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Linear Operator Theory in Engineering and Science Operator Theory for Electromagnetics *Elements of Operator Theory* An Introduction to Models and Decompositions in Operator Theory **Partial Differential Equations I** Semigroups of Linear Operators and Applications to Partial Differential Equations Vibration with Control **Real and Functional Analysis Functional Analysis Real and Functional Analysis** *Catalog of Copyright Entries. Third Series Applied Functional Analysis Radiating Nonuniform Transmission-Line Systems and the Partial Element Equivalent Circuit Method* **Finite Element Analysis of Acoustic Scattering Manifolds, Tensor Analysis, and Applications Global Analysis in Mathematical Physics** *Analysis and Simulation of Chaotic Systems Analysis of Spherical Symmetries in Euclidean Spaces The Nonlinear Schrödinger Equation* Modeling and Inverse Problems in Imaging Analysis *Optimization* **Partial Differential Equations III** Weakly Connected Neural Networks Integral Manifolds and Inertial Manifolds for Dissipative Partial Differential Equations **Acoustic and Electromagnetic Equations** Hysteresis and Phase Transitions **Inverse Problems for Partial Differential Equations The N-Vortex Problem** Chaos Near Resonance **Chaos, Fractals, and Noise Stability and Transition in Shear Flows** *Linear Integral Equations* **Homogenization of Reticulated Structures Infinite-Dimensional Dynamical Systems in Mechanics and Physics** *Shape Optimization by the Homogenization Method* **Configurational Forces as Basic Concepts of Continuum Physics** *Variational Methods for Structural Optimization Invariant Manifolds and Fibrations for Perturbed Nonlinear Schrödinger Equations* **Numerical Approximation of Hyperbolic Systems of Conservation Laws** *Determinants and Their Applications in Mathematical Physics*

Semigroups of Linear Operators and Applications to Partial Differential Equations May 22 2023 Since the characterization of generators of C0 semigroups was established in the 1940s, semigroups of linear operators and its neighboring areas have developed into an abstract theory that has become a necessary discipline in functional analysis and differential equations. This book presents that theory and its basic applications, and the last two chapters give a connected account of the applications to partial differential equations.

Manifolds, Tensor Analysis, and Applications Aug 13 2022 The purpose of this book is to provide core material in nonlinear analysis for mathematicians, physicists, engineers, and mathematical biologists. The main goal is to provide a working knowledge of manifolds, dynamical systems, tensors, and differential forms. Some applications to Hamiltonian mechanics, fluid me chanics, electromagnetism, plasma dynamics and control thcory arc given in Chapter 8, using both invariant and index notation. The current edition of the book does not deal with Riemannian geometry in much detail, and it does not treat Lie groups, principal bundles, or Morse theory. Some of this is planned for a subsequent edition. Meanwhile, the authors will make available to interested readers supplementary chapters on Lie Groups and Differential Topology and invite comments on the book's contents and development. Throughout the text supplementary topics are given, marked with the symbols ~ and {l:;J. This device enables the reader to skip various topics without disturbing the main flow of the text. Some of these provide additional background material intended for completeness, to minimize the necessity of consulting too many outside references. We treat finite and infinite-dimensional manifolds simultaneously. This is partly for efficiency of exposition. Without advanced applications, using manifolds of mappings, the study of infinite-dimensional manifolds can be hard to motivate.

Applied Functional Analysis Nov 16 2022 The second part of an elementary textbook which combines linear functional analysis, nonlinear functional analysis, and their substantial applications. The book addresses undergraduates and beginning graduates of mathematics, physics, and engineering who want to learn how functional analysis elegantly solves mathematical problems which relate to our real world and which play an important role in the history of mathematics. The books approach is to attempt to determine the most important applications. These concern integral equations, differential equations, bifurcation theory, the moment problem, Cebysev approximation, the optimal control of rockets, game theory, symmetries and conservation laws, the quark model, and gauge theory in elementary particle physics. The presentation is self-contained and requires only that readers be familiar with some basic facts of calculus.

