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Multiphysics Simulations in Automotive and Aerospace Applications Multiphysics Modeling Using COMSOL® Multiphysics Phase-Field Fracture Multiphysics Simulation Modelling Organs, Tissues, Cells and Devices Multiphysics Modelling and Simulation for Systems Design and Monitoring The Cell Method for Electrical Engineering and Multiphysics Problems Multiphysics Modeling: Numerical Methods and Engineering Applications NASA Tech Briefs Multiphysics Simulation by Design for Electrical Machines, Power Electronics and Drives Numerical Simulation of Mechatronic Sensors and Actuators Multiphysics Modeling Modelling of Nuclear Reactor Multi-physics Multiphysics Modelling with Finite Element Methods Introduction to Transport Phenomena Modeling Multiscale and Multiphysics Flow Simulations of Using the Boltzmann Equation Multiphysics Modeling with Finite Element Methods COMSOL5 for Engineers Geometry Creation and Import With COMSOL Multiphysics Multiphysics Modeling Using COMSOL 5 and MATLAB Fundamental Controls on Fluid Flow in Carbonates Mechanical Engineering Optics Modeling and Visualization with COMSOL Multiphysics International Assessment of Research and Development in Simulation-Based Engineering and Science Strategies to Enhance Environmental Security in Transition Countries Sustainable Product Development NASA Tech Briefs Computational Homogenization of Heterogeneous Materials with Finite Elements Integrative Computational Materials Engineering Fields of Physics on the PC by Finite Element Analysis The High Luminosity Large Hadron Collider Machine Design Thermal Ablation Therapy Handbook of Materials Behavior Models, Three-Volume Set Digital Twin Development and Deployment on the Cloud Peridynamic Theory and Its Applications Introduction to Numerical Geodynamic Modelling Computational Fluid Dynamics Modeling and Simulation in Engineering Sciences Chemical Engineering Progress

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Multiphysics Simulations in Automotive and Aerospace Applications 2021-07-20 multiphysics simulations in automotive and aerospace applications provides the fundamentals and latest developments on numerical methods for solving multiphysics problems including fluid solid interaction fluid structure thermal coupling electromagnetic fluid solid coupling vibro and aeroacoustics chapters describe the different algorithms and numerical methods used for solving coupled problems using implicit or explicit coupling problems from industrial or academic applications given the book s comprehensive coverage automotive and aerospace engineers designers graduate students and researchers involved in the simulation of practical coupling problems will find the book useful in its approach provides the fundamentals of numerical methods along with comprehensive examples for solving coupled problems features multi physics methods and available codes along with what those codes can do presents examples from industrial and academic applications

Multiphysics Modeling Using COMSOL® 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

Multiphysics Phase-Field Fracture 2020-10-12 this monograph is centered on mathematical modeling innovative numerical algorithms and adaptive concepts to deal with fracture phenomena in multiphysics state of the art phase field fracture models are complemented with prototype explanations and rigorous numerical analysis these developments are embedded into a carefully designed balance between scientific computing aspects and numerical modeling of nonstationary coupled variational inequality systems therein a focus is on nonlinear solvers goal oriented error estimation predictor corrector adaptivity and interface conditions engineering applications show the potential for tackling practical problems within the fields of solid mechanics porous media and fluidstructure interaction

Multiphysics Simulation 2014-05-28 this book highlights a unique combination of numerical tools and strategies for handling the challenges of

multiphysics simulation with a specific focus on electromechanical systems as the target application features introduces the concept of design via simulation along with the role of multiphysics simulation in today s engineering environment discusses the importance of structural optimization techniques in the design and development of electromechanical systems provides an overview of the physics commonly involved with electromechanical systems for applications such as electronics magnetic components rf components actuators and motors reviews the governing equations for the simulation of related multiphysics problems outlines relevant topology and parametric size optimization methods for electromechanical systems describes in detail several multiphysics simulation and optimization example studies in both two and three dimensions with sample numerical code

Modelling Organs, Tissues, Cells and Devices 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

Multiphysics Modelling and Simulation for Systems Design and Monitoring 2015-01-03 this book reports on the state of the art in the field of multiphysics systems it consists of accurately reviewed contributions to the mmssd 2014 conference which was held from december 17 to 19 2004 in hammamet tunisia the different chapters covering new theories methods and a number of case studies provide readers with an up to date picture of multiphysics modeling and simulation they highlight the role played by high performance computing and newly available software in promoting the study of multiphysics coupling effects and show how these technologies can be practically implemented to bring about significant improvements in the field of design control and monitoring of machines in addition to providing a detailed description of the methods and their applications the book also identifies new research issues challenges and opportunities thus providing researchers and practitioners with both technical information to support their daily work and a new source of inspiration for their future research

