Nonlinear Ordinary Differential Equations

Nonlinear ordinary differential equations

Presents simple analytic methods which are readily accessible for use in applications. These include transformations, phase plane analysis, integral equation formulation, shooting arguments, local and asymptotic analysis, singular point analysis, and others. The
Nonlinear Ordinary Differential Equations

Lectures on Nonlinear Hyperbolic Differential Equations

Periodic solutions of nonlinear ordinary differential equations

Nonlinear Ordinary Differential Equations and Their Applications

Lineare Funktionalanalysis

Nonlinear Partial Differential Equations in Engineering

The text of this edition has been revised to bring it into line with current teaching, including an expansion of the material on bifurcations and chaos. It is directed towards practical applications of the theory with examples and problems.

Nonlinear Ordinary Differential Equations with Linear Constraints

Ordinary differential equations have long been an important area of study because of their wide application in physics, engineering, biology, chemistry, ecology, and economics. Based on a series of lectures given at the Universities of Melbourne and New South Wales in Australia, Nonlinear Ordinary Differential Equations takes the reader from basic elementary notions to the point where the exciting and fascinating developments in the theory of nonlinear differential equations can be understood and appreciated. Each chapter is self-contained, and includes a selection of problems together with some detailed workings within the main text. Nonlinear Ordinary Differential Equations helps develop an understanding of the subtle and sometimes unexpected properties of nonlinear systems and simultaneously introduces practical analytical techniques to analyze nonlinear phenomena. This excellent book gives a structured, systematic, and rigorous development of the basic theory from elementary concepts to a
Point where readers can utilize ideas in nonlinear differential equations.

Local Methods in Nonlinear Differential Equations

Nonlinear Ordinary Differential Equations

Non Linear Analysis and Boundary Value Problems for Ordinary Differential Equations

Nonlinear Partial Differential Equations in Engineering

Nonlinear Differential Equations

Nonlinear Ordinary Differential Equations in Transport Processes

Handbook of Differential Equations: Ordinary Differential Equations

The book discusses the solutions to nonlinear ordinary differential equations (ODEs) using analytical and numerical approximation methods. Recently, analytical approximation methods have been largely used in solving linear and nonlinear lower-order ODEs. It also discusses using these methods to solve some strong nonlinear ODEs. There are two chapters devoted to solving nonlinear ODEs using numerical methods, as in practice high-dimensional systems of nonlinear ODEs that cannot be solved by analytical approximate methods are common. Moreover, it studies analytical and numerical techniques for the treatment of parameter-depending ODEs. The book explains various methods for solving nonlinear-oscillator and structural-system problems, including the energy balance method, harmonic balance method, amplitude frequency formulation, variational iteration method, homotopy perturbation method, iteration perturbation method, homotopy analysis method, simple and multiple shooting method, and the nonlinear stabilized march method. This book comprehensively investigates various new analytical and numerical approximation techniques that are used in solving nonlinear-oscillator and structural-system problems. Students often rely on the finite element method to such an extent that on graduation they have little or no knowledge of alternative methods of solving problems. To rectify this, the book introduces several new approximation techniques.

Differential Equations
**Differentialgleichungen, Volume II**


**GENERAL GROUP- THEORETIC TRANSFORMATIONS FROM NONLINEAR TO LINEAR DIFFERENTIAL EQUATIONS**

This new edition has been expanded to contain an introduction to areas of current importance such as bifurcation, structural stability and chaotic behavior. Other topics include linearization, perturbation theory, subharmonics, stability, the existence of limit cycles, and Poincar maps. The text is concerned with practical applications and includes over 400 examples and exercises.

**A New Method of Approximation for Systems of Nonlinear Ordinary Differential Equations**

**Ordinary Differential Equations**

**Nonlinear Ordinary Differential Equations in Transport Processes**

**Nonlinear Ordinary Differential Equations: Problems and Solutions**
The area covered by this volume represents a broad choice of some interesting research topics in the field of dynamical systems and applications of nonlinear analysis to ordinary and partial differential equations. The contributed papers, written by well known specialists, make this volume a useful tool both for the experts (who can find recent and new results) and for those who are interested in starting a research work in one of these topics (who can find some updated and carefully presented papers on the state of the art of the corresponding subject).

