Nonlinear Differential Equations Of Monotone Types In Banach Spaces Springer Monographs In Mathematics

Theory and Applications of Nonlinear Operators of Accretive and Monotone TypeNonlinear Evolution and Difference Equations of Monotone Type in Hilbert SpacesMethods for Analysis of Nonlinear Elliptic Boundary Value ProblemsVariational Methods in Nonlinear AnalysisMonotone Iterative Techniques for Nonlinear Differential EquationsNumerical Analysis of Nonlinear Partial Differential-algebraic EquationsDifferential EquationsMonotone Operators in Banach Space and Nonlinear Partial Differential EquationsNonlinear Systems of Partial Differential EquationsMonotone Iterative Techniques for Discontinuous Nonlinear Differential EquationsVariational Method and Method of Monotone Operators in the Theory of Nonlinear EquationsNonlinear Parabolic and Elliptic EquationsMonotonic Range of Some Non-linear Differential EquationsNonlinear Evolution Equations and ApplicationsStability of Infinite Dimensional Stochastic Differential Equations with ApplicationsMonotone Operators in Banach Spaces and Nonlinear Partial Differential EquationsNonlinear Differential Equations of Monotone Types in Banach SpacesNonlinear Partial Differential Equations with ApplicationsNonlinear Partial Differential EquationsMonotone Flows and Rapid Convergence for Nonlinear Partial Differential EquationsConvexity and Optimization

in Banach SpacesNonlinear Differential Equations and Dynamical SystemsNonlinear Differential EquationsFixed Points of Nonlinear OperatorsNonoscillation and Oscillation Theory for Functional Differential EquationsStability of Runge-Kutta Methods for Stiff Nonlinear Differential EquationsHarnack Inequalities for Stochastic Partial Differential EquationsMonotone Operators in Banach Space and Nonlinear Partial Differential EquationsCoincidence Degree and Nonlinear Differential EquationsHandbook of Differential Equations: Evolutionary EquationsMonotone Dynamical SystemsNonlinear Functional Analysis and its ApplicationsNonlinear Differential Equations in Ordered SpacesMathematical NeurosciencePartial Differential Equations and Related TopicsShape, Smoothness, and Invariant Stratification of an Attracting Set for Delayed Monotone Positive FeedbackNonlinear Elliptic Partial Differential EquationsNonlinear Mappings of Monotone TypeStabilization of Navier–Stokes FlowsIterative Solution of Nonlinear Equations in Several Variables

Theory and Applications of Nonlinear Operators of Accretive and Monotone Type

The object of this monograph is to present a unified account of all developments concerning stability of Runge-Kutta methods for stiff nonlinear differential equations which began in 1975 with Dahlquist's G-stability paper and Butcher's B-

stability paper. Designed for the reader with a background in numerical analysis, the book contains numerous theoretical and practical results aimed at giving insight into the treatment of nonlinear problems.

Nonlinear Evolution and Difference Equations of Monotone Type in Hilbert Spaces

This book contains recent results about the global dynamics defined by a class of delay differential equations which model basic feedback mechanisms and arise in a variety of applications such as neural networks. The authors describe in detail the geometric structure of a fundamental invariant set, which in special cases is the global attractor, and the asymptotic behavior of solution curves on it. The approach makes use of advanced tools which in recent years have been developed for the investigation of infinite-dimensional dynamical systems: local invariant manifolds and inclination lemmas for noninvertible maps, Floquet theory for delay differential equations, a priori estimates controlling the growth and decay of solutions with prescribed oscillation frequency, a discrete Lyapunov functional counting zeros, methods to represent invariant sets as graphs, and Poincare-Bendixson techniques for classes of delay differential systems. Several appendices provide the general results needed in the case study, so the presentation is self-contained. Some of the general results are not available elsewhere, specifically on

smooth infinite-dimensional center-stable manifolds for maps. Results in the appendices will be useful for future studies of more complicated attractors of delay and partial differential equations.

