Comsol For Engineers

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no detailed description available for comsol for engineers

this updated edition 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 book provides a collection of examples and modeling guidelines through which readers can build their own models 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 and 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

this book gives the reader a brief introduction to the comsol multiphysics software tool building comsol multiphysics models in 2d or 3d will help students to consolidate their skills by applying basic theory to the real modelling of tasks that in the recent past would require months of programming and dedicated projects to solve a single problem the examples illustrated in this book include modelling of heat transfer the migration of a radioactive species in a channel using the navier stokes equations and a chemical heterogenous reactor these are problems that tend to be rather abstract until such time as a student applies these fundamental equations in practice advanced coupling between phenomena in fields such as electromagnetics with others such as heat transfer and computational fluid flow is made easy in comsol multiphysics a short introduction to the basics concepts and techniques will allow the reader to progress rapidly and start developing his her own models in the second part of this book some of the models developed in the first part are used to create model applications that can even run on a mobile phone about the authors antónio de campos pereira phd in physics is an author and consultant he is a retired researcher from the dept of physics at stockholm university prof isabel paiva ph d in chemical engeneering is a researcher at c2tn at ist the school of engineering of the university of lisbon marcus inácio has a b sc in electrotechnical engineering and is specialising in the field of medical physics at kth the royal institute of technology in stockholm sweden hugo de campos pereira is an environmental engineer from uppsala university and a ph d student specialising in the sorption of highly fluorinated compounds in soils at the department of soil and environment at slu the swedish university of agricultural sciences in uppsala sweden

comsol5 multiphysics is one of the most valuable software modeling tools for engineers and scientists this book introduces multiphysics modeling techniques and examples accompanied by practical applications using comsol5 x 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

this textbook covers computational fluid dynamics simulation using comsol multiphysics modeling software in chemical engineering applications in the volume the comsol multiphysics package is introduced and applied to solve typical problems in chemical reactors transport processes fluid flow and heat and mass transfer inspired by the difficulties of introducing the use of comsol multiphysics software during classroom time the book incorporates the author s experience of working with undergraduate graduate and postgraduate students to make the book user friendly and that at the same time addresses typical examples within the subjects covered in the chemical engineering curriculum real world problems require the use of simulation and optimization tools and this volume shows how comsol multiphysics software can be used for that purpose key features includes over 500 step by step screenshots shows the graphical user interface of comsol which does not require any programming effort provides chapter end problems for extensive practice along with solutions includes actual examples of chemical reactors transport processes fluid flow and heat and mass transfer this book is intended for students who want or need more

help to solve chemical engineering assignments using computer software it can also be used for computational courses in chemical engineering it will also be a valuable resource for professors research scientists and practicing engineers

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

step by step instructions enable chemical engineers to master key software programs and solve complex problems today both students and professionals in chemical engineering must solve increasingly complex problems dealing with refineries fuel cells microreactors and pharmaceutical plants to name a few with this book as their guide readers learn to solve these problems using their computers and excel matlab aspen plus and comsol multiphysics moreover they learn how to check their solutions and validate their results to make sure they have solved the problems correctly now in its second edition introduction to chemical engineering computing is based on the author s firsthand teaching experience as a result the emphasis is on problem solving simple introductions help readers become conversant with each program and then tackle a broad range of problems in chemical engineering including equations of state chemical reaction equilibria mass balances with recycle streams thermodynamics and simulation of mass transfer equipment process simulation fluid flow in two and three dimensions all the chapters contain clear instructions figures and examples to guide readers through all the programs and types of chemical engineering problems problems at the end of each chapter ranging from simple to difficult allow readers to gradually build their skills whether they solve the problems themselves or in teams in addition the book s accompanying website lists the core principles learned from each problem both from a chemical engineering and a computational perspective covering a broad range of disciplines and problems within chemical engineering introduction to chemical engineering computing is recommended for both undergraduate and graduate students as well as practicing engineers who want to know how to choose the right computer software program and tackle almost any chemical engineering problem

the essential textbook for mastering chemical reaction engineering now fully updated with expanded coverage of electrochemical reactors h scott fogler s elements of chemical reaction engineering now in its seventh edition continues to set the standard as the leading textbook in chemical reaction engineering this edition coauthored by bryan r goldsmith eranda nikolla and nirala singh still offers fogler s engaging and active learning experience with updated content and expanded coverage of electrochemical reactors reflecting current theories and practices and with a continuing emphasis on safety and sustainability this edition includes expanded sections on

