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Fluid Mechanics for Chemical Engineers - James O. Wilkes 2017-07-20
The Chemical Engineer's Practical Guide to Fluid Mechanics: Now Includes COMSOL Multiphysics 5 Since most chemical processing applications are conducted either partially or totally in the fluid phase, chemical engineers need mastery of fluid mechanics. Such knowledge is especially valuable in the biochemical, chemical, energy, fermentation, materials, mining, petroleum, pharmaceuticals, polymer, and waste-processing industries. Fluid Mechanics for Chemical Engineers: with Microfluidics, CFD, and COMSOL Multiphysics 5, Third Edition, systematically introduces fluid mechanics from the perspective of the chemical engineer who must understand actual physical behavior and solve real-world problems. Building on the book that earned Choice Magazine's Outstanding Academic Title award, this edition also gives a comprehensive introduction to the popular COMSOL Multiphysics 5 software. This third edition contains extensive coverage of both microfluidics and computational fluid dynamics, systematically demonstrating CFD through detailed examples using COMSOL Multiphysics 5 and ANSYS Fluent. The chapter on turbulence now presents valuable CFD techniques to investigate practical situations such as turbulent mixing and recirculating flows. Part I offers a clear, succinct, easy-to-follow introduction to macroscopic fluid mechanics, including physical properties; hydrostatics; basic rate laws; and

fundamental principles of flow through equipment. Part II turns to microscopic fluid mechanics: Differential equations of fluid mechanics Viscous-flow problems, some including polymer processing Laplace's equation; irrotational and porous-media flows Nearly unidirectional flows, from boundary layers to lubrication, calendaring, and thin-film applications Turbulent flows, showing how the $k-\epsilon$ method extends conventional mixing-length theory Bubble motion, two-phase flow, and fluidization Non-Newtonian fluids, including inelastic and viscoelastic fluids Microfluidics and electrokinetic flow effects, including electroosmosis, electrophoresis, streaming potentials, and electroosmotic switching Computational fluid mechanics with ANSYS Fluent and COMSOL Multiphysics Nearly 100 completely worked practical examples include 12 new COMSOL 5 examples: boundary layer flow, non-Newtonian flow, jet flow, die flow, lubrication, momentum diffusion, turbulent flow, and others. More than 300 end-of-chapter problems of varying complexity are presented, including several from University of Cambridge exams. The author covers all material needed for the fluid mechanics portion of the professional engineer's exam. The author's website (fmche.engin.umich.edu) provides additional notes, problem-solving tips, and errata. Register your product at informit.com/register for convenient access to downloads, updates, and corrections as they become available.

Shape Memory Alloy Engineering - Antonio Concilio 2014-09-25

Shape Memory Alloy Engineering introduces materials, mechanical, and aerospace engineers to shape memory alloys (SMAs), providing a unique perspective that combines fundamental theory with new approaches to design and modeling of actual SMAs as compact and inexpensive actuators for use in aerospace and other applications. With this book readers will gain an understanding of the intrinsic properties of SMAs and their characteristic state diagrams, allowing them to design innovative compact actuation systems for applications from aerospace and aeronautics to ships, cars, and trucks. The book realistically discusses both the potential of these fascinating materials as well as their limitations in everyday life, and how to overcome some of those limitations in order to achieve proper design of useful SMA mechanisms. Discusses material characterization processes and results for a number of newer SMAs Incorporates numerical (FE) simulation and integration procedures into commercial codes (Msc/Nastran, Abaqus, and others) Provides detailed examples on design procedures and optimization of SMA-based actuation systems for real cases, from specs to verification lab tests on physical demonstrators One of the few SMA books to include design and set-up of demonstrator characterization tests and correlation with numerical models

Introduction to Software for Chemical Engineers - Mariano Martín Martín 2014-07-01

The field of chemical engineering is in constant evolution, and access to information technology is changing the way chemical engineering problems are addressed. Inspired by the need for a user-friendly chemical engineering text that demonstrates the real-world applicability of different computer programs, *Introduction to Software for Chemical Engi*

Multiphysics Modeling Using COMSOL? - Roger Pryor 2011

Multiphysics Modeling Using COMSOL? rapidly introduces the senior level undergraduate, graduate or professional scientist or engineer to the art and science of computerized modeling for physical systems and devices. It offers a step-by-step modeling methodology through examples

that are linked to the Fundamental Laws of Physics through a First Principles Analysis approach. The text explores a breadth of multiphysics models in coordinate systems that range from 1D to 3D and introduces the readers to the numerical analysis modeling techniques employed in the COMSOL? Multiphysics? software. After readers have built and run the examples, they will have a much firmer understanding of the concepts, skills, and benefits acquired from the use of computerized modeling techniques to solve their current technological problems and to explore new areas of application for their particular technological areas of interest.

