Differential And Integral Equations Journal

The recent appearance of wavelets as a new computational tool in applied mathematics has given a new impetus to the field of numerical analysis of Fredholm integral equations. This book gives an account of the state of the art in the study of fast multiscale methods for solving these equations based on wavelets. The authors begin by introducing essential concepts and describing conventional numerical methods. They then develop fast algorithms and apply these to solving linear, nonlinear Fredholm integral equations of the second kind, ill-posed integral equations of the first kind and eigen-problems of compact integral operators. Theorems of functional analysis used throughout the book are summarised in the appendix. The book is an essential reference for practitioners wishing to use the new techniques. It may also be used as a text, with the first five chapters forming the basis of a one-semester course for advanced undergraduates or beginning graduates.

Discovering Evolution Equations with Applications: Volume 1-Deterministic Equations provides an engaging, accessible account of core theoretical results of evolution equations in a way that gradually builds intuition and culminates in exploring active research. It gives nonspecialists, even those with minimal prior exposure to analysis, the foundation to understand what evolution equations are and how to work with them in various areas of practice. After presenting the essentials of analysis, the book discusses homogenous finite-dimensional ordinary differential equations. Subsequent chapters then focus on linear homogenous abstract, nonhomogenous linear, semi-linear, functional, Sobolev-type, neutral, delay, and nonlinear evolution equations. The final two chapters explore research topics, including nonlocal evolution equations. For each class of equations, the author develops a core of theoretical results concerning the existence and uniqueness of solutions under various growth and compactness assumptions, continuous dependence upon initial data and parameters, convergence results regarding the initial data, and elementary stability results. By taking an applications-oriented approach, this self-contained, conversational-style book motivates readers to fully grasp the mathematical details of studying evolution equations. It prepares newcomers to successfully navigate further research in the field.

Integral equations are functional equations in which an unknown function appears under an integral sign. This can involve aspects of function theory and their integral transforms when the unknown function appears with a functional non-degenerated kernel under the integral sign. The close relation between differential and integral equations does that in some functional analysis, and function theory problems may be formulated either way. This book establishes the fundamentals of integral equations and considers some deep research aspects on integral equations of first and second kind, operator theory applied to integral equations, methods to solve some nonlinear integral equations, and singular integral equations, among other things. This is the first volume on this theme, hoping that other volumes of this important functional analysis theme and operator theory to formal functional equations will be realized in the future.

In 1979, I edited Volume 18 in this series: Solution Methods for Integral Equations: Theory and Applications. Since that time, there has been an explosive growth in all aspects of the numerical solution of integral equations. By my estimate over 2000 papers on this subject have been published in the last decade, and more than 60 books on theory and applications have appeared. In particular, as can be seen in many of the chapters in this book, integral equation techniques are playing an increas ingly important role in the solution of many scientific and engineering problems. For instance, the boundary element method discussed by Atkinson in Chapter 1 is becoming an equal partner with finite element and finite difference techniques for solving many types of partial differential equations. Obviously, in one volume it would be impossible to present a complete picture of what has taken place in this area during the past ten years. Consequently, we have chosen a number of subjects in which significant advances have been made that we feel have not been covered in depth in other books. For instance, ten years ago the theory of the numerical solution of Cauchy singular equations was in its infancy. Today, as shown by Golberg and Elliott in Chapters 5 and 6, the theory of polynomial approximations is essentially complete, although many details of practical implementation remain to be worked out.

Topics covered include differential equations of the 1st order, the Riccati equation and existence theorems, 2nd order equations, elliptic integrals and functions, nonlinear mechanics, nonlinear integral equations, more. Includes 137 problems.

Inequalities for Differential and Integral EquationsElsevier

This text is well-designed with respect to the exposition from the preliminary to the more advanced and the applications interwoven throughout. It provides the essential foundations for the theory as well as the basic facts relating to almost periodicity. In six structured and self-contained chapters, the author unifies the treatment of various classes of almost periodic functions, while uniquely addressing oscillations and waves in the almost periodic case. This is the first text to present the latest results in almost periodic oscillations and waves. The presentation level and inclusion of several clearly presented proofs make this work ideal for graduate students in engineering and science. The concept of almost periodicity is widely applicable to continuuum mechanics, electromagnetic theory, plasma physics, dynamical systems, and astronomy, which makes the book a useful tool for mathematicians and physicists.

