

Finite Element Analysis Fagan

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Biomaterials for Spinal Surgery - Luigi Ambrosio
2012-03-12

There have been important developments in materials and therapies for the treatment of spinal conditions. Biomaterials for spinal surgery summarises this research and how it is being applied for the benefit of patients. After an introduction to the subject, part one reviews fundamental issues such as spinal conditions and their pathologies, spinal loads, modelling and osteobiologic agents in spinal surgery. Part two discusses the use of bone substitutes and artificial intervertebral discs whilst part three covers topics such as the use of injectable biomaterials like calcium phosphate for vertebroplasty and kyphoplasty as well as scoliosis implants. The final part of the book summarises developments in regenerative therapies such as the use of stem cells for intervertebral disc regeneration. With its distinguished editors and international team of contributors, Biomaterials for spinal surgery is a

standard reference for both those developing new biomaterials and therapies for spinal surgery and those using them in clinical practice. Summarises recent developments in materials and therapies for the treatment of spinal conditions and examines how it is being applied for the benefit of patients Reviews fundamental issues such as spinal conditions and their pathologies, spinal loads, modelling and osteobiologic agents in spinal surgery Discusses the use of bone substitutes and artificial intervertebral discs and covers topics such as the use of injectable biomaterials like calcium phosphate for vertebroplasty and kyphoplasty

MATLAB Guide to Finite Elements - Peter I. Kattan
2013-04-17

This book explores numerical implementation of Finite Element Analysis using MATLAB. Stressing interactive use of MATLAB, it provides examples and exercises from mechanical, civil and aerospace engineering as well as

materials science. The text includes a short MATLAB tutorial. An extensive solutions manual offers detailed solutions to all problems in the book for classroom use. The second edition includes a new brick (solid) element with eight nodes and a one-dimensional fluid flow element. Also added is a review of applications of finite elements in fluid flow, heat transfer, structural dynamics and electro-magnetics. The accompanying CD-ROM presents more than fifty MATLAB functions.

Failure Assessment of Thin-walled Structures with Particular Reference to Pipelines - Lie Zhang 2010

This book describes integrity management procedures for thin-walled structures such as gas pipelines. It covers various methods for the analysis of crack growth in thin-walled structures and the probability of failure evaluation of pipelines using the Monte-Carlo simulation. The focus of this book is on the practical applications of the boundary element method, finite element method and probabilistic fracture mechanics. Popular methods for SIF calculation, crack growth are presented and the evaluation of failure probabilities based on BS7910 is also explained in detail. The procedures described in the book can be used to optimise the maintenance of pipelines thereby reducing the operating costs. This book will be of interest to pipeline engineers, postgraduate students and university researchers.

VipIMAGE 2017 - João Manuel R.S. Tavares 2017-10-12

This book gathers papers presented at the VipIMAGE 2017-VI ECCOMAS Thematic Conference on Computational Vision and Medical Image Processing. It highlights invited lecturers and full papers presented at the conference, which was held in Porto, Portugal, on October 18–20, 2017. These international contributions provide

comprehensive coverage on the state-of-the-art in the following fields: 3D Vision, Computational Bio-Imaging and Visualization, Computational Vision, Computer Aided Diagnosis, Surgery, Therapy and Treatment, Data Interpolation, Registration, Acquisition and Compression, Industrial Inspection, Image Enhancement, Image Processing and Analysis, Image Segmentation, Medical Imaging, Medical Rehabilitation, Physics of Medical Imaging, Shape Reconstruction, Signal Processing, Simulation and Modelling, Software Development for Image Processing and Analysis, Telemedicine Systems and their Applications, Tracking and Analysis of Movement, and Deformation and Virtual Reality. In addition, it explores a broad range of related techniques, methods and applications, including: trainable filters, bilateral filtering, statistical, geometrical and physical modelling, fuzzy morphology, region growing, grabcut, variational methods, snakes, the level set method, finite element method, wavelet transform, multi-objective optimization, scale invariant feature transform, Laws' texture-energy measures, expectation maximization, the Markov random fields bootstrap, feature extraction and classification, support vector machines, random forests, decision trees, deep learning, and stereo vision. Given its breadth of coverage, the book offers a valuable resource for academics, researchers and professionals in Biomechanics, Biomedical Engineering, Computational Vision (image processing and analysis), Computer Sciences, Computational Mechanics, Signal Processing, Medicine and Rehabilitation.