Brain and Human Body Modeling 2020 - Sergey N. Makarov 2020

The 41st Annual International Conference of the IEEE EMBS, took place between July 23 and 27, 2019, in Berlin, Germany. The focus was on "Biomedical engineering ranging from wellness to intensive care." This conference provided an opportunity for researchers from academia and industry to discuss a variety of topics relevant to EMBS and hosted the 4th Annual Invited Session on Computational Human Models. At this session, a bevy of research related to the development of human phantoms was presented, together with a substantial variety of practical applications explored through simulation.

Long-Term Reliability of Nanometer VLSI Systems - Sheldon Tan 2019-09-12

This book provides readers with a detailed reference regarding two of the most important long-term reliability and aging effects on nanometer integrated systems, electromigrations (EM) for interconnect and biased temperature instability (BTI) for CMOS devices. The authors discuss in detail recent developments in the modeling, analysis and optimization of the reliability effects from EM and BTI induced failures at the circuit, architecture and system levels of abstraction. Readers will benefit from a focus on topics such as recently developed, physics-based EM modeling, EM modeling for multi-segment wires, new EM-aware power grid analysis, and system level EM-induced reliability optimization and management techniques. Reviews classic Electromigration (EM) models, as well as existing EM failure models and discusses the limitations of

those models; Introduces a dynamic EM model to address transient stress evolution, in which wires are stressed under time-varying current flows, and the EM recovery effects. Also includes new, parameterized equivalent DC current based EM models to address the recovery and transient effects; Presents a cross-layer approach to transistor aging modeling, analysis and mitigation, spanning multiple abstraction levels; Equips readers for EM-induced dynamic reliability management and energy or lifetime optimization techniques, for many-core dark silicon microprocessors, embedded systems, lower power many-core processors and datacenters.

Comsol5 for Engineers - Merhzad Tabatabaian 2015-08-21

COMSOL5 Multiphysics® is one of the most valuable software modeling tools for engineers and scientists. This book, an updated edition of the previously published, COMSOL for Engineers, covers COMSOL5 which now includes a revolutionary tool, the Application Builder. This component enables users to build apps based on COMSOL models that can be run on almost any operating system (Windows, MAC, mobile/iOS, etc.). Designed for engineers from various disciplines, the book introduces multiphysics modeling techniques and examples accompanied by practical applications using COMSOL5.x. The main objective is to introduce readers to use COMSOL as an engineering tool for modeling, by solving examples that could become a guide for modeling similar or more complicated problems. The book provides a collection of examples and modeling guidelines through which readers can build their own models. The mathematical fundamentals, engineering principles, and design criteria are presented as integral parts of the examples. At the end of chapters are references that contain more in-depth physics, technical information, and data; these are referred to throughout the book and used in the examples. COMSOL5 for Engineers could be used to complement another text that provides background training in engineering computations and methods. Exercises are provided at the end of the text for use in adoption situations. Features: *Expands the Finite Element Method (FEM) theory and adds more examples from the original edition *Outlines the new features in COMSOL5, the graphical

user interface (GUI), and how to build a COMSOL app for models *Includes apps for selected model examples-with parameterization of these models *Features new and modified, solved model examples, in addition to the models provided in the original edition *Companion disc with executable copies of each model and their related animations

Heat Transfer Modelling Using Comsol - Layla Mayboudi 2018-04-30

Fins have been used historically as reliable design features for thermal management, which continues to be an important problem in engineering today. This book develops heat transfer models for progressively complex fin designs. Mathematicians, engineers, and analysts may equally benefit from the content as it provides the reader with numerical and analytical tools to approach general and thermal management heat transfer problems. The main focus is on the COMSOL® Multiphysics Heat Transfer module; however, the fundamentals may be applied to other commercial packages such as ANSYS® and Abaqus™. The content can be utilized in a variety of engineering disciplines including mechanical, aerospace, biomedical, chemical, civil, and electrical, etc. Features: +Includes numerous example models that enable the reader to implement conceptual material in practical scenarios with broad industrial applications +Uses COMSOL Multiphysics® version 5.3 in combination with the Heat Transfer Module to set up and carry out the numerical analysis for the models presented in the book +Presents mathematical methods related to the problems +Includes a companion disc with models and custom apps created with COMSOL Application Builder (available by emailing info @ merclearing.com with proof of purchase if e-version)

Power, Thermal, Noise, and Signal Integrity Issues on Substrate/Interconnects Entanglement - Yue Ma 2019-03-08

As demand for on-chip functionalities and requirements for low power operation continue to increase as a result of the emergence in mobile, wearable and internet-of-things (IoT) products, 3D/2.5D have been identified as an inevitable path moving forward. As circuits become more and more complex, especially three-dimensional ones, new insights have to be developed in many domains, including electrical, thermal, noise,

interconnects, and parasites. It is the entanglement of such domains that begins the very key challenge as we enter in 3D nano-electronics. This book aims to develop this new paradigm, going to a synthesis beginning between many technical aspects.