Ordinary differential equations serve as mathematical models for many exciting real world problems. Rapid growth in the theory and applications of differential equations has resulted in a continued interest in their study by students in many disciplines. This textbook organizes material around theorems and proofs, comprising of 42 class-tested lectures that effectively convey the subject in easily manageable sections. The presentation is driven by detailed examples that illustrate how the subject works. Numerous exercise sets, with an "answers and hints" section, are included. The book further provides a background and history of the subject.

The aim of this volume is to introduce new topics on the areas of difference, differential, integrodifferential and integral equations, evolution equations, control and optimisation theory, dynamic system theory, queuing theory and electromagnetism and their applications.

the mass of experimental data from current research in psychology and physiology, Grossberg proposes and develops a non-linear mathematics as a model for specific functions of mind and brain. He finds the classic approach to the mathematical modelling of mind and brain systematically inadequate. This inadequacy, he holds, arises from the attempt to describe adaptive systems in the mathematical language of 9 physics developed to describe "stationary", i. e. non-adaptive and non-evolving systems. In place of this linear mathematics, Grossberg develops his non-linear approach. His method is at once imaginative, rigorous, and philosophically significant: it is the thought experiment. It is here that the richness of his interdisciplinary mastery, and the power of his methods, constructions and proofs, reveal themselves. The method is what C. S. Peirce characterized as the method of abduction, or of hypothetical inference in theory construction: given the output of the system as a psychological phenomenon (e. g.

In many fields of application of mathematics, progress is crucially dependent on the good flow of information between (i) theoretical mathematicians looking for applications, (ii) mathematicians working in applications in need of theory, and (iii) scientists and engineers applying mathematical models and methods. The intention of this book is to stimulate this flow of information. In the first three chapters (accessible to third year students of mathematics and physics and to mathematically interested engineers) applications of Abel integral equations are surveyed broadly including determination of potentials, stereology, seismic travel times, spectroscopy, optical fibres. In subsequent chapters (requiring some background in functional analysis) mapping properties of Abel integral operators and their relation to other integral transforms in various function spaces are investi- gated, questions of existence and uniqueness of solutions of linear and nonlinear Abel integral equations are treated, and for equations of the first kind problems of ill-posedness are discussed. Finally, some numerical methods are described. In the theoretical parts, emphasis is put on the aspects relevant to applications.

The report is a survey of theoretical and computational methods in the field of optimal control of distributed parameter systems. This includes systems described by integral equations and partial differential equations. The various studies which have been done are grouped according to the method employed. A number of applications and potential applications of these methods are discussed, and certain deficiencies in the current state of knowledge are noted. Difficulties and opportunities in practical applications are discussed, and suggestions are offered for directions of research to render the results more readily usable. A list of references is included numbering more than 250 items: papers, report, and books.

The editors of this book have incorporated contributions from a diverse group of leading researchers in the field of nonlinear systems. To enrich the scope of the content, this book contains a valuable selection of works on fractional differential equations.The book aims to provide an overview of the current knowledge on nonlinear systems and some aspects of fractional calculus. The main subject areas are divided into two theoretical and applied sections. Nonlinear systems are useful for researchers in mathematics, applied mathematics, and physics, as well as graduate students who are studying these systems with reference to their theory and application. This book is also an ideal complement to the specific literature on engineering, biology, health science, and other applied science areas. The opportunity given by IntechOpen to offer this book under the open access system contributes to disseminating the field of nonlinear systems to a wide range of researchers.

