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Theory and Completely Solved Problems Walter de Gruyter GmbH & Co KG

This highly visual introductory textbook provides a rigorous mathematical foundation for all solution methods and reinforces ties to physical motivation.

Contributions to the Theory of Partial Differential Equations Springer

This concise book covers the classical tools of Partial Differential Equations Theory in today's science and engineering. The rigorous theoretical presentation includes many hints, and the book contains many illustrative applications from physics.

Partial Differential Equations Courier Corporation

The description for this book, *Contributions to the Theory of Partial Differential Equations*. (AM-33), Volume 33, will be forthcoming.

Partial Differential Equations FriesenPress

In this undergraduate/graduate textbook, the authors introduce ODEs and PDEs through 50 class-tested lectures.

Mathematical concepts are explained with clarity and rigor, using fully worked-out examples and helpful illustrations.

Exercises are provided at the end of each chapter for practice. The treatment of ODEs is developed in conjunction with PDEs and is aimed mainly towards applications. The book covers important applications-oriented topics such as solutions of ODEs in form of power series, special functions, Bessel functions, hypergeometric functions, orthogonal functions and polynomials, Legendre, Chebyshev, Hermite, and Laguerre polynomials, theory of Fourier series. Undergraduate and graduate students in

mathematics, physics and engineering will benefit from this book. The book assumes familiarity with calculus.

With Special Functions, Fourier Series, and Boundary Value Problems Springer Science & Business Media

This text explores the essentials of partial differential equations as applied to engineering and the physical sciences. Discusses ordinary differential equations, integral curves and surfaces of vector fields, the Cauchy-Kovalevsky theory, more. Problems and answers.

Partial Differential Equations Springer Science & Business Media

This text provides an introduction to the theory of partial differential equations. It introduces basic examples of partial differential equations, arising in continuum mechanics, electromagnetism, complex analysis and other areas, and develops a number of tools for their solution, including particularly Fourier analysis, distribution theory, and Sobolev spaces. These tools are applied to the treatment of basic problems in linear PDE, including the Laplace equation, heat equation, and wave equation, as well as more general elliptic, parabolic, and hyperbolic equations. Companion texts, which take the theory of partial differential equations further, are AMS volume 116, treating more advanced topics in linear PDE, and AMS volume 117, treating problems in nonlinear PDE. This book is addressed to graduate students in mathematics and to professional mathematicians, with an interest in partial differential equations, mathematical physics, differential geometry, harmonic analysis, and complex analysis.

Introduction to Partial Differential Equations with Applications PHI Learning Pvt. Ltd.

Publisher Description

Partial Differential Equations in Action CRC Press

Theory of Partial Differential Equations Springer Science & Business Media

This textbook is designed for a one year course covering the fundamentals of partial differential equations, geared towards advanced undergraduates and beginning graduate students in mathematics, science, engineering, and elsewhere. The exposition carefully balances solution techniques, mathematical rigor, and significant applications, all illustrated by numerous examples. Extensive exercise sets appear at the end of almost every subsection, and include straightforward computational problems to develop and reinforce new techniques and results, details on theoretical developments and proofs, challenging projects both computational and conceptual, and supplementary material that motivates the student to delve further into the subject. No previous experience with the subject of partial differential equations or Fourier theory is assumed, the main prerequisites being undergraduate calculus, both one- and multi-variable, ordinary differential equations, and basic linear algebra. While the classical topics of separation of variables, Fourier analysis, boundary value problems, Green's functions, and special functions continue to form the core of an introductory course, the inclusion of nonlinear equations, shock wave dynamics, symmetry and similarity, the Maximum Principle, financial models, dispersion and solutions, Huygens' Principle, quantum mechanical systems, and more make this text well attuned to recent developments and trends in this active field of contemporary research. Numerical approximation schemes are an important component of any introductory course, and the text covers the two most basic approaches: finite differences and finite elements.

Partial Differential Equations CUP Archive

Provides more than 150 fully solved problems for linear partial differential equations and boundary value problems. *Partial Differential Equations: Theory and Completely Solved Problems* offers a modern introduction into the theory and applications of linear partial differential equations (PDEs). It is the material for a typical third year university course in PDEs. The material of this textbook has been extensively class tested over a period of 20 years in about 60 separate classes. The book is divided into two parts. Part I contains the Theory part and covers topics such as a classification of second order PDEs, physical and biological derivations of the heat, wave and Laplace equations, separation of variables, Fourier series, D'Alembert's principle, Sturm-Liouville theory, special functions, Fourier transforms and the method of characteristics. Part II contains more than 150 fully solved problems, which are ranked according to their difficulty. The last two chapters include sample Midterm and Final exams for this course with full solutions.

