Physics and Partial Differential Equations, Volume II

Tatsien Li, Tiehu Qin

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Physics and Partial Differential Equations, Volume II proceeds directly from Volume I (SIAM, 2012) with five additional chapters that bridge physics and applied mathematics in a manner that is easily accessible to readers with an undergraduate-level background in these disciplines.

Readers who are more familiar with mathematics than physics will discover the connection between various physical and mechanical disciplines and their related mathematical models, which are described by partial differential equations (PDEs). The authors establish the fundamental equations for fields such as electrodynamics; fluid dynamics, magnetohydrodynamics, and reacting fluid dynamics; elastic, thermoelastic, and viscoelastic mechanics; the kinetic theory of gases; special relativity; and quantum mechanics.

Readers who are more familiar with physics than mathematics will benefit from in-depth explanations of how PDEs work as effective mathematical tools to more clearly express and present the basic concepts of physics. The book describes the mathematical structures and features of these PDEs, including the types and basic characteristics of the equations, the behavior of the solutions, and some commonly used approaches to solving PDEs.

Each chapter can be read independently and includes exercises and references.

Audience: Used alone or in conjunction with Volume I, this book is appropriate as a textbook for upper-level undergraduate and graduate courses and can also serve as a reference for researchers in application areas that use PDEs and in physical and mechanical disciplines.

Contents: Preface to the English Edition; Preface to the Chinese Edition; Chapter 6: Thermoelasticity; Chapter 7: Viscoelasticity; Chapter 8: Kinetic Theory of Gases; Chapter 9: Special Relativity and Relativistic Fluid Dynamics; Chapter 10: Quantum Mechanics; Appendix C: Tensors in Minkowski Four-Space-Time; Index.

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