

Application Of Differential Transform Method To The

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Applications of Differential Transform to Real World Problems - Yogeshwari F Patel 2022-08-08

This book is an invaluable resource for applied researchers to find the analytical solution of differential equations describing the dynamical system with less computational effort and time. It describes the basic concepts of the differential transform method and solution of various real-world problems described by simple to complicated differential equations. It provides a computational technique that is not only conceptually simple and easy to use but also readily adaptable for computer coding. Different chapters of the book deal with the basic differential equations involved in the physical phenomena as well as a complicated system of differential equations described by the mathematical model. The book offers comprehensive coverage of the most essential topics, including Basic concepts and fundamental properties of the proposed technique with proof The solution of linear, nonlinear, homogeneous, and nonhomogeneous ordinary differential equations (ODEs) and partial differential equations (PDEs) The initial and boundary value problems Real-world ODE and PDE problems are also discussed Applications of Differential Transform to Real World Problems is primarily aimed at undergraduates, graduates, and researchers studying differential equations. Scientists dealing with complicated differential equations or systems of differential equations will also find

this book useful.

Beyond Perturbation - Shijun Liao 2003-10-27
Solving nonlinear problems is inherently difficult, and the stronger the nonlinearity, the more intractable solutions become. Analytic approximations often break down as nonlinearity becomes strong, and even perturbation approximations are valid only for problems with weak nonlinearity. This book introduces a powerful new analytic method for nonlinear problems-homotopy analysis-that remains valid even with strong nonlinearity. In Part I, the author starts with a very simple example, then presents the basic ideas, detailed procedures, and the advantages (and limitations) of homotopy analysis. Part II illustrates the application of homotopy analysis to many interesting nonlinear problems. These range from simple bifurcations of a nonlinear boundary-value problem to the Thomas-Fermi atom model, Volterra's population model, Von Karman swirling viscous flow, and nonlinear progressive waves in deep water. Although the homotopy analysis method has been verified in a number of prestigious journals, it has yet to be fully detailed in book form. Written by a pioneer in its development, Beyond Perturbation: Introduction to the Homotopy Analysis Method is your first opportunity to explore the details of this valuable new approach, add it to your analytic toolbox, and perhaps make contributions to some of the questions that remain open.
Transform Methods for Solving Partial

Differential Equations - Dean G. Duffy
2004-07-15

Transform methods provide a bridge between the commonly used method of separation of variables and numerical techniques for solving linear partial differential equations. While in some ways similar to separation of variables, transform methods can be effective for a wider class of problems. Even when the inverse of the transform cannot be found and

Nonlinear Analysis, Differential Equations, and Applications - Themistocles M. Rassias
2021-08-20

This contributed volume showcases research and survey papers devoted to a broad range of topics on functional equations, ordinary differential equations, partial differential equations, stochastic differential equations, optimization theory, network games, generalized Nash equilibria, critical point theory, calculus of variations, nonlinear functional analysis, convex analysis, variational inequalities, topology, global differential geometry, curvature flows, perturbation theory, numerical analysis, mathematical finance and a variety of applications in interdisciplinary topics. Chapters in this volume investigate compound superquadratic functions, the Hyers-Ulam Stability of functional equations, edge degenerate pseudo-hyperbolic equations, Kirchhoff wave equation, BMO norms of operators on differential forms, equilibrium points of the perturbed R3BP, complex zeros of solutions to second order differential equations, a higher-order Ginzburg-Landau-type equation, multi-symplectic numerical schemes for differential equations, the Erdős-Rényi network model, strongly m -convex functions, higher order strongly generalized convex functions, factorization and solution of second order differential equations, generalized topologically open sets in relator spaces, graphical mean curvature flow, critical point theory in infinite dimensional spaces using the Leray-Schauder index, non-radial solutions of a supercritical equation in expanding domains, the semi-discrete method for the approximation of the solution of stochastic differential equations, homotopic metric-interval L -contractions in gauge spaces, Rhoades contractions theory, network centrality measures, the Radon

transform in three space dimensions via plane integration and applications in positron emission tomography boundary perturbations on medical monitoring and imaging techniques, the KdV-B equation and biomedical applications.