molecular simulation methods analysis of experimental reactor data and catalytic reactions leveraging the power of wolfram python polymath and matlab students can explore the intricacies of reactions and reactors through realistic simulation experiments this hands on approach allows students to clearly understand the practical applications of theoretical concepts this book prepares undergraduate students to apply chemical reaction kinetics and physics to the design of chemical reactors advanced chapters cover graduate level topics including diffusion and reaction models residence time distribution and tools to model non ideal reactors the seventh edition includes an expanded section on molecular simulation methods and potential energy surfaces updated examples of experimental reactor data and its analysis detailed discussion of definitions in catalysis and examples of catalytic reactions additional examples and an expanded section on surface reaction mechanisms and microkinetic modeling a new chapter on electrochemical reactors with example problems reflecting the growing importance of this field in renewable energy and industrial processes about the companion site umich edu elements 7e index html comprehensive powerpoint slides for lecture notes for chemical reaction engineering classes links to additional software including polymathtm matlabtm python wolfram mathematicatm aspentechtm and comsoltm interactive learning resources linked to each chapter including learning objectives summary notes modules interactive computer games solved problems faqs additional homework problems and links to learncheme and other resources living example problems provide interactive simulations allowing students to explore the examples and ask what if questions professional reference shelf which includes advanced content on reactors weighted least squares experimental planning pharmacokinetics detailed explanations of key derivations and more redesigned site to increase accessibility register your book for convenient access to downloads updates and or corrections as they become available see inside book for details

the chemical engineer s practical guide to fluid mechanics now includes comsol multiphysics 5 since most chemical processing applications are conducted either partially or totally in the fluid phase chemical engineers need mastery of fluid mechanics such knowledge is especially valuable in the biochemical chemical energy fermentation materials mining petroleum pharmaceuticals polymer and waste processing industries fluid mechanics for chemical engineers with microfluidics cfd and comsol multiphysics 5 third edition systematically introduces fluid mechanics from the perspective of the chemical engineer who must understand actual physical behavior and solve real world problems building on the book that earned choice magazine s outstanding academic title award this edition also gives a comprehensive introduction to the popular comsol multiphysics 5 software this third edition contains extensive coverage of both microfluidics and computational fluid dynamics systematically demonstrating cfd through detailed examples using comsol multiphysics 5 and ansys fluent the chapter on turbulence now presents valuable cfd techniques to investigate practical situations such as turbulent mixing and recirculating flows part i offers a clear succinct easy to follow introduction to macroscopic fluid mechanics including physical properties hydrostatics basic rate laws and fundamental principles of flow through equipment part ii turns to microscopic fluid mechanics differential equations of fluid mechanics viscous flow problems some including polymer processing laplace s equation irrotational and porous media flows nearly unidirectional flows from boundary layers to lubrication calendering and thin film applications turbulent flows showing how the k method extends conventional mixing length theory bubble motion two phase flow and

fluidization non newtonian fluids including inelastic and viscoelastic fluids microfluidics and electrokinetic flow effects including electroosmosis electrophoresis streaming potentials and electroosmotic switching computational fluid mechanics with ansys fluent and comsol multiphysics nearly 100 completely worked practical examples include 12 new comsol 5 examples boundary layer flow non newtonian flow jet flow die flow lubrication momentum diffusion turbulent flow and others more than 300 end of chapter problems of varying complexity are presented including several from university of cambridge exams the author covers all material needed for the fluid mechanics portion of the professional engineer s exam the author s website fmche engin umich edu provides additional notes problem solving tips and errata register your book for convenient access to downloads updates and or corrections as they become available see inside book for details

this book gives the reader a quick introduction to the application builder tool in comsol multiphysics this tool allows the user to build apps that are tailored to the needs of other engineers or scientists who are not specialists in modelling using comsol multiphysics but who need to use simulations in their work to predict design or analyse the technical or economic potential of prototypes of industrial devices and other products or in the planning of large scale projects such as the types of projects that environmental engineers are usually confronted with these users need not be aware of the complex details of the underlying mathematical models when using application builder apps to contribute to their organisations or to the development and implementation of products for the market

fins have been used historically as reliable design features for thermal management which continues to be an important problem in engineering today this book develops heat transfer models for progressively complex fin designs mathematicians engineers and analysts may equally benefit from the content as it provides the reader with numerical and analytical tools to approach general and thermal management heat transfer problems the main focus is on the comsol multiphysics heat transfer module however the fundamentals may be applied to other commercial packages such as ansys and abaqus the content can be utilized in a variety of engineering disciplines including mechanical aerospace biomedical chemical civil and electrical etc features includes numerous example models that enable the reader to implement conceptual material in practical scenarios with broad industrial applications uses comsol multiphysics version 5 3 in combination with the heat transfer module to set up and carry out the numerical analysis for the models presented in the book presents mathematical methods related to the problems includes a companion disc with models and custom apps created with comsol application builder available by emailing info merclearning com with proof of purchase if e version

14th nordic baltic conference on biomedical engineering and medical physics nbc 2008 brought together scientists not only from the nordic baltic region but from the entire world this volume presents the proceedings of this international conference jointly organized by the latvian medical engineering and physics society riga technical university and university of latvia in close cooperation with international federation of medical and biological engineering ifmbe the topics covered by the conference proceedings include biomaterials and tissue engineering biomechanics artificial organs implants and rehabilitation biomedical instrumentation and measurements biosensors and transducers biomedical optics and lasers healthcare management education and

training information technology to health medical imaging telemedicine and e health medical physics micro and nanoobjects nanostructured systems biophysics

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comsol 5 and matlab are valuable software modeling tools for engineers and scientists this book explores a wide range of models in coordinate systems from 0d to 3d and introduces the numerical analysis techniques employed in comsol 5 including application builder 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 dvd includes 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 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 a dvd 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

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