Comsol Multiphysics Geometry - Layla S. Mayboudi 2019-08-15

This book focuses on the geometry creation techniques for use in finite element analysis. Examples are provided as a sequence of fin designs with progressively increasing complexity. A fin was selected as it is a feature widely employed for thermal management. As the content progresses, the reader learns to create or import a geometry into a FEM tool using COMSOL Multiphysics(R). The fundamentals may also be applied to other commercial packages such as ANSYS(R) or AbaqusTM. The content can be utilized in a variety of engineering disciplines including mechanical, aerospace, biomedical, chemical, civil, and electrical. The book provides an overview of the tools available to create and interact with the geometry. It also takes a broader look on the world of geometry, showing how geometry is a fundamental part of nature and how it is interconnected with the world around us. Features: Includes example models that enable the reader to implement conceptual material in practical scenarios with broad industrial applications Provides geometry modeling examples created with built in features of COMSOL Multiphysics(R) v. 5.4 or imported from other dedicated CAD tools Presents meshing examples and provides practical advice on mesh generation Includes companion files with models and custom applications created with COMSOL Multiphysics(R) Application Builder.

Noise-Controlling Casings - Marek Pawelczyk 2022-07-28

Noise-Controlling Casings offers a range of feasible noise-controlling strategies for different kinds of devices generating excessive noise. Depending on the required performance and the availability of energy sources, three solution categories are presented: passive (no external energy is needed, but performance is limited), semi-active (little energy is needed, but performance achieves higher values) and active (best performance, but an external energy source is needed). Two very important benefits of these proposed solutions are global noise reduction

(in an entire enclosure or the surrounding space) and compact technology (contrary to other active noise control solutions requiring a large number of secondary sources and distributed sensors). Many of the solutions presented are original approaches by the authors, their own developed concepts and new elements and designs that have gained recognition in prestigious journals. The book provides a theoretical background to the research, looking at system configurations, mathematical modelling, signal processing implementation and numerical analysis. The proposed ideas can be applied to any devices provided they have casings of thin walls or they can be enclosed by casings of thin walls. Applications include industrial devices, household appliances, vehicle or aircraft cabins and more. This book will be of interest to professionals and students in the fields of acoustics, vibration, signal processing, control, automotive and aircraft engineering.

Recent Innovations in Mechanical Engineering - Meghanshu Vashista 2022

This book presents the select proceedings of the 3rd International Conference on Recent Innovations & Technological Development in Mechanical Engineering (ICRITDME 2020). It focuses on recent innovations and technological developments in the area of mechanical engineering to solve real-life problems occurring in different domains. Various topics covered in this book include machinery and machine elements, automotive engineering, aerospace technology and astronautics, nanotechnology and microengineering, control, robotics, mechatronics, dynamical systems, control, fluid mechanics engineering, thermodynamics, and heat and mass transfer. The book will be useful for students, researchers and professionals working in the area of mechanical engineering and allied fields.

Introduction to Software for Chemical Engineers, Second Edition - Mariano Martín Martín 2019-06-06

The field of Chemical Engineering and its link to computer science is in constant evolution and new engineers have a variety of tools at their disposal to tackle their everyday problems. Introduction to Software for Chemical Engineers, Second Edition provides a quick guide to the use of

various computer packages for chemical engineering applications. It covers a range of software applications from Excel and general mathematical packages such as MATLAB and MathCAD to process simulators, CHEMCAD and ASPEN, equation-based modeling languages, gProms, optimization software such as GAMS and AIMS, and specialized software like CFD or DEM codes. The different packages are introduced and applied to solve typical problems in fluid mechanics, heat and mass transfer, mass and energy balances, unit operations, reactor engineering, process and equipment design and control. This new edition offers a wider view of packages including open source software such as R, Python and Julia. It also includes complete examples in ASPEN Plus, adds ANSYS Fluent to CFD codes, Lingo to the optimization packages, and discusses Engineering Equation Solver. It offers a global idea of the capabilities of the software used in the chemical engineering field and provides examples for solving real-world problems. Written by leading experts, this book is a must-have reference for chemical engineers looking to grow in their careers through the use of new and improving computer software. Its user-friendly approach to simulation and optimization as well as its example-based presentation of the software, makes it a perfect teaching tool for both undergraduate and master levels.