The Laplace Transform - Joel L. Schiff
2013-06-05

The Laplace transform is a wonderful tool for solving ordinary and partial differential equations and has enjoyed much success in this realm. With its success, however, a certain casualness has been bred concerning its application, without much regard for hypotheses and when they are valid. Even proofs of theorems often lack rigor, and dubious mathematical practices are not uncommon in the literature for students. In the present text, I have tried to bring to the subject a certain amount of mathematical correctness and make it accessible to undergraduates. To this end, this text addresses a number of issues that are rarely considered. For instance, when we apply the Laplace transform method to a linear ordinary differential equation with constant coefficients, $y^{(n)} + a_{n-1}y^{(n-1)} + \dots + a_0y = f(t)$, why is it justified to take the Laplace transform of both sides of the equation (Theorem A. 6)? Or, in many proofs it is required to take the limit inside an integral. This is always fraught with danger, especially with an improper integral, and not always justified. I have given complete details (sometimes in the Appendix) whenever this procedure is required. IX X Preface
Furthermore, it is sometimes desirable to take the Laplace transform of an infinite series term by term. Again it is shown that this cannot always be done, and specific sufficient conditions are established to justify this operation.

Green's Functions and Linear Differential Equations - Prem K. Kythe 2011-01-21
Green's Functions and Linear Differential Equations: Theory, Applications, and Computation presents a variety of methods to solve linear ordinary differential equations (ODEs) and partial differential equations (PDEs). The text provides a sufficient theoretical basis to understand Green's function method, which is used to solve initial and boundary
Engineering Applications of the Laplace Transform - Y.H. Gangadharaiyah 2021-08-25

This book is devoted to one of the most critical areas of applied mathematics, namely the Laplace transform technique for linear time invariance systems arising from the fields of electrical and mechanical engineering. It focuses on introducing Laplace transformation and its operating properties, finding inverse Laplace transformation through different methods, and describing transfer function applications for mechanical and electrical networks to develop input and output relationships. It also discusses solutions of initial value problems, the state-variables approach, and the solution of boundary value problems connected with partial differential equations.

Elementary Differential Equations - Charles Roberts 2018-12-13

Elementary Differential Equations, Second Edition is written with the knowledge that there has been a dramatic change in the past century in how solutions to differential equations are calculated. However, the way the topic has been taught in introductory courses has barely changed to reflect these advances, which leaves students at a disadvantage. This second edition has been created to address these changes and help instructors facilitate new teaching methods and the latest tools, which includes computers. The text is designed to help instructors who want to use computers in their classrooms. It accomplishes this by emphasizing and integrating computers in teaching elementary or ordinary differential equations. Many examples and exercises included in the text require the use of computer software to solve problems. It should be noted that since instructors use their own preferred software, this book has been written to be independent of any specific software package. Features: Focuses on numerical methods and computing to generate solutions Features extensive coverage of nonlinear differential equations and nonlinear systems Includes software programs to solve problems in the text which are located on the author's website Contains a wider variety of non-mathematical models than any competing textbook This second edition is a valuable, up-to-date tool for instructors teaching courses about differential equations. It serves as an excellent introductory textbook for undergraduate students majoring in applied mathematics,

computer science, various engineering disciplines and other sciences. They also will find that the textbook will aid them greatly in their professional careers because of its instructions on how to use computers to solve equations.

Applied Engineering Analysis - Tai-Ran Hsu 2018-04-30

A resource book applying mathematics to solve engineering problems Applied Engineering Analysis is a concise textbook which demonstrates how to apply mathematics to solve engineering problems. It begins with an overview of engineering analysis and an introduction to mathematical modeling, followed by vector calculus, matrices and linear algebra, and applications of first and second order differential equations. Fourier series and Laplace transform are also covered, along with partial differential equations, numerical solutions to nonlinear and differential equations and an introduction to finite element analysis. The book also covers statistics with applications to design and statistical process controls. Drawing on the author's extensive industry and teaching experience, spanning 40 years, the book takes a pedagogical approach and includes examples, case studies and end of chapter problems. It is also accompanied by a website hosting a solutions manual and PowerPoint slides for instructors. Key features: Strong emphasis on deriving equations, not just solving given equations, for the solution of engineering problems. Examples and problems of a practical nature with illustrations to enhance student's self-learning. Numerical methods and techniques, including finite element analysis. Includes coverage of statistical methods for probabilistic design analysis of structures and statistical process control (SPC). Applied Engineering Analysis is a resource book for engineering students and professionals to learn how to apply the mathematics experience and skills that they have already acquired to their engineering profession for innovation, problem solving, and decision making.