The Cell Method for Electrical Engineering and Multiphysics Problems 2013-01-24 this book presents a numerical scheme for the solution of field problems governed by partial differential equations the cell method the technique lends itself naturally to the solution of multiphysics problems with several interacting phenomena the cell method based on a space time tessellation is intimately related to the work of tonti and to his ideas of classification diagrams or as they are nowadays called tonti diagrams a graphical representation of the problem s equations made possible by a suitable selection of a space time framework relating physical variables to each other the main features of the cell method are presented and links with many other discrete numerical methods finite integration techniques finite difference time domain finite volumes mimetic finite differences etc are discussed after outlining the theoretical basis of the method a set of physical problems which have been solved with the cell method is described these single and multiphysics problems stem from the authors research experience in the fields of electromagnetism elasticity thermo elasticity and others finally the implementation of the numerical technique is described in all its main components space time discretization problem formulation solution and representation of the resulting physical fields

Multiphysics Modeling: Numerical Methods and Engineering Applications 2015-12-15 multiphysics modeling numerical methods and engineering applications tsinghua university press computational mechanics series describes the basic principles and methods for multiphysics modeling covering related areas of physics such as structure mechanics fluid dynamics heat transfer electromagnetic field and noise the book provides the latest information on basic numerical methods also considering coupled problems spanning fluid solid interaction thermal stress coupling fluid solid thermal coupling electromagnetic solid thermal fluid coupling and structure noise coupling users will find a comprehensive book that covers background theory algorithms key technologies and applications for each coupling method presents a wealth of multiphysics modeling methods issues and worked examples in a single volume provides a go to resource for coupling and multiphysics problems covers the multiphysics details not touched upon in broader numerical methods references including load transfer between physics element level strong coupling and interface strong coupling amongst others discusses practical applications throughout and tackles real life multiphysics problems across areas such as automotive aerospace and biomedical engineering

NASA Tech Briefs 2017-02 presents applied theory and advanced simulation techniques for electric machines and drives this book combines the knowledge of

experts from both academia and the software industry to present theories of multiphysics simulation by design for electrical machines power electronics and drives the comprehensive design approach described within supports new applications required by technologies sustaining high drive efficiency the highlighted framework considers the electric machine at the heart of the entire electric drive the book also emphasizes the simulation by design concept a concept that frames the entire highlighted design methodology which is described and illustrated by various advanced simulation technologies multiphysics simulation by design for electrical machines power electronics and drives begins with the basics of electrical machine design and manufacturing tolerances it also discusses fundamental aspects of the state of the art design process and includes examples from industrial practice it explains fem based analysis techniques for electrical machine design providing details on how it can be employed in ansys maxwell software in addition the book covers advanced magnetic material modeling capabilities employed in numerical computation thermal analysis automated optimization for electric machines and power electronics and drive systems this valuable resource delivers the multi physics know how based on practical electric machine design methodologies provides an extensive overview of electric machine design optimization and its integration with power electronics and drives incorporates case studies from industrial practice and research and development projects multiphysics simulation by design for electrical machines power electronics and drives is an incredibly helpful book for design engineers application and system engineers and technical professionals it will also benefit graduate engineering students with a strong interest in electric machines and drives

Multiphysics Simulation by Design for Electrical Machines, Power Electronics and Drives 2017-12-18 like the previous editions also the third edition of this book combines the detailed physical modeling of mechatronic systems and their precise numerical simulation using the finite element fe method thereby the basic chapter concerning the finite element fe method is enhanced provides now also a description of higher order finite elements both for nodal and edge finite elements and a detailed discussion of non conforming mesh techniques the author enhances and improves many discussions on principles and methods in particular more emphasis is put on the description of single fields by adding the flow field corresponding to these field the book is augmented with the new chapter about coupled flow structural mechanical systems thereby the discussion of computational aeroacoustics is extended towards perturbation approaches which allows a decomposition of flow and acoustic quantities within the flow region last but not least applications are updated and restructured so that the book meets modern demands