The N-Vortex Problem Jun 30 2021 This text is an introduction to current research on the N- vortex problem of fluid mechanics. It describes the Hamiltonian aspects of vortex dynamics as an entry point into the rather large literature on the topic, with exercises at the end of each chapter.

The Nonlinear Schrödinger Equation Apr 09 2022 Filling the gap between the mathematical literature and applications to domains, the authors have chosen to address the problem of wave collapse by several methods ranging from rigorous mathematical analysis to formal aymptotic expansions and numerical simulations.

Hysteresis and Phase Transitions Sep 02 2021 Hysteresis is an exciting and mathematically challenging phenomenon that oc curs in rather different situations: jt, can be a byproduct offundamental physical mechanisms (such as phase transitions) or the consequence of a degradation or imperfection (like the play in a mechanical system), or it is built deliberately into a system in order to monitor its behaviour, as in the case of the heat control via thermostats. The delicate interplay between memory effects and the occurrence of hys teresis loops has the effect that hysteresis is a genuinely nonlinear phenomenon which is usually non-smooth and thus not easy to treat mathematically. Hence it was only in the early seventies that the group of Russian scientists around M. A. Krasnoselskii initiated a systematic mathematical investigation of the phenomenon of hysteresis which culminated in the fundamental monograph Krasnoselskii-Pokrovskii (1983). In the meantime, many mathematicians have contributed to the mathematical theory, and the important monographs of 1. Mayergoyz (1991) and A. Visintin (1994a) have appeared. We came into contact with the notion of hysteresis around the year 1980.

Functional Analysis Feb 19 2023 This book started its life as a series of lectures given by the second author from the 1970's onwards to students in their third and fourth years in the Department of Mechanics and Mathematics at Rostov State University. For these lectures there was also an audience of engineers and applied mechanicists who wished to understand the functional analysis used in contemporary research in their fields. These people were not so much interested in functional analysis itself as in its applications; they did not want to be told about functional analysis in its most abstract form, but wanted a guided tour through those parts of the analysis needed for their applications. The lecture notes evolved over the years as the first author started to make more formal typewritten versions incorporating new material. About 1990 the first author prepared an English version and submitted it to Kluwer Academic Publishers for inclusion in the series Solid Mechanics and its Applications. At that state the notes were divided into three long chapters covering linear and nonlinear analysis. As Series Editor, the third author started to edit them. The requirements of lecture notes and books are vastly different. A book has to be complete (in some sense), self contained, and able to be read without the help of an instructor.

Numerical Approximation of Hyperbolic Systems of Conservation Laws Jul 20 2020 This work is devoted to the theory and approximation of nonlinear hyper bolic systems of conservation laws in one or two space variables. It follows directly a previous publication on hyperbolic systems of conservation laws by the same authors, and we shall make frequent references to Godlewski and Raviart (1991) (hereafter noted G. R.), though the present volume can be read independently. This earlier publication, apart from a first chap ter, especially covered the scalar case. Thus, we shall detail here neither the mathematical theory of multidimensional scalar conservation laws nor their approximation in the one-dimensional case by finite-difference con servative schemes, both of which were treated in G. R. , but we shall mostly consider systems. The theory for systems is in fact much more difficult and not at all completed. This explains why we shall mainly concentrate on some theoretical aspects that are needed in the applications, such as the solution of the Riemann problem, with occasional insights into more sophisticated problems. The present book is divided into six chapters, including an introductory chapter. For the reader's convenience, we shall resume in this Introduction the notions that are necessary for a self-sufficient understanding of this book -the main definitions of hyperbolicity, weak solutions, and entropy present the practical examples that will be thoroughly developed in the following chapters, and recall the main results concerning the scalar case.

Chaos, Fractals, and Noise Apr 28 2021 The first edition of this book was originally published in 1985 under the ti tle "Probabilistic Properties of Deterministic Systems. " In the intervening years, interest in so-called "chaotic" systems has continued unabated but with a more thoughtful and sober eye toward applications, as befits a ma turing field. This interest in the serious usage of the concepts and techniques of nonlinear dynamics by applied scientists has probably been spurred more by the availability of inexpensive computers than by any other factor. Thus, computer experiments have been prominent, suggesting the wealth of phe nomena that may be resident in nonlinear systems. In particular, they allow one to observe the interdependence between the deterministic and probabilistic properties of these systems such as the existence of invariant measures and densities, statistical stability and periodicity, the influence of stochastic perturbations, the formation of attractors, and many others. The aim of the book, and especially of this second edition, is to present recent theoretical methods which allow one to study these effects. We have taken the opportunity in this second edition to not only correct the errors of the first edition, but also to add substantially new material in five sections and a new chapter.

