PARTIAL DIFFERENTIAL EQUATIONS

I. Introduction

A. Catalog Description

This course introduces partial differential equations, how they arise in certain physical situations, and methods of solving them. Topics of study include the heat equation, the wave equation, Laplace's Equation and Fourier Series with its applications to partial differential equations and boundary value problems. Additional topics may include Green's Functions, the Fourier Transform, the method of characteristics, dispersive waves and perturbation methods. *Prerequisite: Math 301 or equivalent.*

B. Objectives

Students should understand how physical situations and applied problems give rise to partial differential equations. They should see how separation of variables and Fourier Series combine to solve the heat and wave equations and give insights into observed properties of heat and sound. In using material from the prerequisite ordinary differential equations course, students should gain further insight into the process of breaking down a mathematical problem and constructing its solution using results from topics they have studied before.

C. Prerequisites

Math 301 or equivalent.

II. Required Topics

A. The Heat Equation

B. The Wave Equation

C. Laplace's Equation

D. Fourier Series and the Convergence Theorem

III. Optional Topics

A. Bessel Functions

B. Green's Functions

C. Sturm-Liouville Eigenvalue Problems

D. Fourier Transforms

E. The Beam Equation

F. The Method of Characteristics

G. Nonlinear Partial Differential Equations

H. Laplace Transform Methods

I. Perturbation Methods

J. Stability

IV. Bibliography

Richard Haberman, Elementary Applied Partial Differential Equations, Prentice Hall, 1998

Nakhle Asmar, Partial Differential Equations And Boundary Value Problems, Prentice Hall, 2000

John Troutman, Boundary Value Problems Of Applied Mathematics, PWS, 1994

Donald Trim, Applied Partial Differential Equations, PWS, 1990