Numerical Simulation of Mechatronic Sensors and Actuators 2015-02-07 multiphysics modelling materials components and systems focuses on situations where coupled phenomena involving a combination of thermal fluid and solid mechanics occur important fundamentals of the various physics that are required in multiphysics modelling are introduced and supported with practical problems more advanced topics such as creep deformation fatigue and fracture multiphase flow or melting in porous media are tackled 3d interactions in system architectures and energy systems such as batteries reformer or fuel cells and modelling of high performance materials are exemplified important multiphysics modelling issues are highlighted in addition to theory solutions to problems such as in linear and non linear situations are addressed as well as specific solutions for multiphysics modelling of fluid solid solid solid and fluid fluid interactions are given drawing on teaching experience industry solutions and the latest research this book is the most complete guide to multiphysics modelling available for students and researchers in diverse science and engineering disciplines provides a thorough intro to the theory behind multiphysics modeling covers both linear and non linear material behaviors helps to answer practical questions such as when to use 2d or 3d modeling

Multiphysics Modeling 2018-06-27 modelling of nuclear reactor multiphysics from local balance equations to macroscopic models in neutronics and thermal hydraulics is an accessible guide to the advanced methods used to model nuclear reactor systems the book addresses the frontier discipline of neutronic thermal hydraulic modelling of nuclear reactor cores presenting the main techniques in a generic manner and for practical reactor calculations the modelling of nuclear reactor systems is one of the most challenging tasks in complex system modelling due to the many different scales and intertwined physical phenomena involved the nuclear industry as well as the research institutes and universities heavily rely on the use of complex numerical codes all the commercial codes are based on using different numerical tools for resolving the various physical fields and to some extent the different scales whereas the latest research platforms attempt to adopt a more integrated approach in resolving multiple scales and fields of physics the book presents the main algorithms used in such codes for neutronic and thermal hydraulic modelling providing the details of the underlying methods together with their

assumptions and limitations because of the rapidly expanding use of coupled calculations for performing safety analyses the analysists should be equally knowledgeable in all fields i e neutron transport fluid dynamics heat transfer the first chapter introduces the book s subject matter and explains how to use its digital resources and interactive features the following chapter derives the governing equations for neutron transport fluid transport and heat transfer so that readers not familiar with any of these fields can comprehend the book without difficulty the book thereafter examines the peculiarities of nuclear reactor systems and provides an overview of the relevant modelling strategies computational methods for neutron transport first at the cell and assembly levels then at the core level and for one two phase flow transport and heat transfer are treated in depth in respective chapters the coupling between neutron transport solvers and thermal hydraulic solvers for coarse mesh macroscopic models is given particular attention in a dedicated chapter the final chapter summarizes the main techniques presented in the book and their interrelation then explores beyond state of the art modelling techniques relying on more integrated approaches covers neutron transport fluid dynamics and heat transfer and their interdependence in one reference analyses the emerging area of multi physics and multi scale reactor modelling contains 71 short videos explaining the key concepts and 77 interactive quizzes allowing the readers to test their understanding

Modelling of Nuclear Reactor Multi-physics 2019-11-19 introduces the intellectual framework for modeling with comsol multiphysics the first part of this book develops an understanding of how to build up complicated models piecemeal and test them modularly the second part introduces advanced analysis techniques the final part deals with case studies in a broad range of application areas

Multiphysics Modelling with Finite Element Methods 2006-01-01 this textbook offers an introduction to multiple interdependent transport phenomena as they occur in various fields of physics and technology like transport of momentum heat and matter these phenomena are found in a number of combined processes in the fields of chemical food biomedical and environmental sciences the book puts a special emphasis on numerical modeling of both purely diffusive mechanisms and macroscopic transport such as fluid dynamics heat and mass convection to favor the applicability of the various concepts they are presented with a simplicity of exposure and synthesis has been preferred with respect to completeness the book includes more than 130 graphs and figures to facilitate the understanding of the various topics it also presents many modeling examples throughout the text to control that the learned material is properly understood there are some typos in the text you can see the corrections here springer com cda content document cda downloaddocument erratacorrige v0 pdf sgwid 0 0 45 1679320 p181107156