Multiphysics Modeling Using Comsol 5 and MATLAB - Roger W. Pryor
2021-12-30

COMSOL 5 and MATLAB are valuable software modeling tools for engineers and scientists. This updated edition includes five new models and explores a wide range of models in coordinate systems from 0D to 3D, introducing the numerical analysis techniques employed in COMSOL 5.6 and MATLAB software. The text presents electromagnetic, electronic, optical, thermal physics, and biomedical models as examples. It presents the fundamental concepts in the models and the step-by-step instructions needed to build each model. The companion files include all the built models for each step-by-step example presented in the text and the related animations, as specified. The book is designed to introduce modeling to an experienced engineer or can also be used for upper level

undergraduate or graduate courses. FEATURES: Focuses on COMSOL 5.x and MATLAB models that demonstrate the use of concepts for later application in engineering, science, medicine, and biophysics for the development of devices and systems Includes companion files with executable copies of each model and related animations Includes detailed discussions of possible modeling errors and results Uses a step-by-step modeling methodology linked to the Fundamental Laws of Physics.

Electrokinetic Particle Transport in Micro-/Nanofluidics - Shizhi Qian
2012-06-19

Numerous applications of micro-/nanofluidics are related to particle transport in micro-/nanoscale channels, and electrokinetics has proved to be one of the most promising tools to manipulate particles in micro/nanofluidics. Therefore, a comprehensive understanding of electrokinetic particle transport in micro-/nanoscale channels is crucial to the development of micro-/nanofluidic devices. *Electrokinetic Particle Transport in Micro-/Nanofluidics: Direct Numerical Simulation Analysis* provides a fundamental understanding of electrokinetic particle transport in micro-/nanofluidics involving electrophoresis, dielectrophoresis, electroosmosis, and induced-charge electroosmosis. The book emphasizes the direct numerical simulation of electrokinetic particle transport phenomena, plus several supportive experimental studies. Using the commercial finite element package COMSOL Multiphysics®, it guides researchers on how to predict the particle transport subjected to electric fields in micro-/nanoscale channels. Researchers in the micro-/nanofluidics community, who may have limited experience in writing their own codes for numerical simulations, can extend the numerical models and codes presented in this book to their own research and guide the development of real micro-/nanofluidics devices. Corresponding COMSOL® script files are provided with the book and can be downloaded from the author's website.

Finite Element Analysis with Comsol - Pramote Dechaumphai
2019-06-30

Presents a clear theory of finite element method with the use of

COMSOL Multiphysics software. This book describes the finite element procedures for solving structural mechanics, heat transfer and fluid flow problems. In each chapter, the governing differential equations and corresponding finite element formulations are described. Academic examples are presented together with detailed steps on using COMSOL. In addition, the last chapter shows how to use the software to solve general form of the differential equations by the finite element method. This chapter demonstrates a unique capability of COMSOL that does not exist in most of other software packages. The book is ideal for beginners to understand the finite element packages. The book is ideal for beginners to understand the finite element method and how to use COMSOL Multiphysics software in a short time.

COMSOL Heat Transfer Models - Layla S. Mayboudi 2019-12-16

This book guides the reader through the process of model creation for heat transfer analysis with the finite element method. The book describes thermal imaging experiments that demonstrate how such models can be validated. It presents application examples, such as heating water in a kettle, to basement insulation, a heated seat, molten rock, pipe flow, and an innovative extended surface. A companion disc provides the files so models can be run (using COMSOL or other software) in order to observe real-world behavior of the applications. Historical background information is provided to show the progression of heat transfer science and mathematical modeling from the earliest developments to the most recent advances in technology. Features: Includes example models that enable the reader to implement conceptual material in practical scenarios with broad industrial applications Includes companion files with models and geometry files created with COMSOL Multiphysics® or imported from a third-party CAD tool.

Multiphysics Modeling Using COMSOL®: A First Principles Approach - Roger W. Pryor 2009-12-07

Multiphysics Modeling Using COMSOL® rapidly introduces the senior level undergraduate, graduate or professional scientist or engineer to the art and science of computerized modeling for physical systems and devices. It offers a step-by-step modeling methodology through examples

that are linked to the Fundamental Laws of Physics through a First Principles Analysis approach. The text explores a breadth of multiphysics models in coordinate systems that range from 1D to 3D and introduces the readers to the numerical analysis modeling techniques employed in the COMSOL® Multiphysics® software. After readers have built and run the examples, they will have a much firmer understanding of the concepts, skills, and benefits acquired from the use of computerized modeling techniques to solve their current technological problems and to explore new areas of application for their particular technological areas of interest.