This third volume of a series on Mechanies of Fraeture deals with eraeks in plates and shells. It was noted in Volume 2 on three-dimensional eraek problems that additional free surfaees can lead to substantial mathematical complexities, often making the analysis unmanageable. The theory of plates and shells forms a part of the theory of elasticity in which eertain physieal assumptions are made on the basis that the distanee between two bounded surfaees, either fiat or eurved, is small in eomparison with the overall dimen sions of the body. In modern times, the broad and frequent applieations of plate- and shell-like struetural members have aeted as a stimulus to whieh engineers and researchers in the field of fracture meehanies have responded with a wide variety of solutions of teehnieal importanee. These eontributions are covered in this book so that the reader may gain an understanding of how analytieal treat me nt s ofplates and shells containing initial imperfeetions in the form of eraeks are earried out. The development of plate and shell theories has involved long standing controversy on the eonsisteney of omitting eertain small terms and at the same time retaining others of the same order of magnitude. This defieieney depends on the ratio of the plate or shell thiekness, h, to other eharaeteristie dimensions and eannot be eompletely resolved in view of the approximations inherent in the transverse dependence of the extensional and bending stresses.

This volume comprises selected papers presented at the Volterra Centennial Symposium and is dedicated to Volterra and the contribution of his work to the study of systems - an important concept in modern engineering. Vito Volterra began his study of integral equations at the end of the nineteenth century and this was a significant development in th

/homepage/sac/cam/na2000/index.html7-Volume Set now available at special set price ! This volume contains contributions in the area of differential equations and integral equations. Many numerical methods have arisen in response to the need to solve "real-life" problems in applied mathematics, in particular problems that do not have a closed-form solution. Contributions on both initial-value problems and boundary-value problems in ordinary differential equations appear in this volume. Numerical methods for initial-value problems in ordinary differential equations fall naturally into two classes: those which use one starting value at each step (one-step methods) and those which are based on several values of the solution (multistep methods). John Butcher has supplied an expert's perspective of the development of numerical methods for ordinary differential equations in the 20th century. Rob Corless and Lawrence Shampine talk about established technology, namely software for initial-value problems using Runge-Kutta and Rosenbrock methods, with interpolants to fill in the solution between mesh-points, but the 'slant' is new - based on the question, "How should such software integrate into the current generation of Problem Solving Environments?" Natalia Borovykh and Marc Spijker study the problem of establishing upper bounds for the norm of the nth power of square matrices. The dynamical system viewpoint has been of great benefit to ODE theory and numerical methods. Related is the study of chaotic behaviour. Willy Govaerts discusses the numerical methods for the computation and continuation of equilibria and bifurcation points of equilibria of dynamical systems. Arieh Iserles and Antonella Zanna survey the construction of Runge-Kutta methods which preserve algebraic invariant functions. Valeria Antohe and Ian Gladwell present numerical experiments on solving a Hamiltonian system of Hénon and Heiles with a symplectic and a nonsymplectic method with a variety of precisions and initial conditions. Stiff differential equations first became recognized as special during the 1950s. In 1963 two seminal publications laid to the foundations for later development: Dahlquist's paper on A-stable multistep methods and Butcher's first paper on implicit Runge-Kutta methods. Ernst Hairer and Gerhard Wanner deliver a survey which retraces the discovery of the order stars as well as the principal achievements obtained by that theory. Guido Vanden Berghe, Hans De Meyer, Marnix Van Daele and Tanja Van Hecke construct exponentially fitted Runge-Kutta methods with s stages. Differential-algebraic equations arise in control, in modelling of mechanical systems and in many other fields. Jeff Cash describes a fairly recent class of formulae for the numerical solution of initial-value problems for stiff and differential-algebraic systems. Shengtai Li and Linda Petzold describe methods and software for sensitivity analysis of solutions of DAE initial-value problems. Again in the area of differential-algebraic systems, Neil Biehn, John Betts, Stephen Campbell and William Huffman present current work on mesh adaptation for DAE two-point boundary-value problems. Contrasting approaches to the question of how good an approximation is as a solution of a given equation involve (i) attempting to estimate the actual error (i.e., the difference between the true and the approximate solutions) and (ii) attempting to estimate the defect

