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Numerical Partial Differential Equations for Environmental Scientists and Engineers - Daniel R. Lynch 2006-06-02
For readers with some competence in PDE solution properties, this book offers an interdisciplinary approach to problems occurring in natural environmental media: the hydrosphere, atmosphere, cryosphere, lithosphere, biosphere and ionosphere. It presents two major discretization methods: Finite Difference and Finite Element, plus a section on practical approaches to ill-posed problems. The blend of theory,

analysis, and implementation practicality supports solving and understanding complicated problems.

Steel Heat Treatment - George E. Totten 2006-09-28

One of two self-contained volumes belonging to the newly revised Steel Heat Treatment Handbook, Second Edition, this book focuses on process design, equipment, and testing used in steel heat treatment. Steel Heat Treatment: Equipment and Process Design presents the classical perspectives that form the basis of heat treatment processes while

Steel Heat Treatment Handbook - 2 Volume Set - George E. Totten 2006-11-14

This reference presents the classical perspectives that form the basis of heat treatment processes while incorporating descriptions of the latest advances to impact this enduring technology. The second edition of the bestselling Steel Heat Treatment Handbook now offers abundantly updated and extended coverage in two self-contained volumes:

NUMERICAL METHODS FOR SCIENTISTS AND ENGINEERS, FOURTH EDITION - Rao, K. Sankara 2017-12-01

With a clarity of approach, this easy-to-comprehend book gives an in-depth analysis of the topics under Numerical Methods, in a systematic manner. Primarily intended for the undergraduate and postgraduate students in many branches of engineering, physics, mathematics and all those pursuing Bachelors/Masters in computer applications. Besides students, those appearing for competitive examinations, research scholars and professionals engaged in numerical computation will also be benefited by this book. The fourth edition of this book has been updated by adding a current topic of interest on Finite Element Methods, which is a versatile method to solve numerically, several problems that arise in engineering design, claiming many advantages over the existing

methods. Besides, it introduces the basics in computing, discusses various direct and iterative methods for solving algebraic and transcendental equations and a system of non-linear equations, linear system of equations, matrix inversion and computation of eigenvalues and eigenvectors of a matrix. It also provides a detailed discussion on Curve fitting, Interpolation, Numerical Differentiation and Integration besides explaining various single step and predictor–corrector methods for solving ordinary differential equations, finite difference methods for solving partial differential equations, and numerical methods for solving Boundary Value Problems. Fourier series approximation to a real continuous function is also presented. The text is augmented with a plethora of examples and solved problems along with well-illustrated figures for a practical understanding of the subject. Chapter-end exercises with answers and a detailed bibliography have also been provided. NEW TO THIS EDITION • Includes two new chapters on the basic concepts of the Finite Element Method and Coordinate Systems in Finite Element Methods with Applications in Heat Transfer and Structural Mechanics. • Provides more than 350 examples including numerous worked-out problems. • Gives detailed solutions and hints to problems under Exercises.

Numerical Analysis - Jan Awrejcewicz 2011-09-09

Numerical Analysis - Theory and Application is an edited book divided into two parts: Part I devoted to Theory, and Part II dealing with Application. The presented book is focused on introducing theoretical approaches of numerical analysis as well as applications of various numerical methods to either study or solving numerous theoretical and engineering problems. Since a large number of pure theoretical research is proposed as well as a large amount of applications oriented numerical simulation results are given, the book can

be useful for both theoretical and applied research aimed on numerical simulations. In addition, in many cases the presented approaches can be applied directly either by theoreticians or engineers.

Finite Element Analysis with Personal Computers - Edward R. Champion 2020-11-25

This book addresses the history of finite element analysis (FEA) and why FEA is becoming a necessary tool for the solution of a wide variety of problems encountered in the professsional engineer's career. It helps the user to solve general classes of problems with FEA on personal computers.