Introduction to Imaging from Scattered Fields - Michael A Fiddy 2014-11-10

Obtain the Best Estimate of a Strongly Scattering Object from Limited Scattered Field Data Introduction to Imaging from Scattered Fields presents an overview of the challenging problem of determining information about an object from measurements of the field scattered from that object. It covers widely used approaches to recover information about the objects and examines the assumptions made a priori about the object and the consequences of recovering object information from limited numbers of noisy measurements of the scattered fields. The book explores the strengths and weaknesses of using inverse methods for weak scattering. These methods, including Fourier-based signal and image processing techniques, allow more straightforward inverse algorithms to be exploited based on a simple mapping of scattered field data. The authors also discuss their recent approach based on a nonlinear filtering step in the inverse algorithm. They illustrate how to use this algorithm through numerous two-dimensional electromagnetic scattering examples. MATLAB® code is provided to help readers quickly apply the approach to a wide variety of inverse scattering problems. In later chapters of the book, the authors focus on important and often forgotten overarching constraints associated with exploiting inverse scattering algorithms. They explain how the number of degrees of freedom associated with any given scattering experiment can be found and how this allows one to specify a minimum number of data that

should be measured. They also describe how the prior discrete Fourier transform (PDFT) algorithm helps in estimating the properties of an object from scattered field measurements. The PDFT restores stability and improves estimates of the object even with severely limited data (provided it is sufficient to meet a criterion based on the number of degrees of freedom). Suitable for graduate students and researchers working on medical, geophysical, defense, and industrial inspection inverse problems, this self-contained book provides the necessary details for readers to design improved experiments and process measured data more effectively. It shows how to obtain the best estimate of a strongly scattering object from limited scattered field data.

Mathematics Applied to Engineering, Modelling, and Social Issues - Frank T. Smith 2019-03-14

This book presents several aspects of research on mathematics that have significant applications in engineering, modelling and social matters, discussing a number of current and future social issues and problems in which mathematical tools can be beneficial. Each chapter enhances our understanding of the research problems in a particular area of study and highlights the latest advances made in that area. The self-contained contributions make the results and problems discussed accessible to readers, and provides references to enable those interested to follow subsequent studies in still developing fields. Presenting real-world applications, the book is a valuable resource for graduate students, researchers and educators. It appeals to general readers curious about the practical applications of mathematics in diverse scientific areas and social problems.

Intermittent and Nonstationary Drying Technologies - Azharul Karim 2017-09-18

The first comprehensive book on intermittent drying, *Intermittent and Nonstationary Drying Technologies: Principles and Applications* demonstrates the benefits of this process and covers key issues, including technologies, effect of operating parameters, mathematical modelling, energy-efficiency, and product quality. It discusses such topics as periodic drying, conventional and intermittent food drying

processes and food quality, relationship among intermittency of drying, microstructural changes, and food quality, microwave assisted pulsed fluidized and spouted bed drying, and cellular level water distribution. Aimed at food engineers, chemical product engineers, pharmaceutical engineers and technologists, plant design engineers, and researchers and students in these areas, this useful reference helps readers:

Computational Fluid Dynamics and COMSOL Multiphysics - Ashish S. Chaurasia 2021-12-29

This textbook covers computational fluid dynamics simulation using COMSOL Multiphysics® Modeling Software in chemical engineering applications. In the volume, the COMSOL Multiphysics package is introduced and applied to solve typical problems in chemical reactors, transport processes, fluid flow, and heat and mass transfer. Inspired by the difficulties of introducing the use of COMSOL Multiphysics software during classroom time, the book incorporates the author's experience of working with undergraduate, graduate, and postgraduate students to make the book user friendly and that, at the same time, addresses typical examples within the subjects covered in the chemical engineering curriculum. Real-world problems require the use of simulation and optimization tools, and this volume shows how COMSOL Multiphysics software can be used for that purpose. Key features:

- Includes over 500 step-by-step screenshots
- Shows the graphical user interface of COMSOL, which does not require any programming effort
- Provides chapter-end problems for extensive practice along with solutions
- Includes actual examples of chemical reactors, transport processes, fluid flow, and heat and mass transfer

This book is intended for students who want or need more help to solve chemical engineering assignments using computer software. It can also be used for computational courses in chemical engineering. It will also be a valuable resource for professors, research scientists, and practicing engineers.