Laplace Transforms and Their Applications to Differential Equations - N.W. McLachlan 2014-08-20

Classic graduate-level exposition covers theory and applications to ordinary and partial

differential equations. Includes derivation of Laplace transforms of various functions, Laplace transform for a finite interval, and more. 1948 edition.

A Second Course in Elementary Differential Equations - Paul Waltman 2014-05-10

A Second Course in Elementary Differential Equations deals with norms, metric spaces, completeness, inner products, and an asymptotic behavior in a natural setting for solving problems in differential equations. The book reviews linear algebra, constant coefficient case, repeated eigenvalues, and the employment of the Putzer algorithm for nondiagonalizable coefficient matrix. The text describes, in geometrical and in an intuitive approach, Liapunov stability, qualitative behavior, the phase plane concepts, polar coordinate techniques, limit cycles, the Poincaré-Bendixson theorem. The book explores, in an analytical procedure, the existence and uniqueness theorems, metric spaces, operators, contraction mapping theorem, and initial value problems. The contraction mapping theorem concerns operators that map a given metric space into itself, in which, where an element of the metric space M , an operator merely associates with it a unique element of M . The text also tackles inner products, orthogonality, bifurcation, as well as linear boundary value problems, (particularly the Sturm-Liouville problem). The book is intended for mathematics or physics students engaged in ordinary differential equations, and for biologists, engineers, economists, or chemists who need to master the prerequisites for a graduate course in mathematics.

Differential Equations: Methods and Applications - Belkacem Said-Houari 2016-01-11

This book presents a variety of techniques for solving ordinary differential equations analytically and features a wealth of examples. Focusing on the modeling of real-world phenomena, it begins with a basic introduction to differential equations, followed by linear and nonlinear first order equations and a detailed treatment of the second order linear equations. After presenting solution methods for the Laplace transform and power series, it lastly presents systems of equations and offers an introduction to the stability theory. To help readers practice the theory covered, two types

of exercises are provided: those that illustrate the general theory, and others designed to expand on the text material. Detailed solutions to all the exercises are included. The book is excellently suited for use as a textbook for an undergraduate class (of all disciplines) in ordinary differential equations.

Fuzzy Differential Equations in Various Approaches - Luciana Takata Gomes 2015-09-07

This book may be used as reference for graduate students interested in fuzzy differential equations and researchers working in fuzzy sets and systems, dynamical systems, uncertainty analysis, and applications of uncertain dynamical systems. Beginning with a historical overview and introduction to fundamental notions of fuzzy sets, including different possibilities of fuzzy differentiation and metric spaces, this book moves on to an overview of fuzzy calculus thorough exposition and comparison of different approaches. Innovative theories of fuzzy calculus and fuzzy differential equations using fuzzy bunches of functions are introduced and explored. Launching with a brief review of essential theories, this book investigates both well-known and novel approaches in this field; such as the Hukuhara differentiability and its generalizations as well as differential inclusions and Zadeh's extension. Through a unique analysis, results of all these theories are examined and compared.

An Introduction to Differential Equations and Their Applications - Stanley J. Farlow 2012-10-23

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

The Analysis of Fractional Differential Equations - Kai Diethelm 2010-08-18

Fractional calculus was first developed by pure mathematicians in the middle of the 19th century. Some 100 years later, engineers and physicists have found applications for these concepts in their areas. However there has traditionally been little interaction between these two communities. In particular, typical mathematical works provide extensive findings on aspects with comparatively little significance in applications, and the engineering literature

often lacks mathematical detail and precision. This book bridges the gap between the two communities. It concentrates on the class of fractional derivatives most important in applications, the Caputo operators, and provides a self-contained, thorough and mathematically rigorous study of their properties and of the corresponding differential equations. The text is a useful tool for mathematicians and researchers from the applied sciences alike. It can also be used as a basis for teaching graduate courses on fractional differential equations.