Fundamentals of the Finite Element Method for Heat and Fluid Flow - Roland W. Lewis 2008-02-07

Heat transfer is the area of engineering science which describes the energy transport between material bodies due to a difference in temperature. The three different modes of heat transport are conduction, convection and radiation. In most problems, these three modes exist simultaneously. However, the significance of these modes depends on the problems studied and often, insignificant modes are neglected. Very often books published on Computational Fluid Dynamics using the Finite Element Method give very little or no significance to thermal or heat transfer problems. From the research point of view, it is important to explain the handling of various types of heat transfer problems with different types of complex boundary conditions. Problems with slow fluid motion and heat transfer can be difficult problems to handle. Therefore, the complexity of combined fluid flow and heat transfer problems should not be underestimated and should be dealt with carefully. This book: Is ideal for teaching senior undergraduates the fundamentals of how to use the Finite Element Method to solve heat transfer and fluid dynamics problems Explains how to solve various heat transfer problems with different types of boundary

conditions Uses recent computational methods and codes to handle complex fluid motion and heat transfer problems Includes a large number of examples and exercises on heat transfer problems In an era of parallel computing, computational efficiency and easy to handle codes play a major part. Bearing all these points in mind, the topics covered on combined flow and heat transfer in this book will be an asset for practising engineers and postgraduate students. Other topics of interest for the heat transfer community, such as heat exchangers and radiation heat transfer, are also included.

Applied Finite Element Analysis for Engineers - Frank L. Stasa 1985

Emphasizing how one applies FEM to practical engineering problems, this text provides a thorough introduction to the methods of finite analysis and applies these methods to problems of stress analysis, thermal analysis, fluid flow analysis, and lubrication.

Phase-Field Crystals - Peter Galenko 2018-11-05

The Phase Field Crystal (PFC) model incorporates microscopic structural details into a mesoscopic continuum theory. Methods for fast propagation of PFC interfaces are discussed in this book. They can handle a wide range of thermal gradients, supersaturations and supercoolings, including applications such as selective laser melting. The reader will find theoretical treatment in the first half, while the latter half discusses numerical models.

Applied Surface Thermodynamics, Second Edition - A.W. Neumann 2010-10-13

Surface thermodynamics forms the foundation of any meaningful study of capillarity and wetting phenomena. The second edition of Applied Surface Thermodynamics offers a comprehensive state-of-the-art treatment of this critical topic. It provides students and researchers with fundamental knowledge and

practical guidelines in solving real-world problems related to the measurement and interpretation of interfacial properties. Containing 40 percent new material and reorganized content, this second edition begins by presenting a generalized Gibbs theory of capillarity, including discussions of highly curved interfaces. Concentrating on drop-shape techniques, the book discusses liquid-fluid interfacial tension and its measurement. Next, the authors focus on contact angles with chapters on experimental procedures, thermodynamic models, and the interpretation of contact angles in terms of solid surface tension. The book discusses theoretical approaches to determining solid surface tension as well as interfacial tensions of particles and their manifestations. It concludes by discussing drop size dependence of contact angles and line tension. What's New in the Second Edition: Recent progress in Axisymmetric Drop Shape Analysis (ADSA) Image processing methods for drop shape analysis Advanced applications and generalizations of ADSA Recent studies of contact angle hysteresis Contact angles on inert fluoropolymers Update on line tension and the drop size dependence of contact angles Exploring a range of different aspects of surface science and its applications, the book logically progresses so that knowledge of previous chapters enhances the understanding of subsequent material, yet each chapter is freestanding so that experienced researchers can quickly refer to topics of particular interest.

