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NBS Special Publication - 1968

Building Energy Modeling with OpenStudio - Larry Brackney 2018-05-15

This textbook teaches the fundamentals of building energy modeling and analysis using open source example applications built with the US DOE's OpenStudio modeling platform and EnergyPlus simulation engine. Designed by researchers at US National Laboratories to support a new generation of high performance buildings, EnergyPlus and OpenStudio are revolutionizing how building energy modeling is taught in universities and applied by professional architects and engineers around the world. The authors, all researchers at National Renewable Energy Laboratory and members of the OpenStudio software development team, present modeling concepts using open source software that may be generally applied using a variety of software tools commonly used by design professionals. The book also discusses modeling process automation in the context of OpenStudio Measures—small self-contained scripts that can transform energy models and their data—to save time and effort. They illustrate key concepts through a sophisticated example problem that evolves in complexity throughout the book. The text also examines advanced topics including daylighting, parametric analysis, uncertainty analysis, design optimization, and model calibration. Building Energy Modeling with OpenStudio teaches students to become sophisticated modelers rather than simply proficient software users. It supports undergraduate and graduate building energy courses in Architecture, and in Mechanical, Civil, Architectural, and Sustainability Engineering.

Advancement in Materials, Manufacturing and Energy Engineering, Vol. I - Puneet Verma 2022-01-02

This book (Vol. I) presents select proceedings of the conference on “Advancement in Materials, Manufacturing, and Energy Engineering (ICAMME 2021).” It discusses the latest materials, manufacturing processes, evaluation of materials properties for the application in automotive, aerospace, marine, locomotive, and energy sectors. The topics covered include advanced metal forming, bending, welding and casting

techniques, recycling and re-manufacturing of materials and components, materials processing, characterization and applications, materials, composites and polymer manufacturing, powder metallurgy and ceramic forming, numerical modeling and simulation, advanced machining processes, functionally graded materials, non-destructive examination, optimization techniques, engineering materials, heat treatment, material testing, MEMS integration, energy materials, bio-materials, metamaterials, metallography, nanomaterial, SMART materials, bioenergy, fuel cell, and superalloys. The book will be useful for students, researchers, and professionals interested in interdisciplinary topics in the areas of materials, manufacturing, and energy sectors.

***Optimization for Energy Systems and Supply Chains* - Viknesh Andiappan 2022-12-08**

To curb the impacts of rising CO2 emissions, the Intergovernmental Panel on Climate Change report states that a net zero target needs to be achieved by the year 2055. Experts argue that this is a critical time to make important and accurate decisions. Thus, it is essential to have the right tools to efficiently plan and deploy future energy systems and supply chains. Mathematical models can provide decision-makers with the tools required to make well-informed decisions relating to development of energy systems and supply chains. This book provides an understanding of the various available energy systems, the basics behind mathematical models, the steps required to develop mathematical models, and examples/case studies where such models are applied. Divided into two parts, one covering basics for beginners and the other featuring contributed chapters offering illustrative examples, this book: Shows how mathematical models are applied to solve problems in energy systems and supply chains Provides fundamentals of the working principles of various energy systems and their technologies Offers basics of how to formulate and best practices for developing mathematical models, topics not covered in other titles Features a wide range of case studies Teaches readers to develop their own mathematical models to make decisions on energy systems This book is aimed at chemical, process, mechanical, and energy engineers.

Creo Simulate 3.0 Tutorial - Roger Toogood 2015

Creo Simulate 3.0 Tutorial introduces new users to finite element analysis using Creo Simulate and how it can be used to analyze a variety of problems. The tutorial lessons cover the major concepts and frequently used commands required to progress from a novice to an intermediate user level. The commands are presented in a click-by-click manner using simple examples and exercises that illustrate a broad range of the analysis types that can be performed. In addition to showing the command usage, the text will explain why certain commands are being used and, where appropriate, the relation of commands to the overall Finite Element Analysis (FEA) philosophy are explained. Moreover, since error analysis is an important skill, considerable time is spent exploring the created models so that users will become comfortable with the “debugging” phase of modeling. This textbook is written for first-time FEA users in general and Creo Simulate users in particular. After a brief introduction to finite element modeling, the tutorial introduces the major concepts behind the use of Creo Simulate to perform Finite Element Analysis of parts. These include: modes of operation, element types, design studies (analysis, sensitivity studies, organization), and the major steps for setting up a model (materials, loads, constraints, analysis type), studying convergence of the solution, and viewing the results. Both 2D and 3D problems are treated. This tutorial deals exclusively with operation in integrated mode with Creo Parametric. It is suitable for use with both Releases 3.0 of Creo Simulate.