Partial Differential Equations for Mathematical Physicists - Bijan Kumar Bagchi 2019-07-02

Partial Differential Equations for Mathematical Physicists is intended for graduate students, researchers of theoretical physics and applied mathematics, and professionals who want to take a course in partial differential equations. This book offers the essentials of the subject with the prerequisite being only an elementary knowledge of introductory calculus, ordinary differential equations, and certain aspects of classical mechanics. We have stressed more the methodologies of partial differential equations and how they can be implemented as tools for extracting their solutions rather than dwelling on the foundational aspects. After covering some basic material, the book proceeds to focus mostly on the three main types of second order linear equations, namely those belonging to the elliptic, hyperbolic, and parabolic classes. For such equations a detailed treatment is given of the derivation of Green's functions, and of the roles of characteristics and techniques required in handling the solutions with the expected amount of rigor. In this regard we have discussed at length the method of separation variables, application of Green's function technique, and employment of Fourier and Laplace's transforms. Also collected in the appendices are some useful results from the Dirac delta function, Fourier transform, and Laplace transform meant to be used as supplementary materials to the text. A good number of problems is worked out and an equally large number of exercises has been appended at the end of each chapter keeping in mind the needs of the students. It is expected that this book will provide a systematic and unitary coverage of the basics of partial

differential equations. Key Features An adequate and substantive exposition of the subject. Covers a wide range of important topics. Maintains mathematical rigor throughout. Organizes materials in a self-contained way with each chapter ending with a summary. Contains a large number of worked out problems.

Partial Differential Equations - Walter A. Strauss 2007-12-21

Partial Differential Equations presents a balanced and comprehensive introduction to the concepts and techniques required to solve problems containing unknown functions of multiple variables. While focusing on the three most classical partial differential equations (PDEs)—the wave, heat, and Laplace equations—this detailed text also presents a broad practical perspective that merges mathematical concepts with real-world application in diverse areas including molecular structure, photon and electron interactions, radiation of electromagnetic waves, vibrations of a solid, and many more. Rigorous pedagogical tools aid in student comprehension; advanced topics are introduced frequently, with minimal technical jargon, and a wealth of exercises reinforce vital skills and invite additional self-study. Topics are presented in a logical progression, with major concepts such as wave propagation, heat and diffusion, electrostatics, and quantum mechanics placed in contexts familiar to students of various fields in science and engineering. By understanding the properties and applications of PDEs, students will be equipped to better analyze and interpret central processes of the natural world.

The Fokker-Planck Equation - Hannes Risken 2012-12-06

This is the first textbook to include the matrix continued-fraction method, which is very effective in dealing with simple Fokker-Planck equations having two variables. Other methods covered are the simulation method, the eigenfunction expansion, numerical integration, and the variational method. Each solution is applied to the statistics of a simple laser model and to Brownian motion in potentials. The whole is rounded off with a supplement containing a short review of new material together with some recent references. This new study edition will prove to be very useful for graduate students in

physics, chemical physics, and electrical engineering, as well as for research workers in these fields.

A First Course in Partial Differential

Equations - H. F. Weinberger 2012-04-20

Suitable for advanced undergraduate and graduate students, this text presents the general properties of partial differential equations, including the elementary theory of complex variables. Solutions. 1965 edition.

Partial Differential Equations and Boundary-Value Problems with Applications - Mark A. Pinsky 2011

Building on the basic techniques of separation of variables and Fourier series, the book presents the solution of boundary-value problems for basic partial differential equations: the heat equation, wave equation, and Laplace equation, considered in various standard coordinate systems--rectangular, cylindrical, and spherical. Each of the equations is derived in the three-dimensional context; the solutions are organized according to the geometry of the coordinate system, which makes the mathematics especially transparent. Bessel and Legendre functions are studied and used whenever appropriate throughout the text. The notions of steady-state solution of closely related stationary solutions are developed for the heat equation; applications to the study of heat flow in the earth are presented. The problem of the vibrating string is studied in detail both in the Fourier transform setting and from the viewpoint of the explicit representation (d'Alembert formula). Additional chapters include the numerical analysis of solutions and the method of Green's functions for solutions of partial differential equations. The exposition also includes asymptotic methods (Laplace transform and stationary phase). With more than 200 working examples and 700 exercises (more than 450 with answers), the book is suitable for an undergraduate course in partial differential equations.