Rainfall-Induced Soil Slope Failure - Lulu Zhang 2018-09-03

Rainfall-induced landslides are common around the world. With global climate change, their frequency is increasing and the consequences are becoming greater. Previous studies assess them mostly from the perspective of a single discipline—correlating landslides with rainstorms,

geomorphology and hydrology in order to establish a threshold prediction value for rainfall-induced landslides; analyzing the slope's stability using a geomechanical approach; or assessing the risk from field records. Rainfall Induced Soil Slope Failure: Stability Analysis and Probabilistic Assessment integrates probabilistic approaches with the geotechnical modeling of slope failures under rainfall conditions with unsaturated soil. It covers theoretical models of rainfall infiltration and stability analysis, reliability analysis based on coupled hydro-mechanical modelling, stability of slopes with cracks, gravels and spatial heterogenous soils, and probabilistic model calibration based on measurement. It focuses on the uncertainties involved with rainfall-induced landslides and presents state-of-the art techniques and methods which characterize the uncertainties and quantify the probabilities and risk of rainfall-induced landslide hazards. Additionally, the authors cover: The failure mechanisms of rainfall-induced slope failure Commonly used infiltration and stability methods The infiltration and stability of natural soil slopes with cracks and colluvium materials Stability evaluation methods based on probabilistic approaches The effect of spatial variability on unsaturated soil slopes and more

Modeling, Mesh Generation, and Adaptive Numerical Methods for Partial Differential Equations - Ivo Babuska 2012-12-06

With considerations such as complex-dimensional geometries and nonlinearity, the computational solution of partial differential systems has become so involved that it is important to automate decisions that have been normally left to the individual. This book covers such decisions: 1) mesh generation with links to the software generating the domain geometry, 2) solution accuracy and reliability with mesh

selection linked to solution generation. This book is suited for mathematicians, computer scientists and engineers and is intended to encourage interdisciplinary interaction between the diverse groups.

Numerical Methods in Geotechnical Engineering - Thomas Benz 2010-05-25

Numerical Methods in Geotechnical Engineering contains 153 scientific papers presented at the 7th European Conference on Numerical Methods in Geotechnical Engineering, NUMGE 2010, held at Norwegian University of Science and Technology (NTNU) in Trondheim, Norway, 2 4 June 2010.The contributions cover topics from emerging research to engineering pra

Steel Heat Treatment Handbook - George E. Totten 1997-02-21

This comprehensive resource provides practical, modern approaches to steel heat treatment topics such as sources of residual stress and distortion, hardenability prediction, modeling, effects of steel alloy chemistry on heat treatment, quenching, carburizing, nitriding, vacuum heat treatment, metallography, and process equipment. Containing recent data and developments from international experts, the Steel Treatment Handbook discusses the principles of heat treatment; quenchants, quenching systems, and quenching technology; strain gauge procedures, X-ray diffraction, and other residual stress measurement methods; carburizing and carbonitriding; powder mettalurgy technology; metallography and physical property determination; ecological regulations and safety standards; and more. Well illustrated with nearly 1000 tables, equations, figures, and photographs, the Steel Heat Treatment Handbook is an excellent reference for materials, manufacturing, heat treatment, maintenance, mechanical, industrial, process and quality control, design, and research engineers; department or corporate metallurgists; and upper-level

undergraduate and graduate students in these disciplines.

Handbook of Frozen Food Processing and Packaging - Da-Wen Sun 2016-04-19

Consumer demand for a year-round supply of seasonal produce and ready-made meals remains the driving force behind innovation in frozen food technology. Now in its second edition, Handbook of Frozen Food Processing and Packaging explores the art and science of frozen foods and assembles essential data and references relied upon by scientists in univ

MEMS: Field Models and Optimal Design - Paolo Di Barba 2019-06-26

This book highlights numerical models as powerful tools for the optimal design of Micro-Electro-Mechanical Systems (MEMS). Most MEMS experts have a background in electronics, where circuit models or behavioral models (i.e. lumped-parameter models) of devices are preferred to field models. This is certainly convenient in terms of preliminary design, e.g. in the prototyping stage. However, design optimization should also take into account fine-sizing effects on device behavior and therefore be based on distributed-parameter models, such as finite-element models. The book shows how the combination of automated optimal design and field-based models can produce powerful design toolboxes for MEMS. It especially focuses on illustrating theoretical concepts with practical examples, fostering comprehension through a problem-solving approach. By comparing the results obtained using different methods, readers will learn to identify their respective strengths and weaknesses. In addition, special emphasis is given to evolutionary computing and nature-inspired optimization strategies, the effectiveness of which has already been amply demonstrated. Given its scope, the book provides PhD students, researchers and professionals in the area of computer-aided analysis with a comprehensive, yet concise

and practice-oriented guide to MEMS design and optimization. To benefit most from the book, readers should have a basic grasp of electromagnetism, vector analysis and numerical methods.