BIM Handbook - Rafael Sacks 2018-07-03

Discover BIM: A better way to build better buildings Building Information Modeling (BIM) offers a novel approach to design, construction, and facility management in which a digital representation of the building product and process is used to facilitate the exchange and interoperability of information in digital format. BIM is beginning to change the way buildings look, the way they function, and the ways in which they are designed and built. The BIM Handbook, Third Edition provides an in-depth understanding of BIM technologies, the business and organizational issues associated with its implementation, and the profound advantages that effective use of BIM can provide to all members of a project team. Updates to this edition include: Information on the ways in which professionals should use BIM to gain maximum value New topics such as collaborative working, national and major construction clients, BIM standards and guides A discussion on how various professional roles have expanded through the widespread use and the new avenues of BIM practices and services A wealth of new case studies that clearly illustrate exactly how BIM is applied in a wide variety of conditions Painting a colorful and thorough picture of the state of the art in building information modeling, the BIM Handbook, Third Edition guides readers to successful implementations, helping them to avoid needless frustration and costs and take full advantage of this paradigm-shifting approach to construct better buildings

that consume fewer materials and require less time, labor, and capital resources.

Model-based Health Monitoring of Hybrid Systems - Danwei Wang 2013-05-23

This book systematically presents a comprehensive framework and effective techniques for in-depth analysis, clear design procedure, and efficient implementation of diagnosis and prognosis algorithms for hybrid systems. It offers an overview of the fundamentals of diagnosis\prognosis and hybrid bond graph modeling. This book also describes hybrid bond graph-based quantitative fault detection, isolation and estimation. Moreover, it also presents strategies to track the system mode and predict the remaining useful life under multiple fault condition. A real world complex hybrid system—a vehicle steering control system—is studied using the developed fault diagnosis methods to show practical significance. Readers of this book will benefit from easy-to-understand fundamentals of bond graph models, concepts of health monitoring, fault diagnosis and failure prognosis, as well as hybrid systems. The reader will gain knowledge of fault detection and isolation in complex systems including those with hybrid nature, and will learn state-of-the-art developments in theory and technologies of fault diagnosis and failure prognosis for complex systems.

The Department of Energy's FY 1997 Budget Request for the Office of Energy Research (OER) - United States. Congress. House. Committee on Science. Subcommittee on Energy and Environment 1996

Building Physics and Building Energy Systems - Davide Astiaso Garcia 2021-03-19

The energy transition is one of the key approaches in the effort to halt climate changes, and it has become even more essential in the light of the recent COVID-19 pandemic. Fostering the energy efficiency and the energy independence of the building sector is a focal aim to move towards a decarbonized society. In this context, building physics and building energy systems are fundamental disciplines based on applied physics applications in civil, architectural, and environmental engineering, including technical themes related to the planning of energy and the environment, diagnostic methods, and mitigating techniques. This Special Issue contains information on experimental studies in the following research topics: renewable energy sources, building energy analysis, rational use of energy, heat transmission, heating and cooling systems, thermofluid dynamics, smart energy systems, and energy service management in buildings.

Predicting Structured Data - Neural Information Processing Systems Foundation 2007

State-of-the-art algorithms and theory in a novel domain of machine learning, prediction when the output has structure.

Energy Research Abstracts - 1991

Model Reduction of Complex Dynamical Systems - Peter Benner 2021-08-26

This contributed volume presents some of the latest research related to model order reduction of complex dynamical systems with a focus on time-dependent problems. Chapters are written by leading researchers and users of model order reduction techniques and are based on presentations given at the 2019 edition of the workshop series Model Reduction of Complex Dynamical Systems – MODRED, held at the University of Graz in Austria. The topics considered can be divided into five categories: system-theoretic methods, such as balanced truncation, Hankel norm approximation, and reduced-basis methods; data-driven methods, including Loewner matrix and pencil-based approaches, dynamic mode decomposition, and kernel-based methods; surrogate modeling for design and optimization, with special emphasis on control and data assimilation; model reduction methods in applications, such as control and network systems, computational electromagnetics, structural mechanics, and fluid dynamics; and model order reduction software packages and benchmarks. This volume will be an ideal resource for graduate students and researchers in all areas of model reduction, as well as those working in applied mathematics and theoretical informatics.