Decision Based Design - Vijitashwa Pandey 2013-08-26

In a presentation that formalizes what makes up decision based design, *Decision Based Design* defines the major concepts that go into product realization. It presents all major concepts in design decision making in

an integrated way and covers the fundamentals of decision analysis in engineering design. It also trains engineers to understand the impacts of design decision. The author teaches concepts in demand modeling and customer preference modeling and provides examples. This book teaches most fundamental concepts encountered in engineering design like: concept generation, multiattribute decision analysis, reliability engineering, design optimization, simulation, and demand modeling. The book provides the tools engineering practitioners and researchers need to first understand that engineering design is best viewed as a sequence of decisions made by the stakeholders involved and then apply the decision based design concepts in practice. It teaches fundamental concepts encountered in engineering design, such as concept generation, multiattribute decision analysis, reliability engineering, design optimization, simulation, and demand modeling. This book helps students and practitioners understand that there is a rigorous way to analyze engineering decisions taking into consideration all the potential technical and business impacts of their decisions. It can be used in its entirety to teach a course in decision based design, while selected chapters can also be used to cover courses in subdisciplines that make up decision based design.

Smart Energy Empowerment in Smart and Resilient Cities - Mustapha Hatti 2019-12-24

International Conference on Artificial Intelligence in Renewable Energetic Systems, IC-AIRES2019, 26-28 November 2019, Taghit-Bechar, Algeria. The challenges of the energy transition in the medium term lead to numerous technological breakthroughs in the areas of production, optimal distribution and the rational use of energy and renewable energy (energy efficiency and optimization of consumption, massive electrification, monitoring and control energy systems, cogeneration and energy recovery processes, new and renewable energies, etc.). The fall in the cost of renewable energies and the desire for a local control of energy production are today calling for a profound change in the electricity system. Local authorities are at the center of energy developments by taking into account the local nature of certain

energy systems, heat networks, geothermal energy, waste heat recovery, and electricity generation from household waste. On the other side, digital sciences are at the heart of connected objects and intelligent products that combine information processing and communication capabilities with their environment. Digital technology is at the center of new systems engineering approaches (3D modeling, virtualization, simulation, digital prototyping, etc.) for the design and development of intelligent systems. The book deals with various topics ranging from the design, development and maintenance of energy production systems, transport, distribution or storage of energy, optimization of energy efficiency, especially in the use of energy. innovation in the fields of energy production from renewable energies, management of energy networks: electricity, fluids, gas, district heating, energy storage modes: battery, super-capacitors , overseeing energy supply through supervision, control and diagnosis, risk management, as well as the design and management of smart grids: microgrid, smartgrid. This imposes the model of energy empowerment in the advent of smart cities. Empower the world's most vulnerable energy-poor citizens and establish growing and vibrant socioeconomic communities, by academics, students in engineering and data computing from around the world who have chosen an academic path leading to an electric power and energy engineering and artificial intelligence to advancing technology for the advantage of humanity.

Shortcut to Superconductivity - Armen Gulian 2020-07-11

This accessible textbook offers a novel, concept-led approach to superconducting electronics, using the COMSOL Multiphysics software to help describe fundamental principles in an intuitive manner. Based on a course taught by the author and aimed primarily at engineering students, the book explains concepts effectively and efficiently, uncovering the "shortcut" to understanding each topic, enabling readers to quickly grasp the underlying essence. The book is divided into two main parts; the first part provides a general introduction to key topics encountered in superconductivity, illustrated using COMSOL simulations based on time-dependent Ginzburg-Landau equations and avoiding any

deeply mathematical derivations. It includes numerous worked examples and problem sets with tips and solutions. The second part of the book is more conventional in nature, providing detailed derivations of the basic equations from first principles. This part covers more advanced topics, including the BCS-Gor'kov-Eliashberg approach to equilibrium properties of superconductors, the derivation of kinetic equations for nonequilibrium superconductors, and the derivation of time-dependent Ginzburg-Landau equations, used as the basis for COMSOL modeling in the first part. Supported throughout by an extensive library of COMSOL Multiphysics animations, the book serves as a uniquely accessible introduction to the field for engineers and others with a less rigorous background in physics and mathematics. However, it also features more detailed mathematical background for those wishing to delve further into the subject.

MEMS Sensors and Resonators - Frederic Nabki 2020-05-27

Microelectromechanical systems (MEMS) have had a profound impact on a wide range of applications. The degree of miniaturization made possible by MEMS technology has significantly improved the functionalities of many systems, and the performance of MEMS has steadily improved as its uses augment. Notably, MEMS sensors have been prevalent in motion sensing applications for decades, and the sensing mechanisms leveraged by MEMS have been continuously extended to applications spanning the detection of gases, magnetic fields, electromagnetic radiation, and more. In parallel, MEMS resonators have become an emerging field of MEMS and affected subfields such as electronic timing and filtering, and energy harvesting. They have, in addition, enabled a wide range of resonant sensors. For many years now, MEMS have been the basis of various industrial successes, often building on novel academic research. Accordingly, this Special Issue explores many research innovations in MEMS sensors and resonators, from biomedical applications to energy harvesting, gas sensing, resonant sensing, and timing.

