Differential Equations And Their Applications An Introduction To Applied Mathematics Applied Mathematical Sciences Volume 15


Nonlinear Partial Differential Equations and Their Applications

An easy to understand guide covering key principles of ordinary differential equations and their applications.

Differential Equations and Their Applications

Used in undergraduate classrooms across the USA, this is a clearly written, rigorous introduction to differential equations and their applications.

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applications. Fully understandable to students who have had one year of calculus, this book distinguishes itself from other differential equations texts through its engaging application of the subject matter to interesting scenarios. This fourth edition incorporates earlier introductory material on bifurcation theory and adds a new chapter on Sturm-Liouville boundary value problems. Computer programs in C, Pascal, and Fortran are presented throughout the text to show readers how to apply differential equations towards quantitative problems.

Nonlinear Partial Differential Equations and Their Applications

Delay and Functional Differential Equations and Their Applications provides information pertinent to the fundamental aspects of functional differential equations and its applications. This book covers a variety of topics, including qualitative and geometric theory, control theory, Volterra equations, numerical methods, the theory of epidemics, problems in physiology, and other areas of applications. Organized into two parts encompassing 25 chapters, this book begins with an overview of problems involving functional differential equations with terminal conditions in function spaces. This text then examines the numerical methods for functional differential equations. Other chapters consider the theory of radiative transfer, which give rise to several interesting functional partial differential equations. This book discusses as well the theory of embedding fields, which studies systems of nonlinear functional differential equations that can be derived from psychological postulates and interpreted as neural networks. The final chapter deals with the usefulness of the flip-flop circuit. This book is a valuable resource for mathematicians.

Differential Equations and Their Applications

Differential equations; Linear differential equations; Systems of differential equations; Qualitative theory of differential equations; Separation of variable and fourier series.

Asymptotic Solutions of Differential Equations and Their Applications

Differential equations and their applications

This book tries to point out the mathematical importance of the Partial Differential Equations of First Order (PDEFO) in Physics and Applied Sciences. The intention is to provide mathematicians with a wide view of the applications of this branch in physics, and to give physicists and applied scientists a powerful tool for solving some problems appearing in Classical Mechanics, Quantum Mechanics, Optics, and General Relativity. This book is intended for senior or first year graduate students in mathematics, physics, or engineering curricula. This book is unique in the sense that it covers the applications of PDEFO in several branches of applied mathematics, and fills the theoretical gap between the formal mathematical presentation of the theory and the pure applied tool to physical problems that are contained in other books. Improvements made in this second edition include corrected typographical errors; rewritten text to improve the flow and enrich the material; added exercises in all chapters; new applications in Chapters 1, 2,
and 5 and expanded examples.

**Differential Equations and Their Applications**

This book contains the written versions of lectures delivered since 1997 in the well-known weekly seminar on Applied Mathematics at the Collège de France in Paris, directed by Jacques-Louis Lions. It is the 14th and last of the series, due to the recent and untimely death of Professor Lions. The texts in this volume deal mostly with various aspects of the theory of nonlinear partial differential equations. They present both theoretical and applied results in many fields of growing importance such as Calculus of variations and optimal control, optimization, system theory and control, operations research, fluids and continuum mechanics, nonlinear dynamics, meteorology and climate, homogenization and material science, numerical analysis and scientific computations. The book is of interest to everyone from postgraduate, who wishes to follow the most recent progress in these fields.

**DIFFERENTIAL EQUATIONS AND THEIR APPLICATIONS**

Used in undergraduate classrooms across the USA, this is a clearly written, rigorous introduction to differential equations and their applications. Fully understandable to students who have had one year of calculus, this book distinguishes itself from other differential equations texts through its engaging application of the subject matter to interesting scenarios. This fourth edition incorporates earlier introductory material on bifurcation theory and adds a new chapter on Sturm-Liouville boundary value problems. Computer programs in C, Pascal, and Fortran are presented throughout the text to show readers how to apply differential equations towards quantitative problems.