Space and Astrophysical Plasma Simulation - Jörg Büchner 2023-03-01

This book is a collection of contributions covering the major subjects in numerical simulation of space and astrophysical plasma. It introduces the different approaches and methods to model plasma, the necessary computational codes, and applications in the field. The book is rooted in the previous work Space Plasma Simulation (Springer, 2003) and includes the latest developments. It is divided into three parts and all chapters start with an introduction motivating the topic and its use in research and ends with a discussion of its applications. The chapters of the first part contain tutorials of the different basic approaches needed to perform space plasma simulations. This part is particularly useful for graduate students to master the subject. The second part presents more advanced materials for students and researchers who already work with pre-existing codes but want to implement the recent progresses made in the field. The last part of the book discusses developments in the area for researchers who are actively working on advanced simulation approaches like higher order schemes and artificial intelligence, agent-based technologies for multiscale and multi-dimensional systems, which represent the recent innovative contributions made in space plasma research.

Index to Simulation Literature, 1976-1981 - Per A. Holst 1982

Bond Graphs for Modelling, Control and Fault Diagnosis of Engineering Systems - Wolfgang Borutzky
2016-12-31

This book presents theory and latest application work in Bond Graph methodology with a focus on: • Hybrid dynamical system models, • Model-based fault diagnosis, model-based fault tolerant control, fault prognosis • and also addresses • Open thermodynamic systems with compressible fluid flow, • Distributed parameter models of mechanical subsystems. In addition, the book covers various applications of current interest ranging from motorised wheelchairs, in-vivo surgery robots, walking machines to wind-turbines. The up-to-date presentation has been made possible by experts who are active members of the worldwide bond graph modelling community. This book is the completely revised 2nd edition of the 2011 Springer compilation text titled Bond Graph Modelling of Engineering Systems – Theory, Applications and Software Support. It extends the presentation of theory and applications of graph methodology by new developments and latest research results. Like the first edition, this book addresses readers in academia as well as practitioners in industry and invites experts in related fields to consider the potential and the state-of-the-art of bond graph modelling.

Cross-Scale Coupling and Energy Transfer in the Magnetosphere-Ionosphere-Thermosphere System - Yukitoshi Nishimura 2021-12-07

Cross-Scale Coupling and Energy Transfer in the Magnetosphere-Ionosphere-Thermosphere System provides a systematic understanding of Magnetosphere-Ionosphere-Thermosphere dynamics. Cross-scale coupling has become increasingly important in the Space Physics community. Although large-scale processes can specify the averaged state of the system reasonably well, they cannot accurately describe localized and rapidly varying structures in space in actual events. Such localized and variable structures can be as intense as the large-scale features. This book covers observations on quantifying coupling and energetics and simulation on evaluating impacts of cross-scale processes. It includes an in-depth review and summary of the current status of multi-scale coupling processes, fundamental physics, and concise illustrations and plots that are usable in tutorial presentations and classrooms. Organized by physical quantities in the system, Cross-Scale Coupling and Energy Transfer in the Magnetosphere-Ionosphere-Thermosphere System reviews recent advances in cross-scale coupling and energy transfer processes, making it an important resource for space physicists and researchers working on the magnetosphere, ionosphere, and thermosphere. Describes frontier science and major science around M-I-T coupling, allowing for foundational understanding of this emerging field in space physics Reviews recent and key findings in the cutting-edge of the science Discusses open questions and pathways for understanding how the field is evolving