Manufacturing - Beno Benhabib 2003-07-03

From concept development to final production, this comprehensive text thoroughly examines the design,

prototyping, and fabrication of engineering products and emphasizes modern developments in system modeling, analysis, and automatic control. This reference details various management strategies, design methodologies, traditional production technique

Geospatial Technology - Pasquale Imperatore 2016-09-08

The pervasive relevance of geospatial information and the development of emerging geospatial technologies offer new opportunity for bridging the gap between remote sensing scientific know-how and end users of products and services. Geospatial technology comprises tools and techniques dealing with the use of spatially referenced information, for the description and modeling of spatial and dynamic phenomena related to the Earth's environment. This book addresses environmental and social applications of geospatial technologies, thus also providing a multidisciplinary perspective on emerging geospatial techniques and tools. It consists of ten chapters offering insight into geospatial technology progress and trends. Authors present several application-oriented studies from various parts of the world, including applications in collaborative geomatics, geospatial statistics, GIS, agriculture, and natural hazard monitoring.

Modelling in Medicine and Biology - C. A. Brebbia 2011

The idea of preparing this volume originated from the ever increasing importance of computational modelling of complex problems in medicine. Considerable advances have been made in this area as demonstrated by the continued success of the International Conference on Modelling in Medicine and Biology organised by the Wessex Institute of Technology. The work reported at those meetings and the research carried out at the Wessex Institute of Technology indicated the increasing interaction and

collaboration between medical and engineering scientists. Advances presented at these conferences are now being used in practice for a wide range of medical and surgical applications. The considerable improvements and evolution of the field has led to some of the best scientists, who have participated in our conferences, to write an article on their most recent research. This has led to thirteen outstanding articles published in this volume which encompass important areas of biomedical modelling.

Finite Element Analysis - M. J. Fagan 1992

This book is an elementary text on the finite element method. It is aimed at engineering and science undergraduates with no previous knowledge of the method, and deliberately attempts to keep the mathematics of the subject as straightforward as possible. It is assumed that the reader does understand the basic concepts and equations of elasticity and thermal heat flow, and is familiar with simple matrix algebra.

Euromat 99, Microstructures, Mechanical Properties and Processes - Yves Bréchet 2000-07-13

The relation between microstructures and mechanical properties has always been a challenge for materials science. Modelling the formation, properties and long term stability of microstructures is one of the most impressive and promising advances of modern materials science. This book presents recent advances and challenges in this fast evolving cross disciplinary field. It addresses applications of classical physical metallurgy, and the need for new modelling approaches, both on the analytical viewpoint and on the simulation side.

Patient-Specific Modeling in Tomorrow's Medicine - Amit Gefen 2012-01-25

This book reviews the frontier of research and clinical applications of Patient Specific Modeling, and provides a state-of-the-art update as well as perspectives on future directions in this exciting field. The book is useful for medical physicists, biomedical engineers and other engineers who are interested in the science and technology aspects of Patient Specific Modeling, as well as for radiologists and other medical specialists who wish to be updated about the state of implementation.

Applied Biomedical Engineering Mechanics - Dhanjoo Ghista 2008-07-18

Combining topics from numerous applications in biomechanics, Applied Biomedical Engineering Mechanics demonstrates how to analyze physiological processes from an engineering perspective and apply the results to tertiary medical care. The book extends its discussion to the investigation of diagnostic and surgical procedures. It also presents guidelines for prostheses design and explains how to optimize performance in sports games such as soccer, baseball, and gymnastics. Using a problem-based format, the book explains how to: Formulate diagnostic and interventional procedures, based on the analysis of physiological and organ system-based processes How human anatomical structures and physiological processes are designed for optimal functionality Develop orthopedic surgical approaches, using pre-surgical analysis Assess and promote fitness, and analyze sports games to maximize competency The world-class instruction presented within Applied Biomedical Engineering Mechanics clearly demonstrates how to quantify physiological processes in order to formulate solutions to various medical problems.