Partial Differential Equations Partial Differential Equations Theory and Technique

This new edition features the latest tools for modeling, characterizing, and solving partial differential equations. The Third Edition of this classic text offers a comprehensive guide to modeling, characterizing, and solving partial differential equations (PDEs). The author provides all the theory and tools necessary to solve problems via exact, approximate, and numerical methods. The Third Edition retains all the hallmarks of its previous editions, including an emphasis on practical applications, clear writing style and logical organization, and extensive use of real-world examples. Among the new and revised material, the book features: * A new section at the end of each original chapter, exhibiting the use of specially constructed Maple procedures that solve PDEs via many of the methods presented in the chapters. The results can be evaluated numerically or displayed graphically. * Two new chapters that present finite difference and finite element methods for the solution of PDEs. Newly constructed Maple procedures are provided and used to carry out each of these methods. All the numerical results can be displayed graphically. * A related FTP site that includes all the Maple code used in the text. * New exercises in each chapter, and answers to many of the exercises are provided via the FTP site. A

supplementary Instructor's Solutions Manual is available. The book begins with a demonstration of how the three basic types of equations-parabolic, hyperbolic, and elliptic-can be derived from random walk models. It then covers an exceptionally broad range of topics, including questions of stability, analysis of singularities, transform methods, Green's functions, and perturbation and asymptotic treatments. Approximation methods for simplifying complicated problems and solutions are described, and linear and nonlinear problems not easily solved by standard methods are examined in depth. Examples from the fields of engineering and physical sciences are used liberally throughout the text to help illustrate how theory and techniques are applied to actual problems. With its extensive use of examples and exercises, this text is recommended for advanced undergraduates and graduate students in engineering, science, and applied mathematics, as well as professionals in any of these fields. It is possible to use the text, as in the past, without use of the new Maple material.

Linear Partial Differential Equations and Fourier Theory Princeton University Press

"Optimal control theory is concerned with finding control functions that minimize cost functions for systems described by differential equations. The methods have found widespread applications in aeronautics, mechanical engineering, the life sciences, and many other disciplines. This book focuses on optimal control problems where the state equation is an elliptic or parabolic partial differential equation. Included are topics such as the existence of optimal solutions, necessary optimality conditions and adjoint equations, second-order sufficient conditions, and main principles of selected numerical techniques. It also contains a survey on the Karush-Kuhn-Tucker theory of nonlinear programming in Banach spaces. The exposition begins with control problems with linear equations, quadratic cost functions and control constraints. To make the book self-contained, basic facts on weak solutions of elliptic and parabolic equations are introduced. Principles of functional analysis are introduced and explained as they are needed. Many simple examples illustrate the theory and its hidden difficulties. This start to the book makes it fairly self-contained and suitable for advanced undergraduates or beginning graduate students. Advanced control problems for nonlinear partial differential equations are also discussed. As prerequisites, results on boundedness and continuity of solutions to semilinear

elliptic and parabolic equations are addressed. These topics are not yet readily available in books on PDEs, making the exposition also interesting for researchers. Alongside the main theme of the analysis of problems of optimal control, Tr'oltzsch also discusses numerical techniques. The exposition is confined to brief introductions into the basic ideas in order to give the reader an impression of how the theory can be realized numerically. After reading this book, the reader will be familiar with the main principles of the numerical analysis of PDE-constrained optimization."-- Publisher's description.

Partial Differential Equations John Wiley & Sons

This text on partial differential equations is intended for readers who want to understand the theoretical underpinnings of modern PDEs in settings that are important for the applications without using extensive analytic tools required by most advanced texts. The assumed mathematical background is at the level of multivariable calculus and basic metric space material, but the latter is recalled as relevant as the text progresses. The key goal of this book is to be mathematically complete without overwhelming the reader, and to develop PDE theory in a manner that reflects how researchers would think about the material. A concrete example is that distribution theory and the concept of weak solutions are introduced early because while these ideas take some time for the students to get used to, they are fundamentally easy and, on the other hand, play a central role in the field. Then, Hilbert spaces that are quite important in the later development are introduced via completions which give essentially all the features one wants without the overhead of measure theory. There is additional material provided for readers who would like to learn more than the core material, and there are numerous exercises to help solidify one's understanding. The text should be suitable for advanced undergraduates or for beginning graduate students including those in engineering or the sciences.

Basic Theory John Wiley & Sons

This is the second edition of the well-established text in partial differential equations, emphasizing modern, practical solution techniques. This updated edition includes a new chapter on transform methods and a new section on integral equations in the numerical methods chapter. The authors have also included additional exercises.