Energy Modeling II - 1980

Creo Simulate Tutorial Release 1.0 & 2.0 - Roger Toogood 2012

Creo Simulate Tutorial Releases 1.0 & 2.0 introduces new users to finite element analysis using Creo Simulate and how it can be used to analyze a variety of problems. The tutorial lessons cover the major concepts and frequently used commands required to progress from a novice to an intermediate user level. The commands are presented in a click-by-click manner using simple examples and exercises that illustrate a broad range of the analysis types that can be performed. In addition to showing the command usage, the text will explain why certain commands are being used and, where appropriate, the relation of commands to the overall Finite Element Analysis (FEA) philosophy are explained. Moreover, since error analysis is an important skill, considerable time is spent exploring the created models so that users will become comfortable with the “debugging” phase of modeling. This textbook is written for first-time FEA users in general and Creo Simulate users in particular. After a brief introduction to finite element modeling, the tutorial introduces the major concepts behind the use of Creo Simulate to perform Finite Element Analysis of parts. These include: modes of operation, element types, design studies (analysis, sensitivity studies, organization), and the major steps for setting up a model (materials, loads, constraints, analysis type), studying convergence of the solution, and viewing the results. Both 2D and 3D problems are treated. This tutorial deals exclusively with operation in integrated mode with Creo Parametric. It is suitable for use with both Releases 1.0 and 2.0 of Creo Simulate.

Modeling, Analysis and Optimization of Process and Energy Systems - F. Carl Knopf 2011-12-14

Energy costs impact the profitability of virtually all industrial processes. Stressing how plants use power, and how that power is actually generated, this book provides a clear and simple way to understand the energy usage in various processes, as well as methods for optimizing these processes using practical hands-on simulations and a unique approach that details solved problems utilizing actual plant data. Invaluable information offers a complete energy-saving approach essential for both the chemical and mechanical engineering curricula, as well as for practicing engineers.

Airborne Wind Energy - Uwe Ahrens 2013-10-01

This reference offers an overview of the field of airborne wind energy. As the first book of its kind, it provides a consistent compilation of the fundamental theories, a compendium of current research and development activities as well as economic and regulatory aspects. In five parts, the book demonstrates the relevance of Airborne Wind Energy and the role that this emerging field of technology can play for the transition towards a renewable energy economy. Part I on "Fundamentals" contains seven general chapters explaining the principles of airborne wind energy and its different variants, of meteorology, the history of kites and financing strategies. Part II on "System Modeling, Optimization and Control" contains eight contributions that develop and use detailed dynamic models for simulation, optimization, and control of airborne wind energy systems,

while Part III on "Analysis of Flexible Kite Dynamics" collects four chapters that focus on the particularly challenging simulation problems related to flexible kites. Part IV "Implemented Concepts" contains eleven contributions each of which presents developed prototypes together with real-world experimental results obtained with the different concepts. Finally, in Part V on "Component Design", five papers are collected that address in detail the technical challenges for some of the components of airborne wind energy. Airborne Wind Energy presents all basics in a single source to someone starting to explore wind power in the upper atmosphere and serves as a valuable reference for researchers, scientists, professionals and students active in the innovative field of Airborne Wind Energy.

Principles of Object-Oriented Modeling and Simulation with Modelica 2.1 - Peter Fritzson 2010-08-31

Provides an introduction to modern object-oriented design principles and applications for the fast-growing area of modeling and simulation Covers the topic of multi-domain system modeling and design with applications that have components from several areas Serves as a reference for the Modelica language as well as a comprehensive overview of application model libraries for a number of application domains

Foundations of Osteopathic Medicine - Anthony G. Chila 2010

Thoroughly revised for its Third Edition, "Foundations of Osteopathic Medicine" is the most comprehensive, current osteopathic text. This edition features expanded coverage of international practice and includes a new chapter on the structure of the profession.

Basic Tutorial on Simulation of Microgrids Control Using MATLAB® & Simulink® Software - Flávia de Andrade 2020-03-03

This book offers a detailed guide to the design and simulation of basic control methods applied to microgrids in various operating modes, using MATLAB® Simulink® software. It includes discussions on the performance of each configuration, as well as the advantages and limitations of the droop control method. The content is organised didactically, with a level of mathematical and scientific rigour suitable for undergraduate and graduate programmes, as well as for industry professionals. The use of MATLAB® Simulink® software facilitates the learning process with regard to modelling and simulating power electronic converters at the interface of distributed energy resource (DER) systems. The book also features a wealth of illustrations, schematics, and simulation results. Given its scope, it will greatly benefit undergraduate and graduate students in the fields of electrical and electronics engineering, as well as professionals working in microgrid design and implementation.