**Nonlinear Partial Differential Equations and Their Applications**

**Theory of Stochastic Differential Equations with Jumps and Applications**

**Differential Equations and Their Applications**

This book contains the written versions of lectures delivered since 1997 in the well-known weekly seminar on Applied Mathematics at the Collège de France in Paris, directed by Jacques-Louis Lions. It is the 14th and last of the series, due to the recent and untimely death of Professor Lions. The texts in this volume deal mostly with various aspects of the theory of nonlinear partial differential equations. They present both theoretical and applied results in many fields of growing importance such as Calculus of variations and optimal control, optimization, system theory and control, operations research, fluids and continuum mechanics, nonlinear dynamics, meteorology and climate, homogenization and material science, numerical analysis and scientific computations. The book is of interest to everyone from postgraduate, who wishes to follow the most recent progress in these fields.
Delay and Functional Differential Equations and Their Applications

Stochastic Differential Equations and Applications

Nonlinear partial differential equations and their applications

Difference Equations and Their Applications

This book is a landmark title in the continuous move from integer to non-integer in mathematics: from integer numbers to real numbers, from factorials to the gamma function, from integer-order models to models of an arbitrary order. For historical reasons, the word 'fractional' is used instead of the word 'arbitrary'. This book is written for readers who are new to the fields of fractional derivatives and fractional-order mathematical models, and feel that they need them for developing more adequate mathematical models. In this book, not only applied scientists, but also pure mathematicians will find fresh motivation for developing new methods and approaches in their fields of research. A reader will find in this book everything necessary for the initial study and immediate application of fractional derivatives fractional differential equations, including several necessary special functions, basic theory of fractional differentiation, uniqueness and existence theorems, analytical numerical methods of solution of fractional differential equations, and many inspiring examples of applications. A unique survey of many applications of fractional calculus Presents basic theory Includes a unified presentation of selected classical results, which are important for applications Provides many examples Contains a separate chapter of fractional order control systems, which opens new perspectives in control theory The first systematic consideration of Caputo's fractional derivative in comparison with other selected approaches Includes tables of fractional derivatives, which can be used for evaluation of all considered types of fractional derivatives

Ordinary Differential Equations

This volume presents lectures given at the 1995 Annual Seminar of the Canadian Mathematical Society on Partial Differential Equations and Their Applications held at the University of Toronto in June 1995. The conference consisted of a combination of minicourses, invited presentations, and contributed talks. In this volume readers will find contributions on a variety of topics related to PDE, such as spectral asymptotics, harmonic analysis, differential operators in hyperbolic manifolds, applications to geometry, mathematical physics, hydrodynamics, and the interaction between theory and numerical methods in PDE.

An Introduction to Differential Equations and Their Applications

This volume is a survey/monograph on the recently developed theory of forward-backward stochastic differential equations (FBSDEs).
Basic techniques such as the method of optimal control, the ‘Four Step Scheme’, and the method of continuation are presented in full. Related topics such as backward stochastic PDEs and many applications of FBSDEs are also discussed in detail. The volume is suitable for readers with basic knowledge of stochastic differential equations, and some exposure to the stochastic control theory and PDEs. It can be used for researchers and/or senior graduate students in the areas of probability, control theory, mathematical finance, and other related fields.

Introduction to Random Differential Equations and Their Applications

Differential Equations and Their Applications; Proceedings

This book is about the theory and applications of Partial Differential Equations of First Order (PDEFO). Many interesting topics in physics such as constant motion of dynamical systems, renormalization theory, Lagrange transformation, ray trajectories, and Hamilton–Jacobi theory are or can be formulated in terms of partial differential equations of first order. In this book, the author illustrates the utility of the powerful method of PDEFO in physics, and also shows how PDEFO are useful for solving practical problems in different branches of science. The book focuses mainly on the applications of PDEFO, and the mathematical formalism is treated carefully but without diverging from the main objective of the book. Request Inspection Copy

Differential Equations and Their Applications

The theory of difference equations is now enjoying a period of Renaissance. Witness the large number of papers in which problems, having at first sight no common features, are reduced to the investigation of subsequent iterations of the maps $f: \mathbb{R}^m \to \mathbb{R}^m, m > 0$, or (which is, in fact, the same) to difference equations. The world of difference equations, which has been almost hidden up to now, begins to open in all its richness. Those experts, who usually use differential equations and, in fact, believe in their universality, are now discovering a completely new approach which resembles the theory of ordinary differential equations only slightly. Difference equations, which reflect one of the essential properties of the real world-its discreteness-rightfully occupy a worthy place in mathematics and its applications. The aim of the present book is to acquaint the reader with some recently discovered and (at first sight) unusual properties of solutions for nonlinear difference equations. These properties enable us to use difference equations in order to model complicated oscillating processes (this can often be done in those cases when it is difficult to apply ordinary differential equations). Difference equations are also a useful tool of synergetics-an emerging science concerned with the study of ordered structures. The application of these equations opens up new approaches in solving one of the central problems of modern science-the problem of turbulence.
Partial Differential Equations of First Order and Their Applications to Physics