U.S. Geological Survey Circular - 1984

The Finite Element Method in Thermomechanics - Tai-Ran Hsu 2012-12-06

The rapid advances in the nuclear and aerospace technologies in the past two decades compounded with the increasing demands for high performance, energy-efficient power plant components and engines have made reliable thermal stress analysis a critical factor in the design and operation of such equipment. Recently, and as experienced by the author, the need for sophis ticated analyses has been extended to the energy resource industry such as in-situ coal gasification and in-situ oil recovery from oil sands and shales. The analyses in the above applications are of a multidisciplinary nature, and some involve the additional complexity of multiphase and phase change phenomena. These extremely complicated factors preclude the use of classical methods, and numerical techniques such as the finite element method appear to be the most viable alternative solution. The development of this technique so far appears to have concentrated in two extremes; one being overly concerned with the accuracy of results and tending to place all effort in the implementation of special purpose element concepts and computational algorithms, the other being for commercial purposes with the ability of solving a wide range of engineering problems. However, to be versatile, users require substantial training and experience in order to use these codes effectively. Above all, no provision for any modifi cation of these codes by users is possible, as all these codes are proprietary and access to the code is limited only to the owners.

Dynamic Thermal Analysis of Machines in Running State - Lihui Wang 2013-08-13
With the increasing complexity and dynamism in today's machine design and development, more precise, robust and practical approaches and systems are needed to support machine design. Existing design methods treat the targeted machine as stationery. Analysis and simulation are mostly performed at the component level. Although there are some computer-aided engineering tools capable of motion analysis and vibration simulation etc., the machine itself is in the dry-run state. For effective machine design, understanding its thermal behaviours is crucial in achieving the desired performance in real situation. Dynamic Thermal Analysis of Machines in Running State presents a set of innovative solutions to dynamic thermal analysis of machines when they are put under actual working conditions. The objective is to better understand the thermal behaviours of a machine in real situation while at the design stage. The book has two major sections, with the first section presenting a broad-based review of the key areas of research in dynamic thermal analysis and simulation, and the second section presents an in-depth treatment of relevant methodology and algorithms, leading to better understanding of a machine in real situation. The book is a collection of novel ideas, taking into account the need for presenting intellectual challenges while appealing to a broad readership, including academic researchers, practicing engineers and managers, and graduate students. Given the essential role of modern machines in factory automation and quality assurance, a book dedicated to the topic of dynamic thermal analysis, and its practical applications to machine design would be beneficial to readers of all design and manufacturing sectors, from machine design to automotive engineering, in better

understanding the present challenges and solutions, as well as future research directions in this important area.

Review of Literature on the Finite-element Solution of the Equations of Two-dimensional Surface-water Flow in the Horizontal Plane - Jonathan K. Lee 1987

Finite Elements Methods in Mechanics - M. Reza Eslami 2014-06-24

This book covers all basic areas of mechanical engineering, such as fluid mechanics, heat conduction, beams and elasticity with detailed derivations for the mass, stiffness and force matrices. It is especially designed to give physical feeling to the reader for finite element approximation by the introduction of finite elements to the elevation of elastic membrane. A detailed treatment of computer methods with numerical examples are provided. In the fluid mechanics chapter, the conventional and vorticity transport formulations for viscous incompressible fluid flow with discussion on the method of solution are presented. The variational and Galerkin formulations of the heat conduction, beams and elasticity problems are also discussed in detail. Three computer codes are provided to solve the elastic membrane problem. One of them solves the Poisson's equation. The second computer program handles the two dimensional elasticity problems and the third one presents the three dimensional transient heat conduction problems. The programs are written in C++ environment.