Introduction to Transport Phenomena Modeling 2018-02-12 this book provides a comprehensive introduction to the kinetic theory for describing flow problems from molecular scale hydrodynamic scale to darcy scale the author presents various numerical algorithms to solve the same boltzmann like equation for different applications of different scales in which the dominant transport mechanisms may differ this book presents a concise introduction to the boltzmann equation of the kinetic theory based on which different simulation methods that were independently developed for solving problems of different fields can be naturally related to each other then the advantages and disadvantages of different methods will be discussed with reference to each other it mainly covers four advanced simulation methods based on the boltzmann equation i e direct simulation monte carlo method direct simulation bgk method discrete velocity method and lattice boltzmann method and their applications with detailed results in particular many simulations are included to demonstrate the applications for both conventional and unconventional reservoirs with the development of high resolution ct and high performance computing facilities the study of digital rock physics is becoming increasingly important for understanding the mechanisms of enhanced oil and gas recovery the advanced methods presented here have broad applications in petroleum engineering as well as mechanical engineering making them of interest to researchers professionals and graduate students alike at the same time instructors can use the codes at the end of the book to help their students implement the advanced technology in solving real industrial problems

Multiscale and Multiphysics Flow Simulations of Using the Boltzmann Equation 2020-09-06 finite element methods for approximating partial differential equations that arise in science and engineering analysis find widespread application numerical analysis tools make the solutions of coupled physics mechanics chemistry and even biology accessible to the novice modeler nevertheless modelers must be aware of the limitations and difficulties in developing numerical models that faithfully represent the system they are modeling this textbook introduces the intellectual framework for modeling with comsol multiphysics a package which has unique features in representing multiply linked domains with complex geometry highly coupled and nonlinear

equation systems and arbitrarily complicated boundary auxiliary and initial conditions but with this modeling power comes great opportunities and great perils progressively in the first part of the book the novice modeler develops an understanding of how to build up complicated models piecemeal and test them modularly the second part of the book introduces advanced analysis techniques the final part of the book deals with case studies in a broad range of application areas including nonlinear pattern formation thin film dynamics and heterogeneous catalysis composite and effective media for heat mass conductivity and dispersion population balances tomography multiphase flow electrokinetic microfluidic networks plasma dynamics and corrosion chemistry as a revision of process modeling and simulation with finite element methods this book uses the very latest features of comsol multiphysics there are new case studies on multiphase flow with phase change plasma dynamics electromagnetohydrodynamics microfluidic mixing and corrosion in addition major improvements to the level set method for multiphase flow to ensure phase conservation is introduced more information about comsol can be found here

Multiphysics Modeling with Finite Element Methods 2006-10-25 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 ebook customers companion files are available for downloading with order number proof of purchase by writing to the publisher at info merclearning com

COMSOL5 for Engineers 2015-07-24 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 the fundamentals may also be applied to other commercial packages such as ansys 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 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 application builder

Geometry Creation and Import With COMSOL Multiphysics 2019-09-20 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 the companion files are also available online by emailing the publisher with proof of purchase at info merclearning com

Multiphysics Modeling Using COMSOL 5 and MATLAB 2021-12-03 this volume highlights key challenges for fluid flow prediction in carbonate reservoirs the approaches currently employed to address these challenges and developments in fundamental science and technology the papers span methods and case studies that highlight workflows and emerging technologies in the fields of geology geophysics petrophysics reservoir modelling and computer science topics include detailed pore scale studies that explore fundamental processes and applications of imaging and flow modelling at the pore scale case studies of diagenetic processes with complementary perspectives from reactive transport modelling novel methods for rock typing petrophysical studies that investigate the impact of diagenesis and fault rock properties on acoustic signatures mechanical modelling and seismic imaging of faults in carbonate rocks modelling geological influences on seismic anisotropy novel approaches to geological modelling methods to represent key geological details in reservoir simulations and advances in computer visualization analytics and interactions for geoscience and engineering