Methods for Analysis of Nonlinear Elliptic Boundary Value Problems

Variational Methods in Nonlinear Analysis

This book presents comprehensive treatment of a rapidly developing area with many potential applications: the theory of monotone dynamical systems and the theory of competitive and cooperative differential equations. The primary aim is to provide potential users of the theory with techniques, results, and ideas useful in applications, while at the same time providing rigorous proofs. Among the topics discussed in the book are continuous-time monotone dynamical systems, and quasimonotone and nonquasimonotone delay differential equations. The book closes with a discussion of applications to quasimonotone systems of reaction-diffusion type. Throughout the book, applications of the theory to many mathematical models arising in biology are discussed. Requiring a background in dynamical systems at the level of a first graduate course, this book is useful to

graduate students and researchers working in the theory of dynamical systems and its applications.

Monotone Iterative Techniques for Nonlinear Differential Equations

Stabilization of Navier–Stokes Flows presents recent notable progress in the mathematical theory of stabilization of Newtonian fluid flows. Finite-dimensional feedback controllers are used to stabilize exponentially the equilibrium solutions of Navier–Stokes equations, reducing or eliminating turbulence. Stochastic stabilization and robustness of stabilizable feedback are also discussed. The analysis developed here provides a rigorous pattern for the design of efficient stabilizable feedback controllers to meet the needs of practical problems and the conceptual controllers actually detailed will render the reader's task of application easier still. Stabilization of Navier–Stokes Flows avoids the tedious and technical details often present in mathematical treatments of control and Navier–Stokes equations and will appeal to a sizeable audience of researchers and graduate students interested in the mathematics of flow and turbulence control and in Navier-Stokes equations in particular.

Numerical Analysis of Nonlinear Partial Differential-algebraic

Equations

The theory of nonlinear elliptic equations is currently one of the most actively developing branches of the theory of partial differential equations. This book investigates boundary value problems for nonlinear elliptic equations of arbitrary order. In addition to monotone operator methods, a broad range of applications of topological methods to nonlinear differential equations is presented: solvability, estimation of the number of solutions, and the branching of solutions of nonlinear equations. Skrypnik establishes, by various procedures, a priori estimates and the regularity of solutions of nonlinear elliptic equations of arbitrary order. Also covered are methods of homogenization of nonlinear elliptic problems in perforated domains. The book is suitable for use in graduate courses in differential equations and nonlinear functional analysis.

Differential Equations

The material collected in this volume discusses the present as well as expected future directions of development of the field with particular emphasis on applications. The seven survey articles present different topics in Evolutionary PDE’s, written by leading experts. - Review of new results in the area - Continuation of previous volumes in the handbook series covering Evolutionary

PDEs - Written by leading experts

Monotone Operators in Banach Space and Nonlinear Partial Differential Equations

In this book the author presents a self-contained account of Harnack inequalities and applications for the semigroup of solutions to stochastic partial and delayed differential equations. Since the semigroup refers to Fokker-Planck equations on infinite-dimensional spaces, the Harnack inequalities the author investigates are dimension-free. This is an essentially different point from the above mentioned classical Harnack inequalities. Moreover, the main tool in the study is a new coupling method (called coupling by change of measures) rather than the usual maximum principle in the current literature.

Nonlinear Systems of Partial Differential Equations

The progress in nonlinear functional analysis has allowed the study of many nonlinear problems in mathematical physics. This book provides basic methods and results for the investigation of the special problems in this area. The connection between nonlinear analysis and convex analysis gave rise to the important field of monotone operators from a Banach space into its dual space.

These mappings extend the properties of compact operators to the infinite-dimensional case. Generalizations of monotone operators are termed mappings of monotone type. Among these, in the last decade, the pseudo-monotone operators and the mappings of type (M) have provided a more proper tool for solving large classes of nonlinear differential and integral equations. The text dwells upon essentially four interrelated topics: Nonlinear mappings of mono tone type, Hammerstein equations, Odd operators and Variational problems. To make the approach easier, we have compiled some basic results on the topological degree and on the Sobolev spaces. In the applications we restrict our discussion to the existence of solutions for nonlinear elliptic equations. The present English editIOn was written starting from the Romanian book "Operatori neliniari" (Nonlinear Mappings) by the first author and his lectures delivered at the Universities of Bucharest and Rome. The improved final form of this book is the result of the joint work of the authors.