NASTRAN Users' Colloquium - 1985

Food Process Modelling - L M M Tijskens 2001-06-14

Food process modelling provides an authoritative review of one of the most exciting and influential developments in the food industry. The modelling of food processes allows analysts not only to understand such

processes more clearly but also to control them more closely and make predictions about them. Modelling thus aids the search for greater and more consistent food quality. Written by a distinguished international team of experts, Food process modelling covers both the range of modelling techniques and their practical applications across the food chain.

Advanced Applied Finite Element Methods - Carl T. F. Ross 1998-09-01

This book is aimed at senior undergraduates, graduates and engineers. It fills the gap between the numerous textbooks on traditional Applied Mechanics and postgraduate books on Finite Element Methods. Fills the gap between the applied mechanics and finite element methods Discusses basic structural concepts and energy theorems, the discrete system, in-plane quadrilateral elements, field problems and mathematical modelling, among other topics Aimed at senior undergraduates, graduates and engineers

Stored-Grain Ecosystems - Digvir S. Jayas 1994-10-20

This work takes a multidisciplinary approach to grain storage research, applying knowledge from the fields of biology, cereal chemistry, economics, engineering, mathematical modelling and toxicology to the study of the complex interactions among physical and biological variables in stored-grain bulks that cause the deterioration of stored grain. Details the prevention and control of pests and contaminants.

Applied Finite Element Analysis - Larry J. Segerlind 1991-01-16

An introductory textbook for senior/graduate couses in finite element analysis taught in all engineering departments. Covers the basic concepts of the finite element method and their application to the analysis of plane structures and two-dimensional continuum problems in heat transfer, irrotational fluid flow, and elasticity. This revised edition includes a reorganization of

topics and an increase in the number of homework problems. The emphasis on numerical illustrations make topis clear without heavy use of sophisticated mathematics.

The Finite Element Method - Darrell W. Pepper 2017-04-11

This self-explanatory guide introduces the basic fundamentals of the Finite Element Method in a clear manner using comprehensive examples. Beginning with the concept of one-dimensional heat transfer, the first chapters include one-dimensional problems that can be solved by inspection. The book progresses through more detailed two-dimensional elements to three-dimensional elements, including discussions on various applications, and ending with introductory chapters on the boundary element and meshless methods, where more input data must be provided to solve problems. Emphasis is placed on the development of the discrete set of algebraic equations. The example problems and exercises in each chapter explain the procedure for defining and organizing the required initial and boundary condition data for a specific problem, and computer code listings in MATLAB and MAPLE are included for setting up the examples within the text, including COMSOL files. Widely used as an introductory Finite Element Method text since 1992 and used in past ASME short courses and AIAA home study courses, this text is intended for undergraduate and graduate students taking Finite Element Methodology courses, engineers working in the industry that need to become familiar with the FEM, and engineers working in the field of heat transfer. It can also be used for distance education courses that can be conducted on the web. Highlights of the new edition include: - Inclusion of MATLAB, MAPLE code listings, along with several COMSOL files, for the example problems within the text. Power point presentations per chapter and a solution manual are also available from the web. -

Additional introductory chapters on the boundary element method and the meshless method. - Revised and updated content. -Simple and easy to follow guidelines for understanding and applying the Finite Element Method.