Fundamental Controls on Fluid Flow in Carbonates 2015-02-02 this manuscript is a step by step graphical instructions for comsol multiphysics with ray optics module and wave optics module modeling and computational physics simulation all the example models investigated and visualized with the help of finite element analysis are referenced from the standard usa undergraduate text on optics by e hecht the simulations include the use of geometrical ray tracings for point source hemispherical and conic rays as well as full electromagnetic waves source employing the maxwell s wave equations for gaussian waves input both 2d and 3d computational physics approach will be discussed with the introduction of the trick of the trades meshings and modeling skill besides setup options that are skillfully hidden in the simulation software from plain sight the geometrical model covers 2d and 3d electromagnetic waves propagation in user defined refractive index domain laws of refraction for 2d converging and diverging lens laws of reflection for specular mirrors 3d prism 3d prism mirror equivalent system polarizations for 3d linear polarizers 3d circular polarizer 3d linear wave retarder such as half wave plate quarter wave plate the theory of superposition for the 2d young s double slits wavefront splitting interference experiment 3d thin film uniform thickness amplitude splitting interference experiment 2d michelson interferometer mirrored interference setup with the 1d interference fringes line graph fermat s principle for 2d single slits diffraction 3d circular aperture diffraction experiment 3d rectangular slit diffraction experiment 3d diffraction gratings experiment with fresnel near field and fraunhofer far field diffraction pattern diffraction pattern sinc function observation discussions the limitation of ray tracing physics vs full electromagnetic waves simulations in the physics of optics the babinet s principle of transparent openings or opaque obstacles diffraction slit and finally the modern optics of 2d and 3d laser cavity multiphysics models with the application of multiple release time of rays for stimulated emission lasing one of the most important and crucial component of the computational physics subject the user customizable library of material properties that governs the realisticality of the final modeled results is highlighted in the appendix section

Mechanical Engineering 2008 simulation based engineering and science sbe s cuts across disciplines showing tremendous promise in areas from storm prediction and climate modeling to understanding the brain and the behavior of numerous other complex systems in this groundbreaking volume nine distinguished leaders assess the latest research trends as a result of 52 site visits in europe and asia and hundreds of hours of expert interviews and discuss the implications of their findings for the us government the authors conclude that while the us remains the quantitative leader in sbe s research and development it is very much in danger of losing that edge to europe and asia commissioned by the national science foundation this multifaceted study will capture the attention of fortune 500 companies and policymakers distinguished contributors sharon c goltzer university of michigan ann arbor usa sangtae kim morgridge institute for research usa peter t cummings vanderbilt university usa and oak ridge national laboratory usa abhijit deshmukh texas a m university usa martin head gordon university of california berkeley usa george em karniadakis brown university usa linda petzold university of california santa barbara usa celeste sagui north carolina state university usa masanobu shinozuka university of california irvine usa contents introduction sharon c goltzer life sciences and medicine linda petzold materials simulation peter t cummings energy and sustainability masanobu shinozuka next generation architectures and algorithms george em karniadakis software development martin head gordon engineering simulations abhijit deshmukh verification validation and uncertainty quantification george em karniadakis multiscale simulation peter t cummings big data visualization and data

driven simulations sangtae kim education and training celeste sagui appendices biographies of panelists and advisorssurvey questionairebibliometric analysis of simulation research grant lewisonglossary readership academics physicists engineers policymakers and graduate students in mathematical modeling computational physics super computing parallel computing and stochastic analysis keywords simulation model research development technology engineering

Optics Modeling and Visualization with COMSOL Multiphysics 2018-07-28 this volume presents the main environmental security challenges facing transition countries as well as practical methods and approaches for addressing them which are equally applicable to all countries coverage also details lesson learned as illustrated via research and case studies as well as issues related to metals in the environment

International Assessment of Research and Development in Simulation-Based Engineering and Science 2011-06-10 this book offers a comprehensive review of sustainability and product design providing useful information on the relevant regulations and standards for industries to meet increasing market demands for eco products while reducing their impact on the environment the examples and methods presented allow readers to gain insights into sustainable products the authors also explain how to develop products with sustainability features by applying tools and methods for sustainable design and manufacture these tools methods include regulations directives related to sustainable product development popular lifecycle analysis software packages environmental and social lifecycle impact assessment methods lifecycle inventory databases eco point and eco accounting infrastructure ict and traceability technologies for sustainable product development sustainable design and manufacture integrated approach for sustainable product development a description of each sustainability tool is accompanied by easy to understand guidelines as well as sustainable product development methods five different case studies are also presented to illustrate how to apply the tools and methods into the development of real sustainable products in view of the increasing pressure on industries to meet the sometimes conflicting demands of the market and environment this book is a valuable resource for engineers and managers in manufacturing companies wishing to update their knowledge of sustainable product development it is also suitable for researchers and consultants who are involved or interested in sustainable product development as well as for students studying sustainable development production and engineering management