NASA Tech Briefs - 2016-05

CFD Module - Mehrzad Tabatabaian 2015-05-15

This book can be used as a reference for the topic of turbulence modeling, especially in an engineering modeling and simulation course or as a tool for professionals on practical applications. Turbulent flow modeling has many applications in industry. The relevant numerical methods have advanced to the level that could be used by industry professionals to model many natural turbulent flows with acceptable accuracy. In this book we cover the fundamentals of turbulence, modeling techniques, and algorithms (including RANS) available in COMSOL® as well as providing several modeling examples and instructions for building these models. The companion DVD includes models and figures discussed in the book. eBook Customers: Companion files are available for downloading with order number/proof of purchase by writing to the publisher at info@merclearning.com. Features:

- Includes companion DVD with models and figures discussed in the book
- Explains the physics and principles of turbulence and provides modeling examples using COMSOL

Ionic Polymer Metal Composites (IPMCs) - Mohsen Shahinpoor 2016

A comprehensive resource on ionic polymer metal composites (IPMCs) edited by the leading authority on the subject.

COMSOL5 for Engineers - Mehrzad Tabatabaian 2015-07-24

COMSOL5 Multiphysics® is one of the most valuable software modeling tools for engineers and scientists. This book, an updated edition of the previously published, COMSOL for Engineers, covers COMSOL5 which now includes a revolutionary tool, the Application Builder. This component enables users to build apps based on COMSOL models that can be run on almost any operating system (Windows, MAC, mobile/iOS, etc.). Designed for engineers from various disciplines, the book introduces multiphysics modeling techniques and examples accompanied by practical applications using COMSOL5.x. The main objective is to introduce readers to use COMSOL as an engineering tool for modeling, by solving examples that could become a guide for modeling similar or more complicated problems. The book provides a collection of examples and modeling guidelines through which readers can build their own

models. The mathematical fundamentals, engineering principles, and design criteria are presented as integral parts of the examples. At the end of chapters are references that contain more in-depth physics, technical information, and data; these are referred to throughout the book and used in the examples. COMSOL5 for Engineers could be used to complement another text that provides background training in engineering computations and methods. Exercises are provided at the end of the text for use in adoption situations. Features:

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- Features new and modified, solved model examples, in addition to the models provided in the original edition
- Companion disc with executable copies of each model and their related animations eBook

Customers: Companion files are available for downloading with order number/proof of purchase by writing to the publisher at info@merclearning.com.

SMART Automatics and Energy - Denis B. Solovev 2022

This book gathers selected papers presented at the International Conference on SMART Automatics and Energy (SMART-ICAE 2021), held in Far Eastern Federal University, Vladivostok, Russian Federation during 7-8 October 2021. The book will be useful for wide range of specialists in the field of designing innovative solutions and organizational measures that increase the efficiency of the use of industry technologies in their various manifestations. The issue is also of interest to scientific and engineering personnel engaged in the achievements and farsighted researches in the area of intellectual technology use for solving of real, applied tasks in various areas of industries and policies of nations and systems and for students and undergraduates studying "Power systems engineering and electrotechnics", "Automatized systems", "Managerial systems in power technologies", etc., and postgraduate students in the corresponding branches of study.

Modelling Organs, Tissues, Cells and Devices - Socrates Dokos
2017-03-08

This book presents a theoretical and practical overview of computational modeling in bioengineering, focusing on a range of applications including electrical stimulation of neural and cardiac tissue, implantable drug delivery, cancer therapy, biomechanics, cardiovascular dynamics, as well as fluid-structure interaction for modelling of organs, tissues, cells and devices. It covers the basic principles of modeling and simulation with ordinary and partial differential equations using MATLAB and COMSOL Multiphysics numerical software. The target audience primarily comprises postgraduate students and researchers, but the book may also be beneficial for practitioners in the medical device industry.

Recent Trends in Construction Technology and Management - Mahadeo Sambhaji Ranadive 2022

This book presents the select proceedings of the International Conference on Advances in Construction Technology and Management (ACTM 2021) and explores recent and innovative developments in all aspects of civil engineering. Advanced construction technologies such as 3D printing, intelligently built environment, use of artificial intelligence, smart structures, green buildings, advanced and engineered materials for producing green concrete, and many more such topics are covered in this book. The advanced management tools such as building information modeling, augmented reality, advanced task management software, and one of the most recent technological advancements are drones, which are changing the face of surveying and security are also explored. This book will be useful for researchers, academicians, and practitioners working in the area of civil engineering and allied fields.