Monotone Iterative Techniques for Discontinuous Nonlinear Differential Equations

This book summarizes the qualitative theory of differential equations with or without delays, collecting recent oscillation studies important to applications and further developments in mathematics, physics, engineering, and biology. The

authors address oscillatory and nonoscillatory properties of first-order delay and neutral delay differential eq

Variational Method and Method of Monotone Operators in the Theory of Nonlinear Equations

Nonlinear Parabolic and Elliptic Equations

For lecture courses that cover the classical theory of nonlinear differential equations associated with Poincare and Lyapunov and introduce the student to the ideas of bifurcation theory and chaos, this text is ideal. Its excellent pedagogical style typically consists of an insightful overview followed by theorems, illustrative examples, and exercises.

Monotonic Range of Some Non-linear Differential Equations

A monotone iterative technique is used to obtain monotone approximate solutions that converge to the solution of nonlinear problems of partial differential equations of elliptic, parabolic and hyperbolic type. This volume describes that technique, which has played a valuable role in unifying a variety of nonlinear problems,

particularly when combin

Nonlinear Evolution Equations and Applications

Stability of Infinite Dimensional Stochastic Differential Equations with Applications

This work is based upon a Special Session on the Theory and Applications of Nonlinear Operators of Accretive and Monotone Type held during the recent meeting of the American Mathematical Society in San Francisco. It examines current developments in non-linear analysis, emphasizing accretive and monotone operator theory. The book presents a major survey/research article on partial functional differential equations with delay and an important survey/research article on approximation solvability.

Monotone Operators in Banach Spaces and Nonlinear Partial Differential Equations

In response to the growing use of reaction diffusion problems in many fields, this monograph gives a systematic treatment of a class of nonlinear parabolic and

elliptic differential equations and their applications these problems. It is an important reference for mathematicians and engineers, as well as a practical text for graduate students.

Nonlinear Differential Equations of Monotone Types in Banach Spaces

Nonlinear Partial Differential Equations with Applications

Nonlinear Partial Differential Equations

Monotone Flows and Rapid Convergence for Nonlinear Partial Differential Equations

This textbook presents the essential parts of the modern theory of nonlinear partial differential equations, including the calculus of variations. After a short review of results in real and functional analysis, the author introduces the main mathematical techniques for solving both semilinear and quasilinear elliptic PDEs,

and the associated boundary value problems. Key topics include infinite dimensional fixed point methods, the Galerkin method, the maximum principle, elliptic regularity, and the calculus of variations. Aimed at graduate students and researchers, this textbook contains numerous examples and exercises and provides several comments and suggestions for further study.

Convexity and Optimization in Banach Spaces

Stochastic differential equations in infinite dimensional spaces are motivated by the theory and analysis of stochastic processes and by applications such as stochastic control, population biology, and turbulence, where the analysis and control of such systems involves investigating their stability. While the theory of such equations is well establ

Nonlinear Differential Equations and Dynamical Systems

The objectives of this monograph are to present some topics from the theory of monotone operators and nonlinear semigroup theory which are directly applicable to the existence and uniqueness theory of initial-boundary-value problems for partial differential equations and to construct such operators as realizations of those problems in appropriate function spaces. A highlight of this presentation is

the large number and variety of examples introduced to illustrate the connection between the theory of nonlinear operators and partial differential equations. These include primarily semilinear or quasilinear equations of elliptic or of parabolic type, degenerate cases with change of type, related systems and variational inequalities, and spatial boundary conditions of the usual Dirichlet, Neumann, Robin or dynamic type. The discussions of evolution equations include the usual initial-value problems as well as periodic or more general nonlocal constraints, history-value problems, those which may change type due to a possibly vanishing coefficient of the time derivative, and other implicit evolution equations or systems including hysteresis models. The scalar conservation law and semilinear wave equations are briefly mentioned, and hyperbolic systems arising from vibrations of elastic-plastic rods are developed. The origins of a representative sample of such problems are given in the appendix.