Introduction to Approximate Solution Techniques, Numerical Modeling, and Finite Element Methods - Victor N. Kaliakin 2018-04-19

Functions as a self-study guide for engineers and as a textbook for nonengineering students and engineering students, emphasizing generic forms of differential equations, applying approximate solution techniques to examples, and progressing to specific physical problems in modular, self-contained chapters that integrate into the text or can stand alone! This reference/text focuses on classical approximate solution techniques such as the finite difference method, the method of weighted residuals, and variation methods, culminating in an introduction to the finite element method (FEM). Discusses the general notion of approximate solutions and associated errors! With 1500 equations and more than 750 references, drawings, and tables, Introduction to Approximate Solution Techniques, Numerical Modeling, and Finite Element Methods: Describes the approximate solution of ordinary and partial differential equations using the finite difference method Covers the method of weighted residuals, including specific weighting and trial functions Considers variational methods Highlights all aspects associated with the formulation of finite element equations Outlines meshing of the solution domain, nodal specifications, solution of global equations, solution refinement, and assessment of results Containing appendices that present concise overviews of topics and serve as rudimentary tutorials for professionals and students without a background in computational mechanics, Introduction to Approximate Solution Techniques,

Numerical Modeling, and Finite Element Methods is a blue-chip reference for civil, mechanical, structural, aerospace, and industrial engineers, and a practical text for upper-level undergraduate and graduate students studying approximate solution techniques and the FEM.

Computer Modeling of Free-Surface and Pressurized Flows - M. Hanif Chaudhry 2012-12-06

Computers are widely used for the analysis, design, and operation of water resource projects. This gives accurate results, allowing the analysis of complex systems which may not have been possible otherwise, and the investigation and comparison of several different alternatives in a short time, thereby reducing the project costs, optimizing design, and efficient utilization of resources. This volume compiles an edited version of the lecture notes specially prepared by 14 well-known European and North American researchers. Part I deals with free-surface flows. Governing equations are derived and their solution by the finite-difference, finite-element, and boundary-integral methods are discussed. Then, turbulence models, three-dimensional models, dam-break flow models, sediment transport models, and flood routing models are presented. Part II is related to the modeling of steady and transient pressurized flows. Governing equations for both single and two-component flows are derived and numerical methods for their solution are presented. The modeling of water quality in pipe networks, of cooling water systems, and slow and rapid transients is then discussed.

Unsaturated Zone Hydrology - Gary L. Guymon 1994-03-23

Using a quantitative modeling approach, this volume offers a comprehensive exploration of the movement of water in the unsaturated zone (and associated transport phenomena) – the pathway of many contaminants to the saturated zone where much of the world's potable water is

stored. It is the first book to combine research and knowledge on this subject from a wide variety of disciplines into a single source directed toward engineering and environmental training and applications. Deals with contaminant and heat transport in the unsaturated zone; includes a description of soils and their properties and unsaturated soil hydraulic properties; describes unsaturated zone processes; and thoroughly explores numerical modeling and uncertainty in modeling. A text for students in engineering and environmental science, and a reference for practicing engineers and scientists involved in the analysis of unsaturated zone contaminant problems.

Applied Stress Analysis of Plastics - S.I. Krishnamachari 2013-11-27

This book is a product of the understanding I developed of stress analysis applied to plastics, while at work at L. J. Broutman and Associates (UBA) and as a lecturer in the seminars on this topic co-sponsored by UBA and Society of Plastics Engineers. I believe that by its extent and level of treatment, this book would serve as an easy-to-read desktop reference for professionals, as well as a text book at the junior or senior level in undergraduate programs. The main theme of this book is what to do with computed stress. To approach the theme effectively, I have taken the "stress category ap proach" to stress analysis. Such an approach is being successfully used in the nuclear power field. In plastics, this approach helps in the prediction of long term behavior of structures. To maintain interest I have limited derivations and proofs to a minimum, and provided them, if at all, as flow charts. In this way, I believe that one can see better the connection between the variables, assumptions, and mathematics.