Complex Algebraic Curves - Frances Clare Kirwan 1992-02-20

This development of the theory of complex algebraic curves was one of the peaks of nineteenth century mathematics. They have many fascinating properties and arise in various areas of mathematics, from number theory to theoretical physics, and are the subject of much

research. By using only the basic techniques acquired in most undergraduate courses in mathematics, Dr. Kirwan introduces the theory, observes the algebraic and topological properties of complex algebraic curves, and shows how they are related to complex analysis.

Numerical and Analytical Solutions for Solving Nonlinear Equations in Heat Transfer - Ganji, Davood Domiri 2017-07-26

Engineering applications offer benefits and opportunities across a range of different industries and fields. By developing effective methods of analysis, results and solutions are produced with higher accuracy. Numerical and Analytical Solutions for Solving Nonlinear Equations in Heat Transfer is an innovative source of academic research on the optimized techniques for analyzing heat transfer equations and the application of these methods across various fields. Highlighting pertinent topics such as the differential transformation method, industrial applications, and the homotopy perturbation method, this book is ideally designed for engineers, researchers, graduate students, professionals, and academics interested in applying new mathematical techniques in engineering sciences.

Differential and Integral Equations: Boundary Value Problems and Adjoints - S. Schwabik 1979-05-31

Solitons, Nonlinear Evolution Equations and Inverse Scattering - Mark J. Ablowitz 1991-12-12

This book will be a valuable addition to the growing literature in the area and essential reading for all researchers in the field of soliton theory.

Differential Transformation Method for Mechanical Engineering Problems - Mohammad Hatami 2016-11-17

Differential Transformation Method for Mechanical Engineering Problems focuses on applying DTM to a range of mechanical engineering applications. The authors modify traditional DTM to produce two additional methods, multi-step differential transformation method (Ms-DTM) and the hybrid differential transformation method and finite difference method (Hybrid DTM-FDM). It is then demonstrated how these can be a suitable series solution for engineering and physical problems,

such as the motion of a spherical particle, nanofluid flow and heat transfer, and micropolar fluid flow and heat transfer. Presents the differential transformation method and why it holds an advantage over higher-order Taylor series methods Includes a full mathematical introduction to DTM, Ms-DTM, and Hybrid DTM Covers the use of these methods for solving a range of problems in areas such as nanofluid flow, heat transfer, and motion of a spherical particle in different conditions Provides numerous examples and exercises which will help the reader fully grasp the practical applications of these new methods

Fractional Differential Equations - Juan J. Nieto 2019-11-19

Fractional calculus provides the possibility of introducing integrals and derivatives of an arbitrary order in the mathematical modelling of physical processes, and it has become a relevant subject with applications to various fields, such as anomalous diffusion, propagation in different media, and propagation in relation to materials with different properties. However, many aspects from theoretical and practical points of view have still to be developed in relation to models based on fractional operators. This Special Issue is related to new developments on different aspects of fractional differential equations, both from a theoretical point of view and in terms of applications in different fields such as physics, chemistry, or control theory, for instance. The topics of the Issue include fractional calculus, the mathematical analysis of the properties of the solutions to fractional equations, the extension of classical approaches, or applications of fractional equations to several fields.

Applications of Differential Transform to Real World Problems - Yogeshwari Patel 2022-08

"Applications of Differential Transform to Real World Problems is an invaluable resource for applied researchers to find the analytical solution of differential equations describing the dynamical system with less computational effort and time. This book describes the basic concepts of differential transform method and solution of various real-world problems describe by simple to complicated differential equations. This book provides a computational technique which is not only conceptually simple and easy to use but

also readily adaptable for computer coding. Different chapters of the book deals with the basic differential equation involve in the physical phenomena as well complicated system of differential described by the mathematical model"--

Introduction to Partial Differential Equations with Applications - E. C. Zachmanoglou 2012-04-20

This text explores the essentials of partial differential equations as applied to engineering and the physical sciences. Discusses ordinary differential equations, integral curves and surfaces of vector fields, the Cauchy-Kovalevsky theory, more. Problems and answers.