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.

Feeding in Vertebrates - Vincent Bels 2019-04-23

This book provides students and researchers with reviews of biological questions related to the evolution of feeding by vertebrates in aquatic and terrestrial environments. Based on recent technical developments and novel conceptual approaches, the book covers functional questions on trophic behavior in nearly all vertebrate groups including jawless fishes. The book describes mechanisms and theories for understanding the relationships between feeding structure and feeding behavior. Finally, the book demonstrates the importance of adopting an integrative approach to the trophic system in order to understand evolutionary mechanisms across the biodiversity of vertebrates.

Handbook of Adhesion - D. E. Packham 2006-02-08

This second edition of the successful Handbook of Adhesion provides concise and authoritative articles covering many aspects of the science and technology associated with adhesion and adhesives. It is intended to fill a gap between the necessarily simplified treatment of the student textbook and the full and thorough treatment of the research monograph and review article. The articles are structured in such a way, with internal cross-referencing and external literature references, that the reader can build up a broader and deeper understanding, as their needs require. This second edition includes many new articles covering developments which have risen in prominence in the intervening years, such as scanning probe techniques, the surface forces apparatus and the relation between adhesion and fractal surfaces. Advances in understanding polymer - polymer interdiffusion are reflected in articles drawing out the implications for adhesive

bonding. In addition, articles derived from the earlier edition have been revised and updated where needed. Throughout the book there is a renewed emphasis on environmental implications of the use of adhesives and sealants. The scope of the Handbook, which features nearly 250 articles from over 60 authors, includes the background science - physics, chemistry and material science - and engineering, and also aspects of adhesion relevant to the use of adhesives, including topics such as: Sealants and mastics Paints and coatings Printing and composite materials Welding and autohesion Engineering design The Handbook of Adhesion is intended for scientists and engineers in both academia and industry, requiring an understanding of the various facets of adhesion.

Index Medicus - 2003

Structural Analysis with Finite Elements - Friedel Hartmann 2013-04-17

This book provides a solid introduction to the foundation and the application of the finite element method in structural analysis. It offers new theoretical insight and practical advice. This second edition contains additional sections on sensitivity analysis, on retrofitting structures, on the Generalized FEM (X-FEM) and on model adaptivity. An additional chapter treats the boundary element method, and related software is available at www.winfem.de.

Quality Management Essentials - David Hoyle 2007-03-15

From the best-selling quality management author, David Hoyle, *Quality Management Essentials* is the perfect brief, yet authoritative, introduction to the fundamentals of quality management. Quality in organizations, large or small, is achieved with

intelligent use of various concepts, principles, tools and techniques. For those coming to the subject for the first time, these philosophies associated with quality management can be quite overwhelming. This very readable book provides a fast track introduction and executive level appraisal of the field from a respected and experienced author.

Earth Observations for Geohazards - Zhenhong Li
2018-07-05

This book is a printed edition of the Special Issue "Earth Observations for Geohazards" that was published in Remote Sensing)

Finite Element Simulations Using ANSYS - Esam M. Alawadhi 2015-09-18

Uses a Step-By-Step Technique Directed with Guided Problems and Relevant Screen Shots Simulation use is on the rise, and more practicing professionals are depending on the reliability of software to help them tackle real-world mechanical engineering problems. Finite Element Simulations Using ANSYS, Second Edition offers a basic understanding of the principles of simulation in conjunction with the application of ANSYS. Employing a step-by-step process, the book presents practical end-of-chapter problems that are solved using ANSYS and explains the physics behind them. The book examines structure, solid mechanics, vibration, heat transfer, and fluid dynamics. Each topic is treated in a way that allows for the independent study of a single subject or related chapter. What's New in the Second Edition: Introduces the newest methods in modeling and meshing for finite element analysis Modifies ANSYS examples to comply with the newest version of ANSYS Replaces many ANSYS examples used in the first edition with more general, comprehensive, and easy-to-follow