Computational and Numerical Challenges in Environmental Modelling - Zahari Zlatev 2006-05-02

Many large mathematical models, not only models arising and used in environmental studies, are described by systems of partial differential equations. The discretization of the spatial derivatives in such models leads to the solution of very large systems of ordinary differential equations. These systems contain many millions of equations and have to be handled over large time intervals by applying many time-steps (up to several hundred thousand time-steps). Furthermore, many scenarios are as a rule to be run. This explains the fact that the computational tasks in this situation are enormous. Therefore, it is necessary to select fast numerical methods; to develop parallel codes and, what is most important when the problems solved are very large to organize the computational process in a proper way. The last item (which is very often underestimated but, let us re-iterate, which is very important) is the major topic of this book. In fact, the proper organization of the computational process can be viewed as a preparation of templates which can be used with different numerical methods and different parallel devices. The development of such templates is described in the book. It is also demonstrated that many comprehensive environmental studies can successfully be carried out when the computations are correctly organized. Thus, this book will help the reader to understand better that, while (a) it is very important to select fast numerical methods as well as (b) it is very important to develop parallel codes, this will not be sufficient when the problems solved are really very large. In the latter case, it is also crucial to exploit better the computer architecture by organizing properly the computational process. Use of templates in connection with the treatment of very large models Performance of comprehensive environmental studies Obtaining reliable and robust information about

pollution levels Studying the impact of future climatic changes on high pollution levels Investigating trends related to critical levels of pollution

1987 Annual Report on Alaska's Mineral Resources - Donald J. Orth 1984

Smoothed Finite Element Methods - G.R. Liu 2016-04-19

Generating a quality finite element mesh is difficult and often very time-consuming. Mesh-free methods operations can also be complicated and quite costly in terms of computational effort and resources. Developed by the authors and their colleagues, the smoothed finite element method (S-FEM) only requires a triangular/tetrahedral mesh to achieve more accurate results, a generally higher convergence rate in energy without increasing computational cost, and easier auto-meshing of the problem domain. Drawing on the authors' extensive research results, Smoothed Finite Element Methods presents the theoretical framework and development of various S-FEM models. After introducing background material, basic equations, and an abstracted version of the FEM, the book discusses the overall modeling procedure, fundamental theories, error assessment matters, and necessary building blocks to construct useful S-FEM models. It then focuses on several specific S-FEM models, including cell-based (CS-FEM), node-based (NS-FEM), edge-based (ES-FEM), face-based (FS-FEM), and a combination of FEM and NS-FEM (αFEM). These models are then applied to a wide range of physical problems in solid mechanics, fracture mechanics, viscoelastoplasticity, plates, piezoelectric structures, heat transfer, and structural acoustics. Requiring no previous knowledge of FEM, this book shows how computational methods and numerical techniques like the S-FEM help in the design and analysis of advanced engineering systems in rapid

and cost-effective ways since the modeling and simulation can be performed automatically in a virtual environment without physically building the system. Readers can easily apply the methods presented in the text to their own engineering problems for reliable and certified solutions.

An Introduction to Linear and Nonlinear Finite Element Analysis - Prem Kythe 2011-06-27

Modern finite element analysis has grown into a basic mathematical tool for almost every field of engineering and the applied sciences. This introductory textbook fills a gap in the literature, offering a concise, integrated presentation of methods, applications, software tools, and hands-on projects. Included are numerous exercises, problems, and Mathematica/Matlab-based programming projects. The emphasis is on interdisciplinary applications to serve a broad audience of advanced undergraduate/graduate students with different backgrounds in applied mathematics, engineering, physics/geophysics. The work may also serve as a self-study reference for researchers and practitioners seeking a quick introduction to the subject for their research.

Finite Element Analysis with Error Estimators - J. E. Akin 2005-06-22

This key text is written for senior undergraduate and graduate engineering students. It delivers a complete introduction to finite element methods and to automatic adaptation (error estimation) that will enable students to understand and use FEA as a true engineering tool. It has been specifically developed to be accessible to non-mathematics students and provides the only complete text for FEA with error estimators for non-mathematicians. Error estimation is taught on nearly half of all FEM courses for engineers at senior undergraduate and postgraduate level; no other existing textbook for this market covers this topic. The

only introductory FEA text with error estimation for students of engineering, scientific computing and applied mathematics Includes source code for creating and proving FEA error estimators

Applied Numerical Methods for Food and Agricultural Engineers - Prabir K. Chandra 2017-12-14

Written from the expertise of an agricultural engineering background, this exciting new book presents the most useful numerical methods and their complete program listings.