**Chebyshev Series Solution of Nonlinear Ordinary Differential Equations**

For students taking second courses; the subject is central and required at second year and above.

**Existence Theory for Nonlinear Ordinary Differential Equations**

In this introductory textbook, a revised and extended version of well-known lectures by L. Hörmander from 1986, four chapters are devoted to weak solutions of systems of conservation laws. Apart from that the book only studies classical solutions. Two chapters concern the existence of global solutions or estimates of the lifespan for solutions of nonlinear perturbations of the wave or Klein-Gordon equation with small initial data. Four chapters are devoted to microanalysis of the singularities of the solutions. This part assumes some familiarity with pseudodifferential operators which are standard in the theory of linear differential operators, but the extension to the more exotic classes of opertors needed in the nonlinear theory is presented in complete detail.

**Nonlinear Ordinary Differential Equations**

The method of normal forms is usually attributed to Poincaré although some of the basic ideas of the method can be found in earlier works of Jacobi, Briot and Bouquet. In this book, A.D.Bruno gives an account of the work of these mathematicians and further developments as well as the results of his own extensive investigations on the subject. The book begins with a thorough presentation of the analytical techniques necessary for the implementation of the theory as well as an extensive description of the geometry of the Newton polygon. It then proceeds to discuss the normal form of systems of ordinary differential equations giving many specific applications of the theory. An underlying theme of the book is the unifying nature of the method of normal forms regarding techniques for the study of the local properties of ordinary differential equations. In the second part of the book it is shown, for a special class of equations, how the method of normal forms yields classical results of Lyapunov concerning families of periodic orbits in the neighborhood of equilibrium points of Hamiltonian systems as well as the more modern results concerning families of quasiperiodic orbits obtained by Kolmogorov, Arnold and Moser. The book is intended for mathematicians, theoretical mechanicians, and physicists. It is suitable for advanced undergraduate and graduate students.
Ordinary Differential Equations

Chebyshev Series Solution of Nonlinear Ordinary Differential Equations - Initial-value Problems

Geometrische Methoden in der Theorie der gewöhnlichen Differentialgleichungen

The series is devoted to the publication of monographs and high-level textbooks in mathematics, mathematical methods and their applications. Apart from covering important areas of current interest, a major aim is to make topics of an interdisciplinary nature accessible to the non-specialist. The works in this series are addressed to advanced students and researchers in mathematics and theoretical physics. In addition, it can serve as a guide for lectures and seminars on a graduate level. The series de Gruyter Studies in Mathematics was founded ca. 30 years ago by the late Professor Heinz Bauer and Professor Peter Gabriel with the aim to establish a series of monographs and textbooks of high standard, written by scholars with an international reputation presenting current fields of research in pure and applied mathematics. While the editorial board of the Studies has changed with the years, the aspirations of the Studies are unchanged. In times of rapid growth of mathematical knowledge carefully written monographs and textbooks written by experts are needed more than ever, not least to pave the way for the next generation of mathematicians. In this sense the editorial board and the publisher of the Studies are devoted to continue the Studies as a service to the mathematical community. Please submit any book proposals to Niels Jacob.

Local Theory of Nonlinear Analytic Ordinary Differential Equations

Thoroughly updated and expanded 4th edition of the classic text, including numerous worked examples, diagrams and exercises. An ideal resource for students and lecturers in engineering, mathematics and the sciences it is published alongside a separate Problems and Solutions Sourcebook containing over 500 problems and fully-worked solutions.