An Introduction to Models and Decompositions in Operator Theory Jul 24 2023 By a Hilbert-space operator we mean a bounded linear transformation be tween separable complex Hilbert spaces. Decompositions and models for Hilbert-space operators have been very active research topics in operator theory over the past three decades. The main motivation behind them is the in variant subspace problem: does every Hilbert-space operator have a nontrivial invariant subspace? This is perhaps the most celebrated open question in op erator theory. Its relevance is easy to explain: normal operators have invariant subspaces (witness: the Spectral Theorem), as well as operators on finite dimensional Hilbert spaces (witness: canonical Jordan form). If one agrees that each of these (i. e. the Spectral Theorem and canonical Jordan form) is important enough an achievement to dismiss any further justification, then the search for nontrivial invariant subspaces is a natural one; and a recalcitrant one at that. Subnormal operators have nontrivial invariant subspaces (extending the normal branch), as well as compact operators (extending the finite-dimensional branch), but the question remains unanswered even for equally simple (i. e. simple to define) particular classes of Hilbert-space operators (examples: hyponormal and quasinilpotent operators). Yet the invariant subspace quest has certainly not been a failure at all, even though far from being settled. The search for nontrivial invariant subspaces has undoubtly yielded a lot of nice results in operator theory, among them, those concerning decompositions and models for Hilbert-space operators. This book contains nine chapters.

Linear Integral Equations Feb 24 2021 The result of the author's fascination with the mathematical beauty of integral equations, this book combines theory, applications, and numerical methods, and covers each of these fields with the same weight. In order to make the book accessible to mathematicians, physicists, and engineers alike, the author has made it as self-contained as possible, requiring only a solid foundation in differential and integral calculus. The functional analysis which is necessary for an adequate treatment of the theory and the numerical solution of integral equations is developed within the book itself. Problems are included at the end of each chapter.

Variational Methods for Structural Optimization Sep 21 2020 This book bridges a gap between a rigorous mathematical approach to variational problems and the practical use of algorithms of structural optimization in engineering applications. The foundations of structural optimization are presented in sufficiently simple form as to make them available for practical use.

Chaos Near Resonance May 30 2021 A unified treatment of resonant problems with special emphasis on the recently discovered phenomenon of homoclinic jumping. After a survey of the necessary background, the book develops a general finite dimensional theory of homoclinic jumping, illustrating it with examples. The main mechanism of chaos near resonances is discussed in both the dissipative and the Hamiltonian context, incorporating previously unpublished new results on universal homoclinic bifurcations near resonances, as well as on multi-pulse Silnikov manifolds. The results are applied to a variety of different problems, which include applications from beam oscillations, surface wave dynamics, nonlinear optics, atmospheric science and fluid mechanics.

Linear Operator Theory in Engineering and Science Oct 27 2023 This book is a unique introduction to the theory of linear operators on Hilbert space. The authors' goal is to present the basic facts of functional analysis in a form suitable for engineers, scientists, and applied mathematicians. Although the Definition-Theorem-Proof format of mathematics is used, careful attention is given to motivation of the material covered and many illustrative examples are presented. First published in 1971, Linear Operator in Engineering and Sciences has since proved to be a popular and very useful textbook.

Weakly Connected Neural Networks Dec 05 2021 Devoted to local and global analysis of weakly connected systems with applications to neurosciences, this book uses bifurcation theory and canonical models as the major tools of analysis. It presents a systematic and well motivated development of both weakly connected system theory and mathematical neuroscience, addressing bifurcations in neuron and brain dynamics, synaptic organisations of the brain, and the nature of neural codes. The authors present classical results together with the most recent developments in the field, making this a useful reference for researchers and graduate students in various branches of mathematical neuroscience.