Nonlinear Differential Equations

This is the second of a five-volume exposition of the main principles of nonlinear functional analysis and its applications to the natural sciences, economics, and numerical analysis. The presentation is self -contained and accessible to the nonspecialist. Part II concerns the theory of monotone operators. It is divided into two subvolumes, II/A and II/B, which form a unit. The present Part II/A is devoted to linear monotone operators. It serves as an elementary introduction to the modern

functional analytic treatment of variational problems, integral equations, and partial differential equations of elliptic, parabolic and hyperbolic type. This book also represents an introduction to numerical functional analysis with applications to the Ritz method along with the method of finite elements, the Galerkin methods, and the difference method. Many exercises complement the text. The theory of monotone operators is closely related to Hilbert's rigorous justification of the Dirichlet principle, and to the 19th and 20th problems of Hilbert which he formulated in his famous Paris lecture in 1900, and which strongly influenced the development of analysis in the twentieth century.

Fixed Points of Nonlinear Operators

An updated and revised edition of the 1986 title Convexity and Optimization in Banach Spaces, this book provides a self-contained presentation of basic results of the theory of convex sets and functions in infinite-dimensional spaces. The main emphasis is on applications to convex optimization and convex optimal control problems in Banach spaces. A distinctive feature is a strong emphasis on the connection between theory and application. This edition has been updated to include new results pertaining to advanced concepts of subdifferential for convex functions and new duality results in convex programming. The last chapter, concerned with convex control problems, has been rewritten and completed with new research concerning boundary control systems, the dynamic programming

equations in optimal control theory and periodic optimal control problems. Finally, the structure of the book has been modified to highlight the most recent progression in the field including fundamental results on the theory of infinite-dimensional convex analysis and includes helpful bibliographical notes at the end of each chapter.

Nonoscillation and Oscillation Theory for Functional Differential Equations

This monograph is concerned with the basic results on Cauchy problems associated with nonlinear monotone operators in Banach spaces with applications to partial differential equations of evolutive type. It focuses on major results in recent decades.

Stability of Runge-Kutta Methods for Stiff Nonlinear Differential Equations

""Providing the theoretical framework to model phenomena with discontinuous changes, this unique reference presents a generalized monotone iterative method in terms of upper and lower solutions appropriate for the study of discontinuous nonlinear differential equations and applies this method to derive suitable fixed

point theorems in ordered abstract spaces.

Harnack Inequalities for Stochastic Partial Differential Equations

Iterative Solution of Nonlinear Equations in Several Variables provides a survey of the theoretical results on systems of nonlinear equations in finite dimension and the major iterative methods for their computational solution. Originally published in 1970, it offers a research-level presentation of the principal results known at that time.

Monotone Operators in Banach Space and Nonlinear Partial Differential Equations

This well-thought-out book covers the fundamentals of nonlinear analysis, with a particular focus on variational methods and their applications. Starting from preliminaries in functional analysis, it expands in several directions such as Banach spaces, fixed point theory, nonsmooth analysis, minimax theory, variational calculus and inequalities, critical point theory, monotone, maximal monotone and pseudomonotone operators, and evolution problems.

Coincidence Degree and Nonlinear Differential Equations

Nonlinear Differential Equations: Invariance, Stability, and Bifurcation presents the developments in the qualitative theory of nonlinear differential equations. This book discusses the exchange of mathematical ideas in stability and bifurcation theory. Organized into 26 chapters, this book begins with an overview of the initial value problem for a nonlinear wave equation. This text then focuses on the interplay between stability exchange for a stationary solution and the appearance of bifurcating periodic orbits. Other chapters consider the development of methods for ascertaining stability and boundedness and explore the development of bifurcation and stability analysis in nonlinear models of applied sciences. This book discusses as well nonlinear hyperbolic equations in further contributions, featuring stability properties of periodic and almost periodic solutions. The reader is also introduced to the stability problem of the equilibrium of a chemical network. The final chapter deals with suitable spaces for studying functional equations. This book is a valuable resource for mathematicians.