An Introduction to Theory and Applications Academic Press

The first of three volumes on partial differential equations, this one introduces basic examples arising in continuum mechanics, electromagnetism, complex analysis and other areas, and develops a number of tools for their solution, in particular Fourier analysis, distribution theory, and Sobolev spaces. These tools are then applied to the treatment of basic problems in linear PDE, including the Laplace equation, heat equation, and wave equation, as well as more general elliptic, parabolic, and hyperbolic equations. The book is targeted at graduate students in mathematics and at professional mathematicians with an interest in partial differential equations, mathematical physics, differential geometry, harmonic analysis, and complex analysis.

Princeton University Press

This book offers an ideal graduate-level introduction to the theory of partial differential equations. The first part of the book describes the basic mathematical problems and structures associated with elliptic, parabolic, and hyperbolic partial differential equations, and explores the connections between these fundamental types. Aspects of Brownian motion or pattern formation processes are also presented. The second part focuses on existence schemes and develops estimates for solutions of elliptic equations, such as Sobolev space theory, weak and strong solutions, Schauder estimates, and Moser iteration. In particular, the reader will learn the basic techniques underlying current research in elliptic partial differential equations. This revised and expanded third edition is enhanced with many additional examples that will help motivate the reader. New features include a reorganized and extended chapter on hyperbolic equations, as well as a new chapter on the relations between different types of partial differential equations, including first-order hyperbolic systems, Langevin and Fokker-Planck equations, viscosity solutions for elliptic PDEs, and much more. Also, the new edition contains additional material

on systems of elliptic partial differential equations, and it explains in more detail how the Harnack inequality can be used for the regularity of solutions.

THEORY AND APPLICATIONS John Wiley & Sons

Ordinary differential control theory (the classical theory) studies input/output relations defined by systems of ordinary differential equations (ODE). The various concepts that can be introduced (controllability, observability, invertibility, etc.) must be tested on formal objects (matrices, vector fields, etc.) by means of formal operations (multiplication, bracket, rank, etc.), but without appealing to the explicit integration (search for trajectories, etc.) of the given ODE. Many partial results have been recently unified by means of new formal methods coming from differential geometry and differential algebra. However, certain problems (invariance, equivalence, linearization, etc.) naturally lead to systems of partial differential equations (PDE). More generally, partial differential control theory studies input/output relations defined by systems of PDE (mechanics, thermodynamics, hydrodynamics, plasma physics, robotics, etc.). One of the aims of this book is to extend the preceding concepts to this new situation, where, of course, functional analysis and/or a dynamical system approach cannot be used. A link will be exhibited between this domain of applied mathematics and the famous 'Backlund problem', existing in the study of solitary waves or solitons. In particular, we shall show how the methods of differential elimination presented here will allow us to determine compatibility conditions on input and/or output as a better understanding of the foundations of control theory. At the same time we shall unify differential geometry and differential algebra in a new framework, called differential algebraic geometry.

From Modelling to Theory Courier Corporation

The description for this book, Contributions to the Theory of Partial Differential Equations. (AM-33), Volume 33, will be forthcoming.

New Perspectives for Applications Elsevier
Resources for instructors who adopt this textbook: Lecture Slides, Instructors' Manual (complete solutions and supporting work), Students' Manual (final answers to computational exercises). Kindly send your requests to sales@wspc.com. This textbook gives an introduction to Partial Differential Equations (PDEs), for any reader wishing to learn and understand the basic concepts, theory, and solution techniques of elementary PDEs. The only prerequisite is an undergraduate course in Ordinary Differential Equations. This work contains a comprehensive treatment of the standard second-order linear PDEs, the heat equation, wave equation, and Laplace's equation. First-order and some common nonlinear PDEs arising in the physical and life sciences, with their solutions, are also covered. This textbook includes an introduction to Fourier series and their properties, an introduction to regular Sturm-Liouville boundary value problems, special functions of mathematical physics, a treatment of nonhomogeneous equations and boundary conditions using methods such as Duhamel's principle, and an introduction to the finite difference technique for the numerical approximation of solutions. All results have been rigorously justified or precise references to justifications in more advanced sources have been cited.

Appendices providing a background in complex analysis and linear algebra are also included for readers with limited prior exposure to those subjects. The textbook includes material from which instructors could create a one- or two-semester course in PDEs. Students may also study this material in preparation for a graduate school (masters or doctoral) course in PDEs. The lecture slides, instructors' manual and students' manual is available upon request for all instructors who adopt this book as a course text. Please send your request to sales@wspc.com.

[Game Theory and Partial Differential Equations](#) Springer

Introduction to the Theory of Linear Partial Differential Equations