Elements of Operator Theory Aug 25 2023 {\it Elements of Operatory Theory} is aimed at graduate students as well as a new generation of mathematicians and scientists who need to apply operator theory to their field. Written in a user-friendly, motivating style, fundamental topics are presented in a systematic fashion, i.e., set theory, algebraic structures, topological structures, Banach spaces, Hilbert spaces, culminating with the Spectral Theorem, one of the landmarks in the theory of operators on Hilbert spaces. The exposition is concept-driven and as much as possible avoids the formula-computational approach. Key features of this largely self-contained work include: * required background material to each chapter * fully rigorous proofs, over 300 of them, are specially tailored to the presentation and some are new * more than 100 examples and, in several cases, interesting counterexamples that demonstrate the frontiers of an important theorem * over 300 problems, many with hints * both problems and examples underscore further auxiliary results and extensions of the main theory; in this non-traditional framework, the reader is challenged and has a chance to prove the principal theorems anew This work is an excellent text for the classroom as well as a self-study resource for researchers. Prerequisites include an introduction to analysis and to functions of a complex variable, which most first-year graduate students in mathematics, engineering, or another formal science have already acquired. Measure theory and integration theory are required only for the last section of the final chapter.

Infinite-Dimensional Dynamical Systems in Mechanics and Physics Dec 25 2020 In this book the author presents the dynamical systems in infinite dimension, especially those generated by dissipative partial differential equations. This book attempts a systematic study of infinite dimensional dynamical systems generated by dissipative evolution partial differential equations arising in mechanics and physics and in other areas of sciences and technology. This second edition has been updated and extended.

Real and Functional Analysis Mar 20 2023 This book is based on lectures given at "Mekhmat", the Department of Mechanics and Mathematics at Moscow State University, one of the top mathematical departments worldwide, with a rich tradition of teaching functional analysis. Featuring an advanced course on real and functional analysis, the book presents not only core material traditionally included in university courses of different levels, but also a survey of the most important results of a more subtle nature, which cannot be considered basic but which are useful for applications. Further, it includes several hundred exercises of varying difficulty with tips and references. The book is intended for graduate and PhD students studying real and functional analysis as well as mathematicians and physicists whose research is related to functional analysis.

Optimization Feb 07 2022 This book deals with optimality conditions, algorithms, and discretization tech niques for nonlinear programming, semi-infinite optimization, and optimal con trol problems. The unifying thread in the presentation consists of an abstract theory, within which optimality conditions are expressed in the form of zeros of optimality junctions, algorithms are characterized by point-to-set iteration maps, and all the numerical approximations required in the solution of semi-infinite optimization and optimal control problems are treated within the context of con sistent approximations and algorithm implementation techniques. Traditionally, necessary optimality conditions for optimization problems are presented in Lagrange, F. John, or Karush-Kuhn-Tucker multiplier forms, with gradients used for smooth problems and subgradients for nonsmooth prob lems. We present these classical optimality conditions and show that they are satisfied at a point if and only if this point is a zero of an upper semicontinuous optimality junction. The use of optimality functions has several advantages. First, optimality functions can be used in an abstract study of optimization algo rithms. Second, many optimization algorithms can be shown to use search directions that are obtained in evaluating optimality functions, thus establishing a clear relationship between optimality conditions and algorithms. Third, estab lishing optimality conditions for highly complex problems, such as optimal con trol problems with control and trajectory constraints, is much easier in terms of optimality functions than in the classical manner. In addition, the relationship between optimality conditions for finite-dimensional problems and semi-infinite optimization and optimal control problems becomes transparent.
Vibration with Control Apr 21 2023 Engineers are becoming increasingly aware of the problems caused by vibration in engineering design, particularly in the areas of structural health monitoring and smart structures. Vibration is a constant problem as it can impair performance and lead to fatigue, damage and the failure of a structure. Control of vibration is a key factor in preventing such detrimental results. This book presents a homogenous treatment of vibration by including those factors from control that are relevant to modern vibration analysis, design and measurement. Vibration and control are established on a firm mathematical basis and the disciplines of vibration, control, linear algebra, matrix computations, and applied functional analysis are connected. Key Features: Assimilates the discipline of contemporary structural vibration with active control Introduces the use of Matlab into the solution of vibration and vibration control problems Provides a unique blend of practical and theoretical developments Contains examples and problems along with a solutions manual and power point presentations Vibration with Control is an essential text for practitioners, researchers, and graduate students as it can be used as a reference text for its complex chapters and topics, or in a tutorial setting for those improving their knowledge of vibration and learning about control for the first time. Whether or not you are familiar with vibration and control, this book is an excellent introduction to this emerging and increasingly important engineering discipline.