Geoenergy Modeling I - Norbert Böttcher 2016-06-27

This introduction to geothermal modeling deals with flow and heat transport processes in porous and fractured

media related to geothermal energy applications. Following background coverage of geothermal resources and utilization in several countries, the basics of continuum mechanics for heat transport processes, as well as numerical methods for solving underlying governing equations are discussed. This examination forms the theoretical basis for five included step-by-step OpenGeoSys exercises, highlighting the most important computational areas within geothermal resource utilization, including heat diffusion, heat advection in porous and fractured media, and heat convection. The book concludes with an outlook on practical follow-up contributions investigating the numerical simulation of shallow and deep geothermal systems.

Building Energy Simulation - Vishal Garg 2020-08-17

The second edition of Building Energy Simulation includes studies of various components and systems of buildings and their effect on energy consumption, with the help of DesignBuilder™, a front-end for the EnergyPlus simulation engine, supported by examples and exercises. The book employs a "learning by doing" methodology. It explains simulation-input parameters and how-to-do analysis of the simulation output, in the process explaining building physics and energy simulation. Divided into three sections, it covers the fundamentals of energy simulation followed by advanced topics in energy simulation and simulation for compliance with building codes and detailed case studies for comprehensive building energy simulation. Features: Focuses on learning building energy simulation while being interactive through examples and exercises. Explains the building physics and the science behind the energy performance of buildings. Encourages an integrated design approach by explaining the interactions between various building systems and their effect on energy performance of building. Discusses a how-to model for building energy code compliance including three projects to practice whole building simulation. Provides hands-on training of building energy simulation tools: DesignBuilder™ and EnergyPlus. Includes practical projects problems, appendices and CAD files in the e-resources section. Building Energy Simulation is intended for students and researchers in building energy courses, energy simulation professionals, and architects.

TIMS/ORSA Bulletin - Institute of Management Sciences 1992

Energy-Efficient Driving of Road Vehicles - Antonio Sciarretta 2019-08-01

This book elaborates the science and engineering basis for energy-efficient driving in conventional and autonomous cars. After covering the physics of energy-efficient motion in conventional, hybrid, and electric powertrains, the book chiefly focuses on the energy-saving potential of connected and automated vehicles. It reveals how being connected to other vehicles and the infrastructure enables the anticipation of upcoming driving-relevant factors, e.g. hills, curves, slow traffic, state of traffic signals, and movements of nearby

vehicles. In turn, automation allows vehicles to adjust their motion more precisely in anticipation of upcoming events, and to save energy. Lastly, the energy-efficient motion of connected and automated vehicles could have a harmonizing effect on mixed traffic, leading to additional energy savings for neighboring vehicles. Building on classical methods of powertrain modeling, optimization, and optimal control, the book further develops the theory of energy-efficient driving. In addition, it presents numerous theoretical and applied case studies that highlight the real-world implications of the theory developed. The book is chiefly intended for undergraduate and graduate engineering students and industry practitioners with a background in mechanical, electrical, or automotive engineering, computer science or robotics.

Advances and New Trends in Environmental and Energy Informatics - Jorge Marx Gomez 2015-12-24

This book presents the latest findings and ongoing research in the field of green information systems and green information and communication technology (ICT). It provides insights into a whole range of cross-cutting topics in ICT and environmental sciences as well as showcases how information and communication technologies allow environmental and energy efficiency issues to be handled effectively. The papers presented in this book are a selection of extended and improved contributions to the 28th International Conference on Informatics for Environmental Protection dedicated to ICT for energy efficiency. This book is essential and particularly worth reading for those who already gained basic knowledge and want to deepen and extend their expertise in the subjects mentioned above.

Models of Thermochemical Heat Storage - Christoph Lehmann 2018-01-23

Thermochemical gas-solid reactions, as well as adsorption processes, are currently of significant interest for the design of heat storage systems. This book provides detailed models of these reactions and processes that account for heat and mass transport, chemical and physical reactions, and possible local thermal non-equilibrium. The underlying scientific theory behind the models is explained, laboratory tests are simulated, and methods for high-performance computing are discussed. Applications ranging from seasonal domestic heat storage to diurnally operating systems in concentrating solar power facilities are considered in these models, which are not available through any other sources. Finally, an outlook on future developments highlights emerging technologies.