Stochastic differential equations (SDEs) are a powerful tool in science, mathematics, economics and finance. This book will help the reader to master the basic theory and learn some applications of SDEs. In particular, the reader will be provided with the backward SDE technique for use in research when considering financial problems in the market, and with the reflecting SDE technique to enable study of optimal stochastic population control problems. These two techniques are powerful and efficient, and can also be applied to research in many other problems in nature, science and elsewhere.

Differential Equations and Their Applications

Ordinary Differential Equations and Their Applications

Primarily intended for the undergraduate students of mathematics, physics and engineering, this text gives in-depth coverage of differential equations and the methods for solving them. The book begins with the definitions, the physical and geometric origins of differential equations, and the methods for solving the first order differential equations. Then it goes on to give the applications of these equations to such areas as biology, medical sciences, electrical engineering and economics. The text also discusses, systematically and logically, higher order differential equations and their applications to telecommunications, civil engineering, cardiology and detection of diabetes, as also the methods of solving simultaneous differential equations and their applications. Besides, the book provides a detailed discussion on Laplace transforms and their applications, partial differential equations and their applications to vibration of stretched string, heat flow, transmission lines, etc., and calculus of variations and its applications. The book, which is a happy fusion of theory and application, would also be useful to postgraduate students.

NEW TO THIS EDITION • New sections on: (a) Equations reducible to linear partial differential equations (b) General method for solving the second order non-linear partial differential equations (Monge’s Method) (c) Lagrange’s equations of motion • Number of solved examples in Chapters 5, 7, 8, 9 and 10.

Partial Differential Equations and Their Applications

An Elementary Treatise on Differential Equations and Their Applications

This introduction to modern operational calculus offers a classic exposition of Laplace transform theory and its application to the solution of ordinary and partial differential equations. The treatment is addressed to graduate students in engineering, physics, and applied mathematics and may be used as a primary text or supplementary reading. Chief topics include the theorems or rules of the operational calculus, evaluation of integrals and establishment of mathematical relationships, derivation of Laplace transforms of various functions, the Laplace transform for a finite interval, and other subjects. Many problems and illustrative examples appear

Laplace Transforms and Their Applications to Differential Equations

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.

Introduction to Partial Differential Equations with Applications

Stochastic Differential Equations and Their Applications

Forward-Backward Stochastic Differential Equations and their Applications

Classification and Examples of Differential Equations and their Applications is the sixth book within Ordinary Differential Equations with Applications to Trajectories and Vibrations, Six-volume Set. As a set, they are the fourth volume in the series Mathematics and Physics Applied to Science and Technology. This sixth book consists of one chapter (chapter 10 of the set). It contains 20 examples related to the preceding five books and chapters 1 to 9 of the set. It includes two recollections: the first with a classification of differential equations into 500 standards and the second with a list of 500 applications. The ordinary differential equations are classified in 500 standards concerning methods of solution and related properties, including: (i) linear differential equations with constant or homogeneous coefficients and finite difference equations; (ii) linear and non-linear single differential equations and simultaneous systems; (iii) existence, unicity and other properties; (iv) derivation of general, particular, special, analytic, regular, irregular, and normal integrals; (v) linear differential equations with variable coefficients including known and new special functions. The theory of differential equations is applied to the detailed solution of 500 physical and engineering problems including: (i) one- and multidimensional oscillators, with damping or amplification, with non-resonant or resonant forcing; (ii) single, non-linear, and parametric resonance; (iii) bifurcations and chaotic dynamical systems; (iv) longitudinal and transversal deformations and buckling of bars, beams, and plates; (v) trajectories of particles; (vi) oscillations and waves in non-uniform media, ducts, and wave guides. Provides detailed solution of examples of differential equations of the types covered in tomes I-5 of the set (Ordinary Differential Equations with Applications to Trajectories and Vibrations, Six-volume Set) Includes physical and engineering problems that extend those presented in the tomes 1-6 (Ordinary Differential Equations with Applications to Trajectories and Vibrations, Six-volume Set) Includes a classification of ordinary differential equations and their properties into 500 standards that can serve as a look-up table of methods of solution Covers a recollection of 500 physical and engineering problems and sub-cases that involve the solution of
differential equations Presents the problems used as examples including formulation, solution, and interpretation of results