Praise for the Second Edition "This book is an excellent introduction to the wide field of boundary value problems."—Journal of Engineering Mathematics "No doubt this textbook will be useful for both students and research workers."—Mathematical Reviews A new edition of the highly-acclaimed guide to boundary value problems, now featuring modern computational methods and approximation theory Green's Functions and Boundary Value Problems, Third Edition continues the tradition of the two prior editions by providing mathematical techniques for the use of differential and integral equations to tackle important problems in applied mathematics, the physical sciences, and engineering. This new edition presents mathematical concepts and quantitative tools that are essential for effective use of modern computational methods that play a key role in the practical solution of boundary value problems. With a careful blend of theory and applications, the authors successfully bridge the gap between real analysis, functional analysis, nonlinear analysis, nonlinear partial differential equations, integral equations, approximation theory, and numerical analysis to provide a comprehensive foundation for understanding and analyzing core mathematical and computational modeling problems. Thoroughly updated and revised to reflect recent developments, the book includes an extensive new chapter on the modern tools of computational mathematics for boundary value problems. The Third Edition features numerous new topics, including: Nonlinear analysis tools for Banach spaces Finite element and related discretizations Best and near-best approximation in Banach spaces Iterative methods for discretized equations Overview of Sobolev and Besov space linear Methods for nonlinear equations Applications to nonlinear elliptic equations In addition, various topics have been substantially expanded, and new material on weak derivatives and Sobolev spaces, the Hahn-Banach theorem, reflexive Banach spaces, the Banach Schauder and Banach-Steinhaus theorems, and the Lax-Milgram theorem has been incorporated into the book. New and revised exercises found throughout allow readers to develop their own problem-solving skills, and the updated bibliographies in each chapter provide an extensive resource for new and emerging research and applications. With its careful balance of mathematics and meaningful applications, Green's

Functions and Boundary Value Problems, Third Edition is an excellent book for courses on applied analysis and boundary value problems in partial differential equations at the graduate level. It is also a valuable reference for mathematicians, physicists, engineers, and scientists who use applied mathematics in their everyday work.

This book consists of 18 papers presented at the KIER-TMU International Workshop on Financial Engineering 2009. These papers address state-of-the-art techniques in financial engineering, and they are selected through appropriate referees'' evaluation followed by the editors'' final decision in order to make this book a high-quality one. The KIER-TMU International Workshop on Financial Engineering was held for the first time in 2009. Prof. Kijima (the Chair of this workshop) and his colleagues held the Daiwa International Workshop on Financial Engineering in Tokyo from 2004-2008. Each year, various kinds of interesting and high-quality studies are presented by many researchers from various countries, from both academia and the industry. Accordingly, this workshop serves as a bridge between academic researchers on financial engineering and practitioners. In 2009, the Institute of Economic Research, Kyoto University (KIER) and Tokyo Metropolitan University (TMU) held a new international workshop, the KIER-TMU International Workshop on Financial Engineering, which is regarded as a successor to the Daiwa International Workshop.

This book contains a novel theory of random fields estimation of Wiener type, developed originally by the author and presented here. No assumption about the Gaussian or Markovian nature of the fields are made. The theory, constructed entirely within the framework of covariance theory, is based on a detailed analytical study of a new class of multidimensional integral equations basic in estimation theory. This book is suitable for graduate courses in random fields estimation. It can also be used in courses in functional analysis, numerical analysis, integral equations, and scattering theory.

?The eigenvalue problems for quasilinear and nonlinear operators present many differences with the linear case, and a Lyapunov inequality for quasilinear resonant systems showed the existence of eigenvalue asymptotics driven by the coupling of the equations instead of the order of the equations. For p=2, the coupling and the order of the equations are the same, so this cannot happen in linear problems. Another striking difference between linear and quasilinear second order differential operators is the existence of Lyapunov-type inequalities in R^n when p>n. Since the linear case corresponds to p=2, for the usual Laplacian there exists a Lyapunov inequality only for one-dimensional problems. For linear higher order problems, several Lyapunov-type inequalities were found by Egorov and Kondratiev and collected in On spectral theory of elliptic operators, Birkhauser Basel 1996. However, there exists an interesting interplay between the dimension of the underlying space, the order of the differential operator, the Sobolev space where the operator is defined, and the norm of the weight appearing in the inequality which is not fully developed. Also, the Lyapunov inequality for differential equations in Orlicz spaces can be used to develop an oscillation theory, bypassing the classical sturmian theory which is not known yet for those equations. For more general operators, like the p(x) laplacian, the possibility of existence of Lyapunov-type inequalities remains unexplored. ?