Validation and Assessment Issues on Energy Models - Saul I. Gass 1980

Financial Derivative and Energy Market Valuation - Michael Mastro, PhD 2013-02-19

A road map for implementing quantitative financial models Financial Derivative and Energy Market Valuation brings the application of financial models to a higher level by helping readers capture the true behavior of

energy markets and related financial derivatives. The book provides readers with a range of statistical and quantitative techniques and demonstrates how to implement the presented concepts and methods in Matlab®. Featuring an unparalleled level of detail, this unique work provides the underlying theory and various advanced topics without requiring a prior high-level understanding of mathematics or finance. In addition to a self-contained treatment of applied topics such as modern Fourier-based analysis and affine transforms, *Financial Derivative and Energy Market Valuation* also:

- Provides the derivation, numerical implementation, and documentation of the corresponding Matlab for each topic
- Extends seminal works developed over the last four decades to derive and utilize present-day financial models
- Shows how to use applied methods such as fast Fourier transforms to generate statistical distributions for option pricing
- Includes all Matlab code for readers wishing to replicate the figures found throughout the book

Thorough, practical, and easy to use, *Financial Derivative and Energy Market Valuation* is a first-rate guide for readers who want to learn how to use advanced numerical methods to implement and apply state-of-the-art financial models. The book is also ideal for graduate-level courses in quantitative finance, mathematical finance, and financial engineering.

Energy-Efficient Wireless Sensor Networks - Vidushi Sharma 2017-07-28

The advances in low-power electronic devices integrated with wireless communication capabilities are one of recent areas of research in the field of Wireless Sensor Networks (WSNs). One of the major challenges in WSNs is uniform and least energy dissipation while increasing the lifetime of the network. This is the first book that introduces the energy efficient wireless sensor network techniques and protocols. The text covers the theoretical as well as the practical requirements to conduct and trigger new experiments and project ideas. The advanced techniques will help in industrial problem solving for energy-hungry wireless sensor network applications.

Modeling the Power Consumption and Energy Efficiency of Telecommunications Networks - Kerry James Hinton 2021-10-29

This book introduces the technical foundations and tools for estimating the power consumption of internet networks and services, including a detailed description of how these models are constructed and applied. *Modeling the Power Consumption and Energy Efficiency of Telecommunications Networks* can be used to gain insight into the construction of mathematical models that provide realistic estimates of the power consumption of internet networks and services. This knowledge enables forecasting the energy footprint of future networks and services to integrate sustainability and environmental considerations into network planning and design. **FEATURES** Provides the motivation for developing mathematical models for telecommunications network and service power consumption and energy efficiency modeling Presents factors

impacting overall network and service power consumption Discusses the types of network equipment and their power consumption profiles Reviews the basics of power modeling, including network segmentation, traffic forecasting, top-down and bottom-up models, wired and wireless networks, data centers and servers Explores the application of energy efficiency metrics for equipment, networks, and services This book is aimed at students and technologists as well as technology managers and policy makers. This book will be of value to any organization that wishes to estimate the energy footprint of the use of information and communications technologies. This book can also be integrated into a course on the sustainability of information and communications technologies.

Energy Abstracts for Policy Analysis - 1981

Energy Saving Melting and Revert Reduction Technology (E-SMARRT) - 2011

As a net shape process, die casting is intrinsically efficient and improvements in energy efficiency are strongly dependent on design and process improvements that reduce scrap rates so that more of the total consumed energy goes into acceptable, usable castings. A casting that is distorted and fails to meet specified dimensional requirements is typically remelted but this still results in a decrease in process yield, lost productivity, and increased energy consumption. This work focuses on developing, and expanding the use of, computer modeling methods that can be used to improve the dimensional accuracy of die castings and produce die designs and machine/die setups that reduce rejection rates due to dimensional issues. A major factor contributing to the dimensional inaccuracy of the casting is the elastic deformations of the die cavity caused by the thermo mechanical loads the dies are subjected to during normal operation. Although thermal and die cavity filling simulation are widely used in the industry, structural modeling of the die, particularly for managing part distortion, is not yet widely practiced. This may be due in part to the need to have a thorough understanding of the physical phenomenon involved in die distortion and the mathematical theory employed in the numerical models to efficiently model the die distortion phenomenon. Therefore, two of the goals of this work are to assist in efforts to expand the use of structural modeling and related technologies in the die casting industry by 1) providing a detailed modeling guideline and tutorial for those interested in developing the necessary skills and capability and 2) by developing simple meta-models that capture the results and experience gained from several years of die distortion research and can be used to predict key distortion phenomena of relevance to a die caster with a minimum of background and without the need for simulations. These objectives were met. A detailed modeling tutorial was provided to NADCA for distribution to the industry. Power law based meta-models for predicting machine tie bar loading and for predicting maximum