Strategies to Enhance Environmental Security in Transition Countries 2007-05-02 this monograph provides a concise overview of the main theoretical and numerical tools to solve homogenization problems in solids with finite elements starting from simple cases linear thermal case the problems are progressively complexified to finish with nonlinear problems the book is not an overview of current research in that field but a course book and summarizes established knowledge in this area such that students or researchers who would like to start working on this subject will acquire the basics without any preliminary knowledge about homogenization more specifically the book is written with the objective of practical implementation of the methodologies in simple programs such as matlab the presentation is kept at a level where no deep mathematics are required

Sustainable Product Development 2020-05-12 presenting the results of an ambitious project this book summarizes the efforts towards an open web based modular and extendable simulation platform for materials engineering that allows simulations bridging several length scales in so doing it covers processes along the entire value chain and even describes such different classes of materials as metallic alloys and polymers it comprehensively describes all structural ideas the underlying concepts standard specifications the verification results obtained for different test cases and additionally how to utilize the platform as a user and how to join it as a provider a resource for researchers users and simulation software providers alike the monograph provides an overview of the current status serves as a generic manual for prospective users and offers insights into the inner modular structure of the simulation platform

NASA Tech Briefs 2007 this book provides a broad introduction to the physics and technology of the high luminosity large hadron collider hl lhc this new configuration of the lhc is one of the major accelerator projects for the next 15 years and will give new life to the lhc after its first 15 year operation not only will it allow more precise measurements of the higgs boson and of any new particles that might be discovered in the next lhc run but also extend the mass limit reach for detecting new particles the hl lhc is based on the innovative accelerator magnet technologies capable of generating 1113 tesla fields with effectiveness enhanced by use of the new achromatic telescopic squeezing scheme and other state of the art accelerator technologies such as superconducting compact rf crab cavities advanced collimation concepts and novel power technology based on high temperature

superconducting links the book consists of a series of chapters touching on all issues of technology and design and each chapter can be read independently the first few chapters give a summary of the whole project of the physics motivation and of the accelerator challenges the subsequent chapters cover the novel technologies the new configurations of lhc and of its injectors as well as the expected operational implications altogether the book brings the reader to the heart of technologies for the leading edge accelerator and gives insights into next generation hadron colliders
Computational Homogenization of Heterogeneous Materials with Finite Elements 2019-06-11 thermal ablation therapy theory and simulation includes detailed theoretical and technical concepts of thermal ablation therapy in different body organs concepts of ablation technology based on different thermal ablation methods are introduced along with changes in the tissues mechanical properties due to thermal denaturation the book emphasizes the mathematical and engineering concepts of rf and mw energy propagation through tissues and where high heating rates produced by mw systems can overcome the heat sink effects from nearby vessels the design and tuning of the mw antennas to deliver energy efficiently to specific organ systems such as the liver or lung is also covered other sections cover the computational modeling of radiofrequency ablation and microwave ablation procedures for developing and implementing new efficient ablation in clinical systems numerical simulations for different scenarios of different organs with different size using rf and mw ablation systems with different antennas probes design and configurations and numerical techniques for temperature profile in tissues presents the latest mathematical models of microwave and rf ablation theories discusses the biological responses and engineering principles by which thermal ablation techniques can provide temperature elevation within the organs of the human body including action mechanisms required equipment needle characteristics and treatment techniques highlights the different techniques of thermal ablation including radiofrequency ablation microwave ablation laser ablation and ultrasound ablation nanotechnology and the different metrics used to evaluate the performance of the used antenna within the ablation needle
Integrative Computational Materials Engineering 2012-07-30 this first of a kind reference handbook deals with nonlinear models and properties of material in the study the behavior of materials phenomena no unique laws exist therefore researchers often turn to models to determine the properties of materials this will be the first book to bring together such a comprehensive collection of these models the handbook deals with all solid materials and is organized first by phenomena most of the materials models presented in an applications oriented fashion less descriptive and more practitioner geared making it useful in the daily working activities of professionals the handbook is divided into three volumes volume i deformation of materials introduces general methodologies in the art of modeling in choosing materials and in the so called size effect chapters 2 5 deal respectively with elasticity and viscoelasticity yield limit plasticity and visco plasticity volume ii failures in materials provides models on such concerns as continuous damage cracking and fracture and friction wear volume iii multiphysics behavior deals with multiphysics coupled behaviors chapter s 10 and 11 are devoted to special classes of materials composites biomaterials and geomaterials the different sections within each chapter describe one model each with its domain of validity its background its formulation the identification of material parameters for as many materials as possible and advice on how to implement or use the model the study of the behavior of materials especially solids is related to hundreds of areas in engineering design and control predicting how a material will perform under various conditions is essential to determining the optimal performance of machines and vehicles and the structural integrity of buildings as well as safety issues such practical examples would be how various new materials such as those used in new airplane hulls react to heat or cold or sudden temperature changes or how new building materials hold up under extreme earthquake conditions the handbook of materials behavior models gathers together 117 models of behavior of materials written by the most eminent specialists in their field presents each model s domain of validity a short background its formulation a methodology to identify the materials parameters advise on how to use it in practical applications as well as extensive references covers all solid materials metals alloys ceramics polymers composites concrete wood rubber geomaterials such as rocks soils sand clay biomaterials etc concerns all engineering phenomena elasticity viscoelasticity yield limit plasticity viscoplasticity damage fracture friction and wear
Fields of Physics on the PC by Finite Element Analysis 1996 digital twin development and deployment in the cloud developing cloud friendly dynamic models using simulink simscapetm and amazon aws promotes a physics based approach to the field of digital twins through the use of multiphysics models running in the cloud significant improvement to the diagnostics and prognostic of systems can be attained the book draws a clear definition of digital twins helping business leaders clearly identify the value it brings in addition it outlines the key elements needed for deployment including the hardware and