examples Adds more details to the theoretical material on the finite element Provides increased coverage of finite element analysis for heat transfer topics Presents open-ended, end-of-chapter problems tailored to serve as class projects Finite Element Simulations Using ANSYS, Second Edition functions as a fundamental reference for finite element analysis with ANSYS methods and procedures, as well as a guide for project and product analysis and design.

Evolution of the Rodents - Philip G. Cox 2015-08-06

A valuable resource for the latest research on rodents, highlighting links across palaeontology, developmental biology, functional morphology, phylogenetics and biomechanics.

Rothman-Simeone The Spine E-Book - Steven R. Garfin
2017-09-11

Get comprehensive, practical coverage of both surgical and non-surgical treatment approaches from the world's most trusted authorities in spine surgery and care. Rothman-Simeone and Herkowitz's The Spine, 7th Edition, edited by Drs. Steven R. Garfin, Frank J. Eismont, Gordon R. Bell, Jeffrey S. Fischgrund, and Christopher M. Bono, presents state-of-the-art techniques helping you apply today's newest developments in your practice. Highlights critical information through the use of pearls, pitfalls, and key points throughout the text, as well as more than 2,300 full-color photographs and illustrations. Offers a newly revised, streamlined format that makes it easier than ever to find the information you need. Contains new chapters on the clinical relevance of finite element modeling and SI joint surgery. Includes an expanded section on minimally invasive spine surgery, including recent developments and future directions. Provides the latest evidence-

based research from high-quality studies, including new randomized controlled trials for lumbar stenosis, surgery, fusion, and injections. Presents the knowledge and expertise of new international contributors, as well as new editorial leadership from Dr. Steven Garfin.

Advances in Concurrent Engineering - R. Goncalves
2002-01-01

Topics covered include: design technologies and applications; FE simulation for concurrent design and manufacture; methodologies; knowledge engineering and management; CE within virtual enterprises; and CE - the future.

Structural Integrity and Reliability in Electronics -
W.J. Plumbridge 2007-05-08

Knowledge itself is soon obsolete; It is a blunt instrument. Only by understanding can problems be solved and progress achieved. Reliability in performance of electronic equipment, in the face of demands for continuing miniaturisation and the anticipated abolition of lead containing solders, represents a major engineering challenge. The involvement of numerous disciplines; such as electrical, electronic, mechanical, manufacturing, and materials engineering together with physicists and computer specialists, adds to the complexity of the situation. Nevertheless, with electronics being the World's largest industrial sector, the potential rewards to the winners are substantial. This book aims to provide the ingredients for understanding, together with knowledge of reliability in interconnection technology and of the implementation of lead free solders. It is strongly contended that such a combination forms the necessary basis for greater structural integrity and enhanced performance The text is essentially in three parts: The intentions of the

Part I component {The Materials Perspective, Chapters 1 6) are to present a snapshot of the current, but rapidly changing, global scene and to establish a firm understanding of the fundamentals surrounding interconnection performance. With potential readers possessing a broad spectrum of knowledge and expertise, this is essential. It could be argued that the reason for the limited progress made in this field to date has been due to the difficulties encountered in communicating effectively across the discipline boundaries.

A Finite Element Analysis of Femoral Stem Design in Cemented Total Hip Replacements - M. J. Fagan 1984

The Mechanobiology and Mechanophysiology of Military-Related Injuries - Amit Gefen 2016-03-31

This book provides a state-of-the-art update, as well as perspectives on future directions of research and clinical applications in the implementation of biomechanical and biophysical experimental, theoretical and computational models which are relevant to military medicine. Such experimental and modeling efforts are helpful, on the one hand, in understanding the aetiology, pathophysiology and dynamics of injury development and on the other hand in guiding the development of better equipment and protective gear or devices that should ultimately reduce the prevalence and incidence of injuries or lessen their hazardous effects. The book is useful for military-oriented biomedical engineers and medical physicists, as well as for military physiologists and other medical specialists who are interested in the science and technology implemented in modern investigations of military related injuries.