Distributed Hydrologic Modeling Using GIS - Baxter E. Vieux 2006-04-11

1. 5 REFERENCES 127 7 DIGITAL TERRAIN 129 1. 1 INTRODUCTION 129 1. 2 DRAINAGE NETWORK 130 1. 3 DEFINITION OF CHANNEL NETWORKS 135 1. 4 RESOLUTION DEPENDENT EFFECTS 138 1. 5 CONSTRAINING DRAINAGE DIRECTION 141 1. 6 SUMMARY 145 1. 7 REFERENCES 146 8 PRECIPITATION MEASUREMENT 149 1. 1 INTRODUCTION 149 1. 2 RAIN GAUGE ESTIMATION OF RAINFALL 151 ADAR STIMATION OF RECIPITATION 1. 3 R E P 155 1. 4 WSR-88D RADAR CHARACTERISTICS 167 1. 5 INPUT FOR HYDROLOGIC MODELING 172 1. 6 SUMMARY 174 1. 7 REFERENCES 175 9 FINITE ELEMENT MODELING 177 1. 1 INTRODUCTION 177 1. 2 MATHEMATICAL FORMULATION 182 1. 3 SUMMARY 194 1. 4 REFERENCES 195 10 DISTRIBUTED MODEL CALIBRATION 197 1. 1 INTRODUCTION 197 1. 2 CALIBRATION APPROACH 199 1. 3 DISTRIBUTED MODEL CALIBRATION 201 1. 4 AUTOMATIC CALIBRATION 208 1. 5 SUMMARY 214 1. 6 REFERENCES 214 11 DISTRIBUTED HYDROLOGIC MODELING 217 1. 1 INTRODUCTION 218 1. 2 CASE STUDIES 218 1. 3 SUMMARY 236 1. 4 REFERENCES 237 12 HYDROLOGIC ANALYSIS AND PREDICTION 239 1. 1

INTRODUCTION 239 x Distributed Hydrologic Modeling Using GIS 1. 2 VFLOTM EDITIONS 241 1. 3 VFLOTM FEATURES AND MODULES 242 1. 4 MODEL FEATURE SUMMARY 245 1. 5 VFLOTM REAL-TIME 256 1. 6 DATA REQUIREMENTS 258 1. 7 RELATIONSHIP TO OTHER MODELS 259 1. 8 SUMMARY 260 1.

The Finite Element Method in Heat Transfer Analysis - Roland W. Lewis 1996-08-06

Heat transfer analysis is a problem of major significance in a vast range of industrial applications. These extend over the fields of mechanical engineering, aeronautical engineering, chemical engineering and numerous applications in civil and electrical engineering. If one considers the heat conduction equation alone the number of practical problems amenable to solution is extensive. Expansion of the work to include features such as phase change, coupled heat and mass transfer, and thermal stress analysis provides the engineer with the capability to address a further series of key engineering problems. The complexity of practical problems is such that closed form solutions are not generally possible. The use of numerical techniques to solve such problems is therefore considered essential, and this book presents the use of the powerful finite element method in heat transfer analysis. Starting with the fundamental general heat conduction equation, the book moves on to consider the solution of linear steady state heat conduction problems, transient analyses and non-linear examples. Problems of melting and solidification are then considered at length followed by a chapter on convection. The application of heat and mass transfer to drying problems and the calculation of both thermal and shrinkage stresses conclude the book. Numerical examples are used to illustrate the basic concepts introduced. This book is the outcome of the teaching and research experience of the

authors over a period of more than 20 years.

A Modular Finite-element Model (MODFE) for Areal and Axisymmetric Groundwater Flow Problems - Richard L. Cooley 1992