Inverse problems are immensely important in modern science and technology. However, the broad mathematical issues raised by inverse problems receive scant attention in the university curriculum. This book aims to remedy this state of affairs by supplying an accessible introduction, at a modest mathematical level, to the alluring field of inverse problems. Many models of inverse problems from science and engineering are dealt with and nearly a hundred exercises, of varying difficulty, involving mathematical analysis, numerical treatment, or modelling of inverse problems, are provided. The main themes of the book are: causation problem modeled as integral equations; model identification problems, posed as coefficient determination problems in differential equations; the functional analytic framework for inverse problems; and a survey of the principal numerical methods for inverse problems. An extensive annotated bibliography furnishes leads on the history of inverse problems and a guide to the frontiers of current research.

The editor has incorporated contributions from a diverse group of leading researchers in the field of differential equations. This book aims to provide an overview of the current knowledge in the field of differential equations. The main subject areas are divided into general theory and applications. These include fixed point approach to solution existence of differential equations, existence theory of differential equations of arbitrary order, topological methods in the theory of ordinary differential equations, impulsive fractional differential equations with finite delay and integral boundary conditions, an extension of Massera's theorem for n-dimensional stochastic differential equations, phase portraits of cubic dynamic systems in a Poincare circle, differential equations arising from the three-variable Hermite polynomials and computation of their zeros and reproducing kernel method for differential equations. Applications include local discontinuous Galerkin method for nonlinear Ginzburg-Landau equation, general function method in transport boundary value problems of theory of elasticity and solution of nonlinear partial differential equations by new Laplace variational iteration method. Existence/uniqueness theory of differential equations is presented in this book with applications that will be of benefit to mathematicians, applied mathematicians and researchers in the field. The book is written primarily for those who have some knowledge of differential equations and mathematical analysis. The authors of each section bring a strong emphasis on theoretical foundations to the book.

Inequalities for Differential and Integral Equations has long been needed; it contains material which is hard to find in other books. Written by a major contributor to the field, this comprehensive resource contains many inequalities which have only recently appeared in the literature and which can be used as powerful tools in the development of applications in the theory of new classes of differential and integral equations. For researchers working in this area, it will be a valuable source of reference and inspiration. It could also be used as the text for an advanced graduate course. Covers a variety of linear and nonlinear inequalities which find widespread applications in the theory of various classes of differential and integral equations Contains many inequalities which have only recently appeared in literature and cannot yet be found in other books Provides a valuable reference to engineers and graduate students

In this volume, we report new results about various theories and methods of integral equation, boundary value problems for partial differential equations and functional equations, and integral operators including singular integral equations, applications of boundary value problems and integral equations to mechanics and physics, numerical methods of integral equations and boundary value problems, theories and methods for inverse problems of mathematical physics, Clifford analysis and related problems. Contents:Some Properties of a Kind of Singular Integral Operator for K-Monogenic Function in Clifford Analysis (L P Wang, Z L Xu and Y Y Qiao)Some Results Related with Möbius Transformation in Clifford Analysis (Z X Zhang)The Scattering of SH Wave on the Array of Periodic Cracks in a Piezoelectric Substrate Bonded a Half-Plane of Functionally Graded Materials (J Q Liu, X Li, S Z Dong, X Y Yao and C F Wang)Anti-Plane Problem of Two Collinear Cracks in a Functionally Graded Coating–Substrate Structure (S H Ding and X Li)A Kind of Riemann Boundary Value Problem for Triharmonic Functions in Clifford Analysis (L F Gu)A New Dynamical Systems Method for Nonlinear Operator Equations (X J Luo, F C Li and S H Yang)A Class of Integral Inequality and Application (W S Wang)An Efficient