**Fractional Differential Equations**

There are two major changes in the Third Edition of Differential Equations and Their Applications. First, we have completely rewritten the section on singular solutions of differential equations. A new section, 2.8.1, dealing with Euler equations has been added, and this section is used to motivate a greatly expanded treatment of singular equations in sections 2.8.2 and 2.8.3. Our second major change is in Section 2.6, where we have switched to the metric system of units. This change was requested by many of our readers. In addition to the above changes, we have updated the material on population models, and have revised the exercises in this section. Minor editorial changes have also been made throughout the text. New York City March, 1983 Martin Braun

vi Preface to the First Edition

This textbook is a unique blend of the theory of differential equations and their exciting application to "real world" problems. First, and foremost, it is a rigorous study of ordinary differential equations and can be fully understood by anyone who has completed one year of calculus. However, in addition to the traditional applications, it also contains many exciting "real life" problems. These applications are completely self contained. First, the problem to be solved is outlined clearly, and one or more differential equations are derived as a model for this problem. These equations are then solved, and the results are compared with real world data. The following applications are covered in this text.

**Partial Differential Equations Of First Order And Their Applications To Physics (2nd Edition)**

**Nonlinear Partial Differential Equations and Their Applications**

This advanced undergraduate and graduate text has now been revised and updated to cover the basic principles and applications of various types of stochastic systems, with much on theory and applications not previously available in book form. The text is also useful as a reference source for pure and applied mathematicians, statisticians and probabilists, engineers in control and communications, and information scientists, physicists and economists. Has been revised and updated to cover the basic principles and applications of various types of stochastic systems Useful as a reference source for pure and applied mathematicians, statisticians and probabilists, engineers in control and communications, and information scientists, physicists and economists

**Nonlinear Partial Differential Equations**

**Differential Equations and Their Applications**

There are three major changes in the Third Edition of Differential Equations and Their Applications. First, we have completely rewritten the section on singular solutions of differential equations. A new section, 2.8.1, dealing with Euler equations has been
added, and this section is used to motivate a greatly expanded treatment of singular equations in sections 2.8.2 and 2.8.3. Our second major change is the addition of a new section, 4.9, dealing with bifurcation theory, a subject of much current interest. We felt it desirable to give the reader a brief but nontrivial introduction to this important topic. Our third major change is in Section 2.6, where we have switched to the metric system of units. This change was requested by many of our readers. In addition to the above changes, we have updated the material on population models, and have revised the exercises in this section. Minor editorial changes have also been made throughout the text. New York City November. 1982 Martin Braun Preface to the First Edition This textbook is a unique blend of the theory of differential equations and their exciting application to "real world" problems. First, and foremost, it is a rigorous study of ordinary differential equations and can be fully understood by anyone who has completed one year of calculus. However, in addition to the traditional applications, it also contains many exciting "real life" problems. These applications are completely self-contained.

**Partial Differential Equations and Their Applications**

**An Introduction to Differential Equations and Their Applications**

This book presents the texts of selected lectures on recent work in the field of nonlinear partial differential equations delivered by leading international experts at the well-established weekly seminar held at the Collège de France. Emphasis is on applications to numerous areas, including control theory, theoretical physics, fluid and continuum mechanics, free boundary problems, dynamical systems, scientific computing, numerical analysis, and engineering. Proceedings of this seminar will be of particular interest to postgraduate students and specialists in the area of nonlinear partial differential equations.

**Differential Equations and Their Applications**

This work will serve as an excellent first course in modern analysis. The main focus is on showing how self-similar solutions are useful in studying the behavior of solutions of nonlinear partial differential equations, especially those of parabolic type. This textbook will be an excellent resource for self-study or classroom use.

**Classification and Examples of Differential Equations and their Applications**

This introductory text explores 1st- and 2nd-order differential equations, series solutions, the Laplace transform, difference equations, much more. Numerous figures, problems with solutions, notes. 1994 edition. Includes 268 figures and 23 tables.