Handbook of Differential Equations: Evolutionary Equations

Monotone Dynamical Systems

This book primarily concerns quasilinear and semilinear elliptic and parabolic partial differential equations, inequalities, and systems. The exposition leads the reader through the general theory based on abstract (pseudo-) monotone or accretive operators as fast as possible towards the analysis of concrete differential equations, which have specific applications in continuum (thermo-) mechanics of solids and fluids, electrically (semi-) conductive media, modelling of biological systems, or in mechanical engineering. Selected parts are mainly an introduction into the subject while some others form an advanced textbook. The second edition simplifies and extends the exposition at particular spots and augments the applications especially towards thermally coupled systems, magnetism, and more. The intended audience is graduate and PhD students as well as researchers in the theory of partial differential equations or in mathematical modelling of distributed parameter systems. ------ The monograph contains a wealth of material in both the abstract theory of steady-state or evolution equations of monotone and accretive type and concrete applications to nonlinear partial differential equations from mathematical modeling. The organization of the material is well done, and the presentation, although concise, is clear, elegant and rigorous. () this book is a notable addition to the existing literature. Also, it certainly will prove useful to engineers, physicists, biologists and other scientists interested in the analysis of () nonlinear differential models of the real world. (Mathematical Reviews)

Nonlinear Functional Analysis and its Applications

Nonlinear Differential Equations in Ordered Spaces

Iterative Methods for Fixed Points of Nonlinear Operators offers an introduction into iterative methods of fixed points for nonexpansive mappings, pseudo-contrations in Hilbert Spaces and in Banach Spaces. Iterative methods of zeros for accretive mappings in Banach Spaces and monotone mappings in Hilbert Spaces are also discussed. It is an essential work for mathematicians and graduate students in nonlinear analysis.

Mathematical Neuroscience

Mathematical Neuroscience is a book for mathematical biologists seeking to discover the complexities of brain dynamics in an integrative way. It is the first research monograph devoted exclusively to the theory and methods of nonlinear analysis of infinite systems based on functional analysis techniques arising in modern mathematics. Neural models that describe the spatio-temporal evolution of coarse-grained variables—such as synaptic or firing rate activity in populations of neurons —and often take the form of integro-differential equations would not normally reflect an integrative approach. This book examines the solvability of infinite systems of reaction diffusion type equations in partially ordered abstract

spaces. It considers various methods and techniques of nonlinear analysis, including comparison theorems, monotone iterative techniques, a truncation method, and topological fixed point methods. Infinite systems of such equations play a crucial role in the integrative aspects of neuroscience modeling. The first focused introduction to the use of nonlinear analysis with an infinite dimensional approach to theoretical neuroscience Combines functional analysis techniques with nonlinear dynamical systems applied to the study of the brain Introduces powerful mathematical techniques to manage the dynamics and challenges of infinite systems of equations applied to neuroscience modeling

Partial Differential Equations and Related Topics

The objectives of this monograph are to present some topics from the theory of monotone operators and nonlinear semigroup theory which are directly applicable to the existence and uniqueness theory of initial-boundary-value problems for partial differential equations and to construct such operators as realizations of those problems in appropriate function spaces. A highlight of this presentation is the large number and variety of examples introduced to illustrate the connection between the theory of nonlinear operators and partial differential equations. These include primarily semilinear or quasilinear equations of eliptic or of parabolic type, degenerate cased with change of type, related systems and variational inequalities, and spatial boundary conditions of the usual Dirichlet, Neumann,

Robin, or dynamic type. The discussions of evolution equations include the usual initial-value problems as well as periodic or more general nonlocal constraints, history-value problems, those which may change type due to a possibly vanishing coefficient of the time derivative, and other implicit evolution equations or systems including hysteresis models.