parting surface separation were successfully developed and tested against simulation results for a wide range of machines and experimental data. The models proved to be remarkably accurate, certainly well within the requirements for practical application. In addition to making die structural modeling more accessible, the work advanced the state-of-the-art by developing improved modeling of cavity pressure effects, which is typically modeled as a hydrostatic boundary condition, and performing a systematic analysis of the influence of ejector die design variables on die deflection and parting plane separation. This cavity pressure modeling objective met with less than complete success due to the limits of current finite element based fluid structure interaction analysis methods, but an improved representation of the casting/die interface was accomplished using a combination of solid and shell elements in the finite element model. This approximation enabled good prediction of final part distortion verified with a comprehensive evaluation of the dimensions of test castings produced with a design experiment. An extra deliverable of the experimental work was development of high temperature mechanical properties for the A380 die casting alloy. The ejector side design objective was met and the results were incorporated into the metamodels described above. This new technology was predicted to result in an average energy savings of 2.03 trillion BTU's/year over a 10 year period. Current (2011) annual energy saving estimates over a ten year period, based on commercial introduction in 2009, a market penetration of 70% by 2014 is 4.26 trillion BTU's/year by 2019. Along with these energy savings, reduction of scrap and improvement in casting yield will result in a reduction of the environmental emissions associated with the melting and pou ...

Creo Simulate 6.0 Tutorial - Roger Toogood 2019-06

Creo Simulate 6.0 Tutorial introduces new users to finite element analysis using Creo Simulate and how it can be used to analyze a variety of problems. The tutorial lessons cover the major concepts and frequently used commands required to progress from a novice to an intermediate user level. The commands are presented in a click-by-click manner using simple examples and exercises that illustrate a broad range of the analysis types that can be performed. In addition to showing the command usage, the text will explain why certain commands are being used and, where appropriate, the relation of commands to the overall Finite Element Analysis (FEA) philosophy are explained. Moreover, since error analysis is an important skill, considerable time is spent exploring the created models so that users will become comfortable with the “debugging” phase of modeling. This textbook is written for first-time FEA users in general and Creo Simulate users in particular. After a brief introduction to finite element modeling, the tutorial introduces the major concepts behind the use of Creo Simulate to perform Finite Element Analysis of parts. These include modes of operation, element types, design studies (analysis, sensitivity studies, organization), and the major steps for setting up a model

(materials, loads, constraints, analysis type), studying convergence of the solution, and viewing the results. Both 2D and 3D problems are covered. This tutorial deals exclusively with operation in integrated mode with Creo Parametric. It is suitable for use with both Releases 6.0 of Creo Simulate. The tutorials consist of the following: • 2 lessons on general introductory material • 2 lessons introducing the basic operations in Creo Simulate using solid models • 4 lessons on model idealizations (shells, beams and frames, plane stress, etc) • 1 lesson on miscellaneous topics • 1 lesson on steady and transient thermal analysis