Configurational Forces as Basic Concepts of Continuum Physics Oct 23 2020 Included is a presentation of configurational forces within a classical context and a discussion of their use in areas as diverse as phase transitions and fracture.

Global Analysis in Mathematical Physics Jul 12 2022 The first edition of this book entitled Analysis on Riemannian Manifolds and Some Problems of Mathematical Physics was published by Voronezh Univer sity Press in 1989. For its English edition, the book has been substantially revised and expanded. In particular, new material has been added to Sections 19 and 20. I am grateful to Viktor L. Ginzburg for his hard work on the transla tion and for writing Appendix F, and to Tomasz Zastawniak for his numerous suggestions. My special thanks go to the referee for his valuable remarks on the theory of stochastic processes. Finally, I would like to acknowledge the support of the AMS fSU Aid Fund and the International Science Foundation (Grant NZBOOO), which made possible my work on some of the new results included in the English edition of the book. Voronezh, Russia Yuri Gliklikh September, 1995 Preface to the Russian Edition The present book is apparently the first in monographic literature in which a common treatment is given to three areas of global analysis previously consid ered quite distant from each other, namely, differential geometry and classical mechanics, stochastic differential geometry and statistical and quantum me chanics, and infinite-dimensional differential geometry of groups of diffeomor phisms and hydrodynamics. The unification of these topics under the cover of one book appears, however, quite natural, since the exposition is based on a geometrically invariant form of the Newton equation and its analogs taken as a fundamental law of motion.

Homogenization of Reticulated Structures Jan 26 2021 Materials science is an area of growing research as composite materials become widely used in such areas as civil engineering, electrotechnics, and the aerospace industry. This mathematically rigorous treatment of lattice-type structures will appeal to both applied mathematicians, as well as engineers looking for a solid mathematical foundation of the methodology.
Radiating Nonuniform Transmission-Line Systems and the Partial Element Equivalent Circuit Method Oct 15 2022 High frequencies of densely packed modern electronic equipment turn even the smallest piece of wire into a transmission line with signal retardation, dispersion, attenuation, and distortion. In electromagnetic environments with high-power microwave or ultra-wideband sources, transmission lines pick up noise currents generated by external electromagnetic fields. These are superimposed on essential signals, the lines acting not only as receiving antennas but radiating parts of the signal energy into the environment. This book is outstanding in its originality. While many textbooks rephrase that which has been written before, this book features: an accessible introduction to the fundamentals of electromagnetics; an explanation of the newest developments in transmission line theory, featuring the transmission line super theory developed by the authors; a unique exposition of the increasingly popular PEEC (partial element equivalent circuit) method, including recent research results. Both the Transmission Line Theory and the PEEC method are well suited to combine linear structures with circuit networks. For engineers, researchers, and graduate students, this text broadens insight into the basics of electrical engineering. It provides a deeper understanding of Maxwellian-circuit-like representations of multi-conductor transmission lines, justifies future research in this field.
Inverse Problems for Partial Differential Equations Aug 01 2021 A comprehensive description of the current theoretical and numerical aspects of inverse problems in partial differential equations. Applications include recovery of inclusions from anomalies of their gravity fields, reconstruction of the interior of the human body from exterior electrical, ultrasonic, and magnetic measurement. By presenting the data in a readable and informative manner, the book introduces both scientific and engineering researchers as well as graduate students to the significant work done in this area in recent years, relating it to broader themes in mathematical analysis.