Spectral Boundary Integral Equation Method for the Simulation of Earthquake Rupture Problems (W S Wang and B W Zhang)High-Frequency Asymptotics for the Modified Helmholtz Equation in a Half-Plane (H M Huang)An Inverse Boundary Value Problem Involving Filtration for Elliptic Systems of Equations (Z L Xu and L Yan)Fixed Point Theorems of Contractive Mappings in Extended Cone Metric Spaces (H P Huang and X Li)Positive Solutions of Singular Third-Order Three-Point Boundary Value Problems (B Q Yan and X Liu)Modified Neumann Integral and Asymptotic Behavior in the Half-Space (Y H Zhang, G T Deng and Z Z Wei)Piecewise Tikhonov Regularization Scheme to Reconstruct Discontinuous Density in Computerized Tomography (J Cheng, Y Jiang, K Lin and J W Yan)About the Quaternionic Jacobian Conjecture (H Liu)Interaction Between Antiplane Circular Inclusion and Circular Hole of Piezoelectric Materials (L H Chang and X Li)Convergence of Numerical Algorithm for Coupled Heat and Mass Transfer in Textile Materials (M B Ge, J X Cheng and D H Xu)Haversian Cortical Bone with a Radial Microcrack (X Wang)Spectra of Unitary Integral Operators on L2(?) with Kernels k(xy) (D W Ma and G Chen)The Numerical Simulation of Long-Period Ground Motion on Basin Effects (Y Q Li and X Li)Complete Plane Strain Problem of a One-Dimensional Hexagonal Quasicrystals with a Doubly-Periodic Set of Cracks (X Li and P P Shi)The Problem About an Elliptic Hole with III Asymmetry Cracks in One-Dimensional Hexagonal Piezoelectric Quasicrystals (H S Huo and X Li)The Second Fundamental Problem of Periodic Plane Elasticity of a One-Dimensional Hexagonal Quasicrystals (J Y Cui, P P Shi and X Li)The Optimal Convex Combination Bounds for the Centroidal Mean (H Liu and X J Meng)The Method of Fundamental Solution for a Class of Elliptical Partial Differential Equations with Coordinate Transformation and Image Technique (L N Wu and Q Jiang)Various Wavelet Methods for Solving Fractional Fredholm–Volterra Integral Equations (P P Shi, X Li and X Li) Readership: Researchers in analysis and differential equations. Keywords:Integral Equations;Boundary Value ProblemsKey Features:Provides new research progress on these topics

The monograph is written with a view to provide basic tools for researchers working in Mathematical Analysis and Applications, concentrating on differential, integral and finite difference equations. It contains many inequalities which have only recently appeared in the literature and which can be used as powerful tools and will be a valuable source for a long time to come. It is self-contained and thus should be useful for those who are interested in learning or applying the inequalities with explicit estimates in their studies. Contains a variety of inequalities discovered which find numerous applications in various branches of differential, integral and finite difference equations Valuable reference for someone requiring results about inequalities for use in some applications in various other branches of mathematics Highlights pure and applied mathematics and other areas of science and technology

This book deals with the numerical solution of integral equations based on approximation of functions and the authors apply wavelet approximation to the unknown function of integral equations. The book's goal is to categorize the selected methods and assess their accuracy and efficiency.

This reference serves as a reader-friendly guide to every basic tool and skill required in the mathematical library and helps mathematicians find resources in any format in the mathematics literature. It lists a wide range of standard texts, journals, review articles, newsgroups, and Internet and database tools for every major subfield in mathematics and details methods of access to primary literature sources of new research, applications, results, and techniques. Using the Mathematics Literature is the most comprehensive and up-to-date resource on mathematics literature in both print and electronic formats, presenting time-saving strategies for retrieval of the latest information.

This volume consists of a collection of 14 accepted submissions (including several invited feature articles) to the Special Issue of MDPI's journal Symmetry on the general subject area of integral transformations, operational calculus and their applications from many different parts around the world. The main objective of the Special Issue was to gather review, expository, and original research articles dealing with the state-of-the-art advances in integral transformations and operational calculus as well as their multidisciplinary applications, together with some relevance to the aspect of symmetry. Various families of fractional-order integrals and derivatives have been found to be remarkably important and fruitful, mainly due to their demonstrated applications in numerous diverse and widespread areas of mathematical, physical, chemical, engineering, and statistical sciences. Many of these fractional-order operators provide potentially useful tools for solving ordinary and partial differential equations, as well as integral, differintegral, and integro-differential equations; fractional-calculus analogues and extensions of each of these equations; and various other problems involving special functions of mathematical physics and applied mathematics, as well as their extensions and generalizations in one or more variables.

This is a complete and concise introduction to classical topics in the numerical solution of ordinary differential equations (ODEs). The text contains many up-to-date references to both analytical and numerical ODE literature while offering new unifying views on different problem classes.