Conflicting Models for the Origin of Life - Stoyan K. Smoukov 2023-03-21

Conflicting Models for the Origin of Life Conflicting Models for the Origin of Life provides a forum to compare and contrast the many hypotheses that have been put forward to explain the origin of life. There is a revolution brewing in the field of Origin of Life: in the process of trying to figure out how Life started, many researchers believe there is an impending second creation of life, not necessarily biological. Up-to-date understanding is needed to prepare us for the technological, and societal changes it would bring. Schrodinger's 1944 “What is life?” included the insight of an information carrier, which inspired the discovery of the structure of DNA. In “Conflicting Models of the Origin of Life” a selection of the world's experts are brought together to cover different aspects of the research: from progress towards synthetic life – artificial cells and sub-cellular components, to new definitions of life and the unexpected places life could (have) emerge(d). Chapters also cover fundamental questions of how memory could emerge from memoryless processes, and how we can tell if a molecule may have emerged from life. Similarly, cutting-edge research discusses plausible reactions for the emergence of life both on Earth and on exoplanets. Additional perspectives from geologists, philosophers and even roboticists thinking about the origin of life round out this volume. The text is a state-of-the-art snapshot of the latest developments on the emergence of life, to be used both in graduate classes and by citizen scientists. Audience Researchers in any area of astrobiology, as well as others interested in the origins of life, will find a modern and current review of the field and the current debates and obstacles. This book will clearly illustrate the current state-of-the-art and engage the imagination and creativity of experts across many disciplines.

Advancements in Real-Time Simulation of Power and Energy Systems - Panos Kotsampopoulos 2021-05-20

Modern power and energy systems are characterized by the wide integration of distributed generation, storage and electric vehicles, adoption of ICT solutions, and interconnection of different energy carriers and consumer engagement, posing new challenges and creating new opportunities. Advanced testing and validation methods are needed to efficiently validate power equipment and controls in the contemporary complex environment and support the transition to a cleaner and sustainable energy system. Real-time

hardware-in-the-loop (HIL) simulation has proven to be an effective method for validating and de-risking power system equipment in highly realistic, flexible, and repeatable conditions. Controller hardware-in-the-loop (CHIL) and power hardware-in-the-loop (PHIL) are the two main HIL simulation methods used in industry and academia that contribute to system-level testing enhancement by exploiting the flexibility of digital simulations in testing actual controllers and power equipment. This book addresses recent advances in real-time HIL simulation in several domains (also in new and promising areas), including technique improvements to promote its wider use. It is composed of 14 papers dealing with advances in HIL testing of power electronic converters, power system protection, modeling for real-time digital simulation, co-simulation, geographically distributed HIL, and multiphysics HIL, among other topics.

Systemic Design Methodologies for Electrical Energy Systems - Xavier Roboam 2012-12-17

This book proposes systemic design methodologies applied to electrical energy systems, in particular analysis and system management, modeling and sizing tools. It includes 8 chapters: after an introduction to the systemic approach (history, basics & fundamental issues, index terms) for designing energy systems, this book presents two different graphical formalisms especially dedicated to multidisciplinary devices modeling, synthesis and analysis: Bond Graph and COG/EMR. Other systemic analysis approaches for quality and stability of systems, as well as for safety and robustness analysis tools are also proposed. One chapter is dedicated to energy management and another is focused on Monte Carlo algorithms for electrical systems and networks sizing. The aim of this book is to summarize design methodologies based in particular on a systemic viewpoint, by considering the system as a whole. These methods and tools are proposed by the

most important French research laboratories, which have many scientific partnerships with other European and international research institutions. Scientists and engineers in the field of electrical engineering, especially teachers/researchers because of the focus on methodological issues, will find this book extremely useful, as will PhD and Masters students in this field.

Energy, Natural Resources and Environmental Economics - Endre Bjørndal 2010-09-14

This book consists of a collection of articles describing the emerging and integrated area of Energy, Natural Resources and Environmental Economics. A majority of the authors are researchers doing applied work in economics, finance, and management science and are based in the Nordic countries. These countries have a long tradition of managing natural resources. Many of the applications are therefore founded on such examples. The book contents are based on a workshop that took place during May 15–16, 2008 in Bergen, Norway. The aim of the workshop was to create a meeting place for researchers who are active in the area of Energy, Natural Resource, and Environmental Economics, and at the same time celebrate Professor Kurt Jorns' 60th birthday. The book is divided into four parts. The first part considers petroleum and natural gas applications, taking up topics ranging from the management of incomes and reserves to market modeling and value chain optimization. The second and most extensive part studies applications from electricity markets, including analyses of market prices, risk management, various optimization problems, electricity market design, and regulation. The third part describes different applications in logistics and management of natural resources. Finally, the fourth part covers more general problems and methods arising within the area.