Analysis of Spherical Symmetries in Euclidean Spaces May 10 2022 This self-contained book offers a new and direct approach to the theories of special functions with emphasis on spherical symmetry in Euclidean spaces of arbitrary dimensions. Based on many years of lecturing to mathematicians, physicists and engineers in scientific research institutions in Europe and the USA, the author uses elementary concepts to present the spherical harmonics in a theory of invariants of the orthogonal group. One of the highlights is the extension of the classical results of the spherical harmonics into the complex - particularly important for the complexification of the Funk-Hecke formula which successfully leads to new integrals for Bessel- and Hankel functions with many applications of Fourier integrals and Radon transforms. Numerous exercises stimulate mathematical ingenuity and bridge the gap between well-known elementary results and their appearance in the new formations.
Invariant Manifolds and Fibrations for Perturbed Nonlinear Schrödinger Equations Aug 21 2020 In this monograph the authors present detailed and pedagogic proofs of persistence theorems for normally hyperbolic invariant manifolds and their stable and unstable manifolds for classes of perturbations of the NLS equation, as well as for the existence and persistence of fibrations of these invariant manifolds. Their techniques are based on an infinite dimensional generalisation of the graph transform and can be viewed as an infinite dimensional generalisation of Fenichels results. As such, they may be applied to a broad class of infinite dimensional dynamical systems.

Partial Differential Equations III Jan 06 2022 The third of three volumes on partial differential equations, this is devoted to nonlinear PDE. It treats a number of equations of classical continuum mechanics, including relativistic versions, as well as various equations arising in differential geometry, such as in the study of minimal surfaces, isometric imbedding, conformal deformation, harmonic maps, and prescribed Gauss curvature.

In addition, some nonlinear diffusion problems are studied. It also introduces such analytical tools as the theory of L Sobolev spaces, H lder spaces, Hardy spaces, and Morrey spaces, and also a development of Calderon-Zygmund theory and paradifferential operator calculus. The book is aimed 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. ^

Stability and Transition in Shear Flows Mar 28 2021 A detailed look at some of the more modern issues of hydrodynamic stability, including transient growth, eigenvalue spectra, secondary instability. It presents analytical results and numerical simulations, linear and selected nonlinear stability methods. By including classical results as well as recent developments in the field of hydrodynamic stability and transition, the book can be used as a textbook for an introductory, graduate-level course in stability theory or for a special-topics fluids course. It is equally of value as a reference for researchers in the field of hydrodynamic stability theory or with an interest in recent developments in fluid dynamics. Stability theory has seen a rapid development over the past decade, this book includes such new developments as direct numerical simulations of transition to turbulence and linear analysis based on the initial-value problem.

Finite Element Analysis of Acoustic Scattering Sep 14 2022 A cognitive journey towards the reliable simulation of scattering problems using finite element methods, with the pre-asymptotic analysis of Galerkin FEM for the Helmholtz equation with moderate and large wave number forming the core of this book. Starting from the basic physical assumptions, the author methodically develops both the strong and weak forms of the governing equations, while the main chapter on finite element analysis is preceded by a systematic treatment of Galerkin methods for indefinite sesquilinear forms. In the final chapter, three dimensional computational simulations are presented and compared with experimental data. The author also includes broad reference material on numerical methods for the Helmholtz equation in unbounded domains, including Dirichlet-to-Neumann methods, absorbing boundary conditions, infinite elements and the perfectly matched layer. A self-contained and easily readable work.

Shape Optimization by the Homogenization Method Nov 23 2020 This book provides an introduction to the theory and numerical developments of the homogenization method. It's main features are: a comprehensive presentation of homogenization theory; an introduction to the theory of two-phase composite materials; a detailed treatment of structural optimization by using homogenization; a complete discussion of the resulting numerical algorithms with many documented test problems. It will be of interest to researchers, engineers, and advanced graduate students in applied mathematics, mechanical engineering, and structural optimization.

Acoustic and Electromagnetic Equations Oct 03 2021 Acoustic and electromagnetic waves underlie a vast range of modern technology from sonar, radio, and television to microwave heating and electromagnetic compatibility analysis. Mathematical modeling of these waves has undergone considerable growth in recent years, and this timely book, written by a leading international researcher, presents the research in a careful and complete way.