Recent Advances in Computational Mechanics and Simulations - Sandip Kumar Saha 2020-11-13

This volume presents selected papers from the 7th International Congress on Computational Mechanics and Simulation held at IIT Mandi, India. The papers discuss the development of mathematical models representing physical phenomena and applying modern computing methods and simulations to analyse them. The studies cover recent

advances in the fields of nano mechanics and biomechanics, simulations of multiscale and multiphysics problems, developments in solid mechanics and finite element method, advancements in computational fluid dynamics and transport phenomena, and applications of computational mechanics and techniques in emerging areas. The volume will be of interest to researchers and academics from civil engineering, mechanical engineering, aerospace engineering, materials engineering/science, physics, mathematics and other disciplines.

Vibration Analysis of Functionally Graded Piezoelectric Actuators - Pankaj Sharma 2019-01-08

This book presents a detailed study on the vibration analysis of functionally graded piezoelectric actuators excited under the shear effect. Two types of actuator geometries viz. beam and annular plate are considered, where the material properties are assumed to have a continuous variation in accordance with a power law distribution. The generalized differential quadrature method is used to obtain the solutions, and is compared to exact analytical results. The methodology reported and the numerical results presented will be useful for the design of devices utilizing functionally graded piezoelectric actuators under the influence of shear.

Multiphase Flow in Porous Media - P.M. Adler 2013-11-27

The study of multiphase flow through porous media is undergoing intense development, mostly due to the recent introduction of new methods. After the profound changes induced by percolation in the eighties, attention is nowadays focused on the pore scale. The physical situation is complex and only recently have tools become available that allow significant progress to be made in the area. This volume on Multiphase Flow in Porous Media, which is also being published as a special issue of the journal Transport in Porous Media, contains contributions on the lattice-Boltzmann technique, the renormalization technique, and semi-phenomenological studies at the pore level. Attention is mostly focused on two- and three-phase flows. These techniques are of tremendous importance for the numerous applications of multiphase flows in oil fields, unsaturated soils, the chemical industry,

and environmental sciences.

3rd International Symposium on High-Temperature Metallurgical Processing - Tao Jiang 2012-05-09

Proceedings of a symposium sponsored by the Pyrometallurgy Committee and the Energy Committee of the Extraction and Processing Division of TMS (The Minerals, Metals & Materials Society) Held during the TMS 2012 Annual Meeting & Exhibition Orlando, Florida, USA March 11-15, 2012

Introduction to Chemical Engineering Computing - Bruce A. Finlayson 2014-03-05

Step-by-step instructions enable chemical engineers to master key software programs and solve complex problems. Today, both students and professionals in chemical engineering must solve increasingly complex problems dealing with refineries, fuel cells, microreactors, and pharmaceutical plants, to name a few. With this book as their guide, readers learn to solve these problems using their computers and Excel, MATLAB, Aspen Plus, and COMSOL Multiphysics. Moreover, they learn how to check their solutions and validate their results to make sure they have solved the problems correctly. Now in its Second Edition, *Introduction to Chemical Engineering Computing* is based on the author's firsthand teaching experience. As a result, the emphasis is on problem solving. Simple introductions help readers become conversant with each program and then tackle a broad range of problems in chemical engineering, including: Equations of state Chemical reaction equilibria Mass balances with recycle streams Thermodynamics and simulation of mass transfer equipment Process simulation Fluid flow in two and three dimensions All the chapters contain clear instructions, figures, and examples to guide readers through all the programs and types of chemical engineering problems. Problems at the end of each chapter, ranging from simple to difficult, allow readers to gradually build their skills, whether they solve the problems themselves or in teams. In addition, the book's accompanying website lists the core principles learned from each problem, both from a chemical engineering and a computational perspective. Covering a broad range of disciplines and

problems within chemical engineering, Introduction to Chemical Engineering Computing is recommended for both undergraduate and graduate students as well as practicing engineers who want to know how to choose the right computer software program and tackle almost any chemical engineering problem.

Introduction to Integrative Engineering - Guigen Zhang 2017-03-03

This textbook is designed for an introductory course at undergraduate and graduate levels for bioengineering students. It provides a systematic way of examining bioengineering problems in a multidisciplinary computational approach. The book introduces basic concepts of multidiscipline-based computational modeling methods, provides detailed

step-by-step techniques to build a model with consideration of underlying multiphysics, and discusses many important aspects of a modeling approach including results interpretation, validation, and assessment.

High Value Manufacturing: Advanced Research in Virtual and Rapid Prototyping - Maria K. Todd 2013-09-16

High Value Manufacturing is the result of the 6th International Conference on Advanced Research in Virtual and Rapid Prototyping, held in Leiria, Portugal, October 2013. It contains current contributions to the field of virtual and rapid prototyping (V&RP) and is also focused on promoting better links between industry and academia. This volume