Deformable Avatars - Nadia Magnenat-Thalmann 2001-08-31

Deformable avatars are virtual humans that deform themselves during motion. This implies facial deformations, body deformations at joints, and global deformations. Simulating deformable avatars ensures a more realistic simulation of virtual humans. The research requires models for capturing of geometrie and kinematic data, the synthesis of the realistic human shape and motion, the parametrisation and motion retargeting, and several appropriate deformation models. Once a deformable avatar has been created and animated, the researcher must model high-level behavior and introduce agent technology. The book can be divided into 5 subtopics: 1. Motion capture and 3D reconstruction 2. Parametrie motion and retargeting 3. Muscles and deformation models 4. Facial animation and communication 5. High-level behaviors and autonomous agents Most of the papers were presented during the IFIP workshop "DEFORM '2000" that was held at the University of Geneva in December 2000, followed by "A V AT ARS 2000" held at EPFL, Lausanne. The two workshops were sponsored by the "Troisü!me Cycle Romand d'Informatique" and allowed participants to discuss the state of research in these important areas. x Preface We would like to thank IFIP for its support and Yana Lambert from Kluwer Academic Publishers for her advice. Finally, we are very grateful to Zerrin Celebi, who has prepared the edited version of this book and Dr. Laurent Moccozet for his collaboration.

Finite Element Analysis - Farzad Ebrahimi 2012-10-10

In the past few decades, the Finite Element Method (FEM) has been developed into a key indispensable technology in the modeling and simulation of various engineering systems. The present book reports on the state of the art research and development findings on this very broad

matter through original and innovative research studies exhibiting various investigation directions of FEM in electrical, civil, materials and biomedical engineering. This book is a result of contributions of experts from international scientific community working in different aspects of FEM. The text is addressed not only to researchers, but also to professional engineers, students and other experts in a variety of disciplines, both academic and industrial seeking to gain a better understanding of what has been done in the field recently, and what kind of open problems are in this area.

Medicine Meets Virtual Reality 2001 - James D. Westwood 2001

Anatomical Accuracy in Medical 3D Modeling

Computational Modeling for the Assessment of the Biomechanical Properties of the Healthy, Diseased and Treated Spine - Enrico Dall'Ara 2022-09-22

Proceedings of the First International Conference on Interfaces in Medicine and Mechanics - K. R. Williams 2012-12-06

The thirty nine papers accepted for publ ication in the First International Conference on 'Interfaces in Medicine & Meehani cs' at Swansea in Apri l, 1988 represent the current state of the art in the science of implant surgery. This initial venture was planned and undertaken when the present editors and their colleagues realised the need for a closer interaction and dialogue between the clinician and. those basic scientists working in the area of implant surgery. Thi s interface, together with the real interface at the material/tissue borders, thus forms the basis of the present conference. These two ideas, we felt, were nicely and effectively

captured in the drawing by Edgar Rubins (1915), a perception psychologist, used on the book cover and elsewhere in our literature. The Proceedings were planned with some difficulty, due to the wide scope of the conference. However, we felt the best format was to follow the logical progression of implant development. The introductory papers and talks therefore demonstrate the scope of surgical implants in current use. The development of an implant starts with modelling of the proposed implant and its potential environment and the proceedings follow the same format. Following this, materials in current use are discussed.