Shape, Smoothness, and Invariant Stratification of an Attracting Set for Delayed Monotone Positive Feedback

Extremality results proved in this Monograph for an abstract operator equation provide the theoretical framework for developing new methods that allow the treatment of a variety of discontinuous initial and boundary value problems for both ordinary and partial differential equations, in explicit and implicit forms. By means of these extremality results, the authors prove the existence of extremal solutions between appropriate upper and lower solutions of first and second order discontinuous implicit and explicit ordinary and functional differential equations. They then study the dependence of these extremal solutions on the data. The authors begin by developing an existence theory for an abstract operator equation in ordered spaces and offer new tools for dealing with different kinds of discontinuous implicit and explicit differential equation problems. They present a unified approach to the existence of extremal solutions of quasilinear elliptic and

parabolic problems and extend the upper and lower solution method to elliptic and parabolic inclusion of hemivariation type using variational and nonvariational methods. Nonlinear Differential Equations in Ordered Spaces includes research that appears for the first time in book form and is designed as a source book for pure and applied mathematicians. Its self-contained presentation along with numerous worked examples and complete, detailed proofs also make it accessible to researchers in engineering as well as advanced students in these fields.

Nonlinear Elliptic Partial Differential Equations

This book presents a collection of selected contributions on recent results in nonlinear partial differential equations from participants to an international conference held in Fes, Morocco in 1994. The emphasis is on nonlinear elliptic boundary value problems, but there are also papers deveoted to related areas such as monotone operator theory, calculus of variations, Hamiltonian systems and periodic solutions. Some of the papers are exhaustive surveys, while others contain new results,published here for the first time. This book will be of particular interest to graduate or postgraduate students as well as to specialists in these areas.

Nonlinear Mappings of Monotone Type

This textbook is a comprehensive treatment of ordinary differential equations, concisely presenting basic and essential results in a rigorous manner. Including various examples from physics, mechanics, natural sciences, engineering and automatic theory, Differential Equations is a bridge between the abstract theory of differential equations and applied systems theory. Particular attention is given to the existence and uniqueness of the Cauchy problem, linear differential systems, stability theory and applications to first-order partial differential equations. Upper undergraduate students and researchers in applied mathematics and systems theory with a background in advanced calculus will find this book particularly useful. Supplementary topics are covered in an appendix enabling the book to be completely self-contained.

Stabilization of Navier–Stokes Flows

Various mathematical models in many application areas give rise to systems of so called partial or abstract differential-algebraic equations (ADAEs). A substantial mathematical treatment of nonlinear ADAEs is still at an initial stage.In this thesis two approaches for treating nonlinear ADAEs are presented. The first one represents an extension of an approach by Tischendorf for the treatment of a specific class of linear ADAEs to the nonlinear case. It is based on the Galerkin approach and the theory of monotone operators for evolution equations. Unique solvability of the ADAE and strong convergence of the Galerkin solutions is proven.

Furthermore it is shown that this class of ADAEs has Perturbation Index 1 and at most ADAE Index 1. In the second approach we formulate two prototypes of coupled systems where a semi-explicit differential-algebraic equation is coupled to an infinite dimensional algebraic operator equation or an evolution equation. For both prototypes unique solvability, strong convergence of Galerkin solutions and a Perturbation Index 1 result is shown. Both prototypes can be applied to concrete coupled systems in circuit simulation relying on a new global solvability result for the nonlinear equations of the Modified Nodal Analysis under suitable topological assumptions.

Iterative Solution of Nonlinear Equations in Several Variables

This book is devoted to the study of non-linear evolution and difference equations of first or second order governed by maximal monotone operator. This class of abstract evolution equations contains ordinary differential equations, as well as the unification of some important partial differential equations including heat equation, wave equation, Schrodinger equation, etc. The book contains a collection of the authors' work and applications in this field, as well as those of other authors.

ROMANCE ACTION & ADVENTURE MYSTERY & THRILLER BIOGRAPHIES & HISTORY CHILDREN'S YOUNG ADULT FANTASY HISTORICAL FICTION HORROR LITERARY FICTION NON-FICTION SCIENCE FICTION