Partial Differential Equations:Methods, Applications and Theories

Harumi Hattori

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This volume is an introductory level textbook for partial differential equations (PDE's) and suitable for a one-semester undergraduate level or two-semester graduate level course in PDE's or applied mathematics. Chapters One to Five are organized according to the equations and the basic PDE's are introduced in an easy to understand manner. They include the first-order equations and the three fundamental second-order equations, i.e. the heat, wave and Laplace equations. Through these equations we learn the types of problems, how we pose the problems, and the methods of solutions such as the separation of variables and the method of characteristics. The modeling aspects are explained as well. The methods introduced in earlier chapters are developed further in Chapters Six to Twelve. They include the Fourier series, the Fourier and the Laplace transforms, and the Green's functions. The equations in higher dimensions are also discussed in detail.

This volume is application-oriented and rich in examples. Going through these examples, the reader is able to easily grasp the basics of PDE's.

Contents:

- First and Second Order Linear Equations — Preparation
- Heat Equation
- Wave Equation
- Laplace Equation
- First Order Equations Revisited
- Fourier Series and Eigenvalue Problems
- Separation of Variables in Higher Dimensions
- More Separation of Variables
- Fourier Transform
- Laplace Transform
- Higher Dimensional Problems — Other Approaches
- Green's Functions

Readership: Undergraduate students in Math, Science, and Engineering.

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