software tools needed special attention is paid to the process of developing and deploying the multi physics models of the digital twins provides a high level overview of digital twins and their underutilization in the field of asset management and maintenance proposes a streamline process to create digital twins for a wide variety of applications using matlab simscapetm deploys developed digital twins on amazon services includes matlab and simulink codes available for free download on matlab central covers popular prototyping hardwares such as arduino and raspberry pi

The High Luminosity Large Hadron Collider 2015 this book presents the peridynamic theory which provides the capability for improved modeling of progressive failure in materials and structures and paves the way for addressing multi physics and multi scale problems the book provides students and researchers with a theoretical and practical knowledge of the peridynamic theory and the skills required to analyze engineering problems the text may be used in courses such as multi physics and multi scale analysis nonlocal computational mechanics and computational damage prediction sample algorithms for the solution of benchmark problems are available so that the reader can modify these algorithms and develop their own solution algorithms for specific problems students and researchers will find this book an essential and invaluable reference on the topic

Machine Design 2005 this user friendly reference for students and researchers presents the basic mathematical theory before introducing modelling of key geodynamic processes

Thermal Ablation Therapy 2021-05-18 this book is the result of a careful selection of contributors in the field of cfd it is divided into three sections according to the purpose and approaches used in the development of the contributions the first section describes the high performance computing hpc tools and their impact on cfd modeling the second section is dedicated to cfd models for local and large scale industrial phenomena two types of approaches are basically contained here one concerns the adaptation from global to local scale e g the applications of cfd to study the climate changes and the adaptations to local scale the second approach very challenging is the multiscale analysis the third section is devoted to cfd in numerical modeling approach for experimental cases its chapters emphasize on the numerical approach of the mathematical models associated to few experimental industrial cases here the impact and the importance of the mathematical modeling in cfd are focused on it is expected that the collection of these chapters will enrich the state of the art in the cfd domain and its applications in a lot of fields this collection proves that cfd is a highly interdisciplinary research area which lies at the interface of physics engineering applied mathematics and computer science

Handbook of Materials Behavior Models, Three-Volume Set 2001-11-17 this book features state of the art contributions in mathematical experimental and numerical simulations in engineering sciences the contributions in this book which comprise twelve chapters are organized in six sections spanning mechanical aerospace electrical electronic computer materials geotechnical and chemical engineering topics include metal micro forming compressible reactive flows radio frequency circuits barrier infrared detectors fiber bragg and long period fiber gratings semiconductor modelling many core architecture computers laser processing of materials alloy phase decomposition nanofluids geo materials and rheo kinetics contributors are from europe china mexico malaysia and iran the chapters feature many sophisticated approaches including monte carlo simulation fluent and abaqus computational modelling discrete element modelling and partitioned frequency time methods the book will be of interest to researchers and also consultants engaged in many areas of engineering simulation

Digital Twin Development and Deployment on the Cloud 2020-05-24

Peridynamic Theory and Its Applications 2013-10-21

Introduction to Numerical Geodynamic Modelling 2010

Computational Fluid Dynamics 2018-02-14

Modeling and Simulation in Engineering Sciences 2016-08-31

Chemical Engineering Progress 2007

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