Interfaces in Medicine and Mechanics-2 - K.R. Williams
2012-12-06

The first Interfaces Conference was held at Swansea in April 1988 and represented the then state of the art of the science of implant surgery. The motivation for the initial venture was a supposed need for a closer interaction and dialogue between the clinician and scientist working in this area. As expressed in the Preface to the first Conference, we felt that the interface was represented graphically, scientifically and psychologically by the drawings of Edgar Rubins (1915), again widely used in the literature to the present Proceedings. The first Conference, we believe, achieved the aims of the organisers in bringing together scientists and clinicians towards an exchange of ideas by logically pursuing the sequence of events in clinical implant surgery. The present Conference, in collaboration with our Italian colleagues, has also attempted to achieve the same aims by examining the behaviour of implants constructed of a variety of materials in both hard and soft tissue. Many contributions in the conference employed the technique

of finite element analysis, both for design and optimisation purposes, particularly in relation to bone remodelling. Indeed, this particular aspect of the Conference led to much debate and will require a major examination of the many levels of physical, chemical and biomechanical interactive behaviour of the implant and its environment. All this natural behaviour was presented and discussed, but difficulties and failures remain with such procedures and we feel it is only by continuing such meetings that we progress in this difficult area of clinical science.

The Sutures of the Skull - Mehmet Turgut 2021-06-02

This book provides an in-depth review of the sutures of the skull. The premature closure of the sutures of the skull (craniosynostosis) due to genetic or metabolic etiologies results in typical progressive skull deformity, due to both the inhibition of growth caused by the affected cranial suture and associated compensatory expansion of the skull along the open ones. Today, it is well known that early diagnosis of craniosynostosis is crucial for the best surgical outcomes and for the normal development of the brain and cosmetic appearance of the skull. As such, in addition to the anatomy, biology, genetics and embryology of the sutures of the skull, the book also covers the diagnosis and treatment of different forms of craniosynostosis such as metopism, and animal models for cranial suture research. This comprehensive work is a valuable resource for neuroscientists at all levels, from graduate students to researchers, as well as neurosurgeons, neuroanatomists, pediatricians, and neurologists seeking both basic and more advanced information on the unique structure of the sutures of the human skull.

Dynamics of Rotating Machines - Michael I. Friswell

2010-03-31

Enables engineers to understand the dynamics of rotating machines, from basic explanations to detailed numerical models and analysis.

DHM and Posturography - Sofia Scataglini 2019-08-22

DHM and Posturography explores the body of knowledge and state-of-the-art in digital human modeling, along with its application in ergonomics and posturography. The book provides an industry first introductory and practitioner focused overview of human simulation tools, with detailed chapters describing elements of posture, postural interactions, and fields of application. Thus, DHM tools and a specific scientific/practical problem – the study of posture – are linked in a coherent framework. In addition, sections show how DHM interfaces with the most common physical devices for posture analysis. Case studies provide the applied knowledge necessary for practitioners to make informed decisions. Digital Human Modelling is the science of representing humans with their physical properties, characteristics and behaviors in computerized, virtual models. These models can be used standalone, or integrated with other computerized object design systems, to design or study designs, workplaces or products in their relationship with humans. Presents an introductory, up-to-date overview and introduction to all industrially relevant DHM systems that will enable users on trialing, procurement decisions and initial applications Includes user-level examples and case studies of DHM application in various industrial fields Provides a structured and posturography focused compendium that is easy to access, read and understand

Advances in Therapeutic Engineering - Wenwei Yu

2012-12-03

Therapeutic Engineering (TE) is a cutting-edge domain in today's era of medical technology research. Through engineering algorithms that provide technological solutions, it aims to elevate the quality of life of disabled individuals. Advances in Therapeutic Engineering describes various therapeutic processes and mechanisms currently applied to the field of healthcare in a range of areas, including mobility, communications, hearing, vision, and mental health and cognition. The book explores research and advances in the areas of hand-eye coordination, motor function, the biomechanics of lower limbs, and treatment of spinal diseases and neural plasticity. It discusses electrical stimulation methodologies for improving human gait. It also examines prosthetic devices and assistive technology, induction heater-based treatment, and inclusive user modelling and simulation. Additional chapters cover automated asthma detection using clinico-spirometric information, computer-aided diagnostic modules for malaria screening, and various data mining techniques that have been developed and successfully implemented in healthcare management. The contributors also examine semantic interoperability issues in e-health systems and clinical decision support systems (CDSSs) Ranging from prosthetics to sensory substitution and medical robotics, the book will prove enlightening to researchers and practitioners in a host of disciplines who want to understand the recent advances achieved globally in the field of therapeutic engineering.