Riccati Differential Equations - Reid 1972-08-22

Riccati Differential Equations

Integral Transform Techniques for Green's Function - Kazumi Watanabe 2015-04-20

This book describes mathematical techniques for integral transforms in a detailed but concise manner. The techniques are subsequently applied to the standard partial differential equations, such as the Laplace equation, the wave equation and elasticity equations. Green's functions for beams, plates and acoustic media are also shown, along with their mathematical derivations. The Cagniard-de Hoop method for double inversion is described in detail and 2D and 3D elastodynamic problems are treated in full. This new edition explains in detail how to introduce the branch cut for the multi-valued square root function. Further, an exact closed form Green's function for torsional waves is presented, as well as an application technique of the complex integral, which includes the square root function and an application technique of the complex integral.

Applied Stochastic Differential Equations - Simo Särkkä 2019-05-02

With this hands-on introduction readers will learn what SDEs are all about and how they should use them in practice.

Solving Frontier Problems of Physics: The Decomposition Method - G. Adomian 2013-06-29

The Adomian decomposition method enables the accurate and efficient analytic solution of nonlinear ordinary or partial differential equations without the need to resort to linearization or perturbation approaches. It

unifies the treatment of linear and nonlinear, ordinary or partial differential equations, or systems of such equations, into a single basic method, which is applicable to both initial and boundary-value problems. This volume deals with the application of this method to many problems of physics, including some frontier problems which have previously required much more computationally-intensive approaches. The opening chapters deal with various fundamental aspects of the decomposition method. Subsequent chapters deal with the application of the method to nonlinear oscillatory systems in physics, the Duffing equation, boundary-value problems with closed irregular contours or surfaces, and other frontier areas. The potential application of this method to a wide range of problems in diverse disciplines such as biology, hydrology, semiconductor physics, wave propagation, etc., is highlighted. For researchers and graduate students of physics, applied mathematics and engineering, whose work involves mathematical modelling and the quantitative solution of systems of equations.

Numerical Solution of Initial-value Problems in Differential-algebraic Equations - K. E. Brenan 1996-01-01

Many physical problems are most naturally described by systems of differential and algebraic equations. This book describes some of the places where differential-algebraic equations (DAE's) occur. The basic mathematical theory for these equations is developed and numerical methods are presented and analyzed. Examples drawn from a variety of applications are used to motivate and illustrate the concepts and techniques. This classic edition, originally published in 1989, is the only general DAE book available. It not only develops guidelines for choosing different numerical methods, it is the first book to discuss DAE codes, including the popular DASSL code. An extensive discussion of backward differentiation formulas details why they have emerged as the most popular and best understood class of linear multistep methods for general DAE's. New to this edition is a chapter that brings the discussion of DAE software up to date. The objective of this monograph is to advance and consolidate the existing research results for the numerical solution of DAE's. The authors present results on the analysis of

numerical methods, and also show how these results are relevant for the solution of problems from applications. They develop guidelines for problem formulation and effective use of the available mathematical software and provide extensive references for further study.

Partial Differential Equations of Mathematical Physics - S. L. Sobolev 1964-01-01

This volume presents an unusually accessible introduction to equations fundamental to the investigation of waves, heat conduction, hydrodynamics, and other physical problems. Topics include derivation of fundamental equations, Riemann method, equation of heat conduction, theory of integral equations, Green's function, and much more. The only prerequisite is a familiarity with elementary analysis. 1964 edition.

Applied Partial Differential Equations - Richard Haberman 2013

Normal 0 false false false This book emphasizes the physical interpretation of mathematical solutions and introduces applied mathematics while presenting differential equations. Coverage includes Fourier series, orthogonal functions, boundary value problems, Green's functions, and transform methods. This text is ideal for readers interested in science, engineering, and applied mathematics.