Real and Functional Analysis Jan 18 2023

Operator Theory for Electromagnetics Sep 26 2023 This text discusses electromagnetics from the view of operator theory, in a manner more commonly seen in textbooks of quantum mechanics. It includes a self-contained introduction to operator theory, presenting definitions and theorems, plus proofs of the theorems when these are simple or enlightening.

Modeling and Inverse Problems in Imaging Analysis Mar 08 2022 More mathematicians have been taking part in the development of digital image processing as a science and the contributions are reflected in the increasingly important role modeling has played solving complex problems. This book is mostly concerned with energy-based models. Most of these models come from industrial projects in which the author was involved in robot vision and radiography: tracking 3D lines, radiographic image processing, 3D reconstruction and tomography, matching, deformation learning. Numerous graphical illustrations accompany the text.

Determinants and Their Applications in Mathematical Physics Jun 18 2020 A unique and detailed account of all important relations in the analytic theory of determinants, from the classical work of Laplace, Cauchy and Jacobi to the latest 20th century developments. The first five chapters are purely mathematical in nature and make extensive use of the column vector notation and scaled cofactors. They contain a number of important relations involving derivatives which prove beyond a doubt that the theory of determinants has emerged from the confines of classical algebra into the brighter world of analysis. Chapter 6 is devoted to the verifications of the known determinantal solutions of several nonlinear equations which arise in three branches of mathematical physics, namely lattice, soliton and relativity theory. The solutions are verified by applying theorems established in earlier chapters, and the book ends with an extensive bibliography and index. Several contributions have never been published before. Indispensable for mathematicians, physicists and engineers wishing to become acquainted with this topic.

Partial Differential Equations I Jun 23 2023 This book is intended to be a comprehensive introduction to the subject of partial differential equations. It should be useful to graduate students at all levels beyond that of a basic course in measure theory. It should also be of interest to professional mathematicians in analysis, mathematical physics, and differential geometry. This work will be divided into three volumes, the first of which focuses on the theory of ordinary differential equations and a survey of basic linear PDEs.

Integral Manifolds and Inertial Manifolds for Dissipative Partial Differential Equations Nov 04 2021 This work was initiated in the summer of 1985 while all of the authors were at the Center of Nonlinear Studies of the Los Alamos National Laboratory; it was then continued and polished while the authors were at Indiana Univer sity, at the University of Paris-Sud (Orsay), and again at Los Alamos in 1986 and 1987. Our aim was to present a direct geometric approach in the theory of inertial manifolds (global analogs of the unstable-center manifolds) for dissipative partial differential equations. This approach, based on Cauchy integral mani folds for which the solutions of the partial differential equations are the generating characteristic curves, has the advantage that it provides a sound basis for numerical Galerkin schemes obtained by approximating the inertial manifold. The work is self-contained and the prerequisites are at the level of a graduate student. The theoretical part of the work is developed in Chapters 2-14, while in Chapters 15-19 we apply the theory to several remarkable partial differ ential equations.

Catalog of Copyright Entries. Third Series Dec 17 2022

Analysis and Simulation of Chaotic Systems Jun 11 2022 Beginning with realistic mathematical or verbal models of physical or biological phenomena, the author derives tractable models for further mathematical analysis or computer simulations. For the most part, derivations are based on perturbation methods, and the majority of the text is devoted to careful derivations of implicit function theorems, the method of averaging, and quasi-static state approximation methods. The duality between stability and perturbation is developed and used, relying heavily on the concept of stability under persistent disturbances. Relevant topics about linear systems, nonlinear oscillations, and stability methods for difference, differential-delay, integro-differential and ordinary and partial differential equations are developed throughout the book. For the second edition, the author has restructured the chapters, placing special emphasis on introductory materials in Chapters 1 and 2 as distinct from presentation materials in Chapters 3 through 8. In addition, more material on bifurcations from the point of view of canonical models, sections on randomly perturbed systems, and several new computer simulations have been added.