Material Properties and Stress Analysis in Biomechanics

- A. L. Yettram 1989

Theory of Linear Poroelasticity with Applications to Geomechanics and Hydrogeology - Herbert F. Wang

2017-02-15

The theory of linear poroelasticity describes the interaction between mechanical effects and adding or removing fluid from rock. It is critical to the study of such geological phenomena as earthquakes and landslides and is important for numerous engineering projects, including dams, groundwater withdrawal, and petroleum extraction. Now an advanced text synthesizes in one place, with one notation, numerous classical solutions and applications of this highly useful theory. The introductory chapter recounts parallel developments in geomechanics, hydrogeology, and reservoir engineering that are unified by the tenets of poroelasticity. Next, the theory's constitutive and governing equations and their associated material parameters are described. These equations are then specialized for different simplifying geometries: unbounded problem domains, uniaxial strain, plane strain, radial symmetry, and axisymmetry. Example problems from geomechanics, hydrogeology, and petroleum engineering are incorporated throughout to illustrate poroelastic behavior and solution methods for a wide variety of real-world scenarios. The final chapter provides outlines for finite-element and boundary-element formulations of the field's governing equations. Whether read as a course of study or consulted as a reference by researchers and professionals, this volume's user-friendly presentation makes accessible one of geophysics' most important subjects and will do much to reduce poroelasticity's reputation as difficult to master.

Computational Partial Differential Equations - Hans Petter Langtangen 2013-04-17

Targeted at students and researchers in computational sciences who need to develop computer codes for solving

PDEs, the exposition here is focused on numerics and software related to mathematical models in solid and fluid mechanics. The book teaches finite element methods, and basic finite difference methods from a computational point of view, with the main emphasis on developing flexible computer programs, using the numerical library Diffpack. Diffpack is explained in detail for problems including model equations in applied mathematics, heat transfer, elasticity, and viscous fluid flow. All the program examples, as well as Diffpack for use with this book, are available on the Internet. XXXXXXXX NEUER TEXT This book is for researchers who need to develop computer code for solving PDEs. Numerical methods and the application of Diffpack are explained in detail. Diffpack is a modern C++ development environment that is widely used by industrial scientists and engineers working in areas such as oil exploration, groundwater modeling, and materials testing. All the program examples, as well as a test version of Diffpack, are available for free over the Internet.

Finite Element Analysis - David Moratal 2010-08-17

Finite element analysis is an engineering method for the numerical analysis of complex structures. This book provides a bird's eye view on this very broad matter through 27 original and innovative research studies exhibiting various investigation directions. Through its chapters the reader will have access to works related to Biomedical Engineering, Materials Engineering, Process Analysis and Civil Engineering. The text is addressed not only to researchers, but also to professional engineers, engineering lecturers and students seeking to gain a better understanding of where Finite Element Analysis stands today.

Mechanics Of Solids And Structures (2nd Edition) - David
W A Rees 2016-08-04

The fifteen chapters of this book are arranged in a logical progression. The text begins with the more fundamental material on stress and strain transformations with elasticity theory for plane and axially symmetric bodies, followed by a full treatment of the theories of bending and torsion. Coverage of moment distribution, shear flow, struts and energy methods precede a chapter on finite elements. Thereafter, the book presents yield and strength criteria, plasticity, collapse, creep, visco-elasticity,

fatigue and fracture mechanics. Appended is material on the properties of areas, matrices and stress concentrations. Each topic is illustrated by worked examples and supported by numerous exercises drawn from the author's teaching experience and professional institution examinations (CEI). This edition includes new material and an extended exercise section for each of the fifteen chapters, as well as three appendices. The broad text ensures its suitability for undergraduate and postgraduate courses in which the mechanics of solids and structures form a part including: mechanical, aeronautical, civil, design and materials engineering.