Periodic Solutions of Nonlinear Ordinary Differential Equations

On the Resonance Concept in Systems of Linear and Nonlinear Ordinary Differential Equations

This volume contains everything possible that can be of use when one has a given differential equation to solve, or when one wishes to investigate that solution thoroughly. The text is in German and includes 16 figures.
Where To Download Nonlinear Ordinary Differential Equations An Introduction For Scientists And Engineers
Oxford Texts In Applied And Engineering Mathematics

Nonlinear Ordinary Differential Equations

A Compendium on Nonlinear Ordinary Differential Equations

The book contains seven survey papers about ordinary differential equations. The common feature of all papers consists in the fact that nonlinear equations are focused on. This reflects the situation in modern mathematical modelling - nonlinear mathematical models are more realistic and describe the real world problems more accurately. The implications are that new methods and approaches have to be looked for, developed and adopted in order to understand and solve nonlinear ordinary differential equations. The purpose of this volume is to inform the mathematical community and also other scientists interested in and using the mathematical apparatus of ordinary differential equations, about some of these methods and possible applications.

Solvability of Nonlinear Singular Problems for Ordinary Differential Equations

Nonlinear Ordinary Differential Equations

This book offers a collection of approximately 2,500 nonlinear ordinary differential equations and includes the equation, the answer or important results, and references. Nonlinear phenomena have become a dominant theme in the sciences and this thoroughly up-to-date book is a useful research tool for applied mathematicians and engineers.

Nonlinear Ordinary Differential Equations

Methods for Solutions of Nonlinear Ordinary Differential Equations, Applications

The feedback control of nonlinear differential and algebraic equation systems (DAEs) is a relatively new subject. Developing steadily over the last few years, it has generated growing interest inspired by its engineering applications and by advances in the feedback control of nonlinear ordinary differential equations (ODEs). This book-the first of its kind-introduces the reader to the
inherent characteristics of nonlinear DAE systems and the methods used to address their control, then discusses the significance of DAE systems to the modeling and control of chemical processes. Within a unified framework, Control of Nonlinear Differential Algebraic Equation Systems presents recent results on the stabilization, output tracking, and disturbance elimination for a large class of nonlinear DAE systems. Written at a basic mathematical level—assuming some familiarity with analysis and control of nonlinear ODEs—the authors focus on continuous-time systems of differential and algebraic equations in semi-explicit form. Beginning with background material about DAE systems and their differences from ODE systems, the book discusses generic classes of chemical processes, feedback control of regular and non-regular DAE systems, control of systems with disturbance inputs, the connection of the DAE systems considered with singularly perturbed systems, and finally offers examples that illustrate the application of control methods and the advantages of using high-index DAE models as the basis for controller design. Mathematicians and engineers will find that this book provides unique, timely results that also clearly documents the relevance of DAE systems to chemical processes.

Nonlinear Ordinary Differential Equations in Transport Processes

An ideal companion to the student textbook Nonlinear Ordinary Differential Equations 4th Edition (OUP, 2007) this text contains over 500 problems and solutions in nonlinear differential equations, many of which can be adapted for independent coursework and self-study.

Control of Nonlinear Differential Algebraic Equation Systems with Applications to Chemical Processes

We begin our applications of fixed point methods with existence of solutions to certain first order initial initial value problems. This problem is relatively easy to treat, illustrates important methods, and in the end will carry us a good deal further than may first meet the eye. Thus, we seek solutions to \( Y' = I(t,y) \ (1.1) \ (y_0) = r \in \mathbb{R} \) where \( I: I \times \mathbb{R}^n \rightarrow \mathbb{R} \) and \( I = [0, b] \). We shall seek solutions that are defined either locally or globally on \( I \), according to the assumptions imposed on \( I \). Notice that (1.1) is a system of first order equations because \( I \) takes its values in \( \mathbb{R}^n \). In section 3.2 we will first establish some basic existence theorems which guarantee that a solution to (1.1) exists for \( t > 0 \) and near zero. Familiar examples show that the interval of existence can be arbitrarily short, depending on the initial value \( r \) and the nonlinear behaviour of \( I \). As a result we will also examine in section 3.2 the dependence of the interval of existence on \( I \) and \( r \). We mention in passing that, in the results which follow, the interval \( I \) can be replaced by any bounded interval and the initial value can be specified at any point in \( I \). The reasoning needed to cover this slightly more general situation requires minor modifications on the arguments given here.

Nonlinear Ordinary Differential Equations
Ordinary Differential Equations: Introduction to Nonlinear Analysis.

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