Half-Linear Differential Equations - Ondrej Dosly 2005-07-06

The book presents a systematic and compact treatment of the qualitative theory of half-linear differential equations. It contains the most updated and comprehensive material and represents the first attempt to present the results of the rapidly developing theory of half-linear differential equations in a unified form. The main topics covered by the book are oscillation and asymptotic theory and the theory of boundary value problems associated with half-linear equations, but the book also contains a treatment of related topics like PDE's with p-Laplacian, half-linear difference equations and various more general nonlinear differential equations. - The first complete treatment of the qualitative theory of half-linear differential equations. - Comparison of linear and half-linear theory. - Systematic approach to half-linear oscillation and asymptotic theory. - Comprehensive bibliography and index. - Useful

as a reference book in the topic.

Modern Engineering Mathematics - Glyn James
2011-09-21

This book provides a complete course for first-year engineering mathematics. Whichever field of engineering you are studying, you will be most likely to require knowledge of the mathematics presented in this textbook. Taking a thorough approach, the authors put the concepts into an engineering context, so you can understand the relevance of mathematical techniques presented and gain a fuller appreciation of how to draw upon them throughout your studies.

Applications of Nanofluid for Heat Transfer Enhancement - Mohsen Sheikholeslami
2017-02-26

Applications of Nanofluid for Heat Transfer Enhancement explores recent progress in computational fluid dynamic and nonlinear science and its applications to nanofluid flow and heat transfer. The opening chapters explain governing equations and then move on to discussions of free and forced convection heat transfers of nanofluids. Next, the effect of nanofluid in the presence of an electric field, magnetic field, and thermal radiation are investigated, with final sections devoted to nanofluid flow in porous media and application of nanofluid for solidification. The models discussed in the book have applications in various fields, including mathematics, physics, information science, biology, medicine, engineering, nanotechnology, and materials science. Presents the latest information on nanofluid free and force convection heat transfer, of nanofluid in the presence of thermal radiation, and nanofluid in the presence of an electric field Provides an understanding of the fundamentals in new numerical and analytical methods Includes codes for each modeling method discussed, along with advice on how to best apply them

Nonlinear Differential Equations in Physics - Santanu Saha Ray
2019-12-28

This book discusses various novel analytical and numerical methods for solving partial and fractional differential equations. Moreover, it presents selected numerical methods for solving stochastic point kinetic equations in nuclear reactor dynamics by using Euler-Maruyama and

strong-order Taylor numerical methods. The book also shows how to arrive at new, exact solutions to various fractional differential equations, such as the time-fractional Burgers-Hopf equation, the (3+1)-dimensional time-fractional Khokhlov-Zabolotskaya-Kuznetsov equation, (3+1)-dimensional time-fractional KdV-Khokhlov-Zabolotskaya-Kuznetsov equation, fractional (2+1)-dimensional Davey-Stewartson equation, and integrable Davey-Stewartson-type equation. Many of the methods discussed are analytical-numerical, namely the modified decomposition method, a new two-step Adomian decomposition method, new approach to the Adomian decomposition method, modified homotopy analysis method with Fourier transform, modified fractional reduced differential transform method (MFRDTM), coupled fractional reduced differential transform method (CFRDTM), optimal homotopy asymptotic method, first integral method, and a solution procedure based on Haar wavelets and the operational matrices with function approximation. The book proposes for the first time a generalized order operational matrix of Haar wavelets, as well as new techniques (MFRDTM and CFRDTM) for solving fractional differential equations. Numerical methods used to solve stochastic point kinetic equations, like the Wiener process, Euler-Maruyama, and order 1.5 strong Taylor methods, are also discussed.

Spectral Methods for Time-Dependent Problems - Jan S. Hesthaven
2007-01-11

Spectral methods are well-suited to solve problems modeled by time-dependent partial differential equations: they are fast, efficient and accurate and widely used by mathematicians and practitioners. This class-tested 2007 introduction, the first on the subject, is ideal for graduate courses, or self-study. The authors describe the basic theory of spectral methods, allowing the reader to understand the techniques through numerous examples as well as more rigorous developments. They provide a detailed treatment of methods based on Fourier expansions and orthogonal polynomials (including discussions of stability, boundary conditions, filtering, and the extension from the linear to the nonlinear situation). Computational

solution techniques for integration in time are dealt with by Runge-Kutta type methods. Several chapters are devoted to material not previously covered in book form, including stability theory

for polynomial methods, techniques for problems with discontinuous solutions, round-off errors and the formulation of spectral methods on general grids. These will be especially helpful for practitioners.