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Engineering Optimization - S. S. Rao 2000

A Rigorous Mathematical Approach To Identifying A Set Of Design Alternatives And Selecting The Best Candidate From Within That Set, Engineering Optimization Was Developed As A Means Of Helping Engineers To Design Systems That Are Both More Efficient And Less Expensive And To Develop New Ways Of Improving The Performance Of Existing Systems.Thanks To The Breathtaking Growth In Computer

Technology That Has Occurred Over The Past Decade, Optimization Techniques Can Now Be Used To Find Creative Solutions To Larger, More Complex Problems Than Ever Before. As A Consequence, Optimization Is Now Viewed As An Indispensable Tool Of The Trade For Engineers Working In Many Different Industries, Especially The Aerospace, Automotive, Chemical, Electrical, And Manufacturing Industries.In Engineering Optimization, Professor Singiresu S. Rao

Provides An Application-Oriented Presentation Of The Full Array Of Classical And Newly Developed Optimization Techniques Now Being Used By Engineers In A Wide Range Of Industries. Essential Proofs And Explanations Of The Various Techniques Are Given In A Straightforward, User-Friendly Manner, And Each Method Is Copiously Illustrated With Real-World Examples That Demonstrate How To Maximize Desired Benefits While Minimizing Negative Aspects Of Project Design. Comprehensive, Authoritative, Up-To-Date, Engineering Optimization Provides In-Depth Coverage Of Linear And Nonlinear Programming, Dynamic Programming, Integer Programming, And Stochastic Programming Techniques As Well As Several Breakthrough Methods, Including Genetic Algorithms, Simulated Annealing, And Neural Network-Based And Fuzzy Optimization Techniques. Designed To Function Equally Well As Either A Professional Reference Or A Graduate-Level Text, Engineering Optimization Features Many Solved Problems Taken From Several Engineering Fields, As Well As Review Questions, Important Figures, And Helpful References. Engineering Optimization Is A Valuable Working Resource For Engineers Employed In Practically All Technological Industries. It Is Also A Superior Didactic Tool For Graduate Students Of Mechanical, Civil, Electrical, Chemical And Aerospace Engineering.

Chemical Process Design and Integration - Robin Smith 2016-08-08
Written by a highly regarded author with industrial and academic experience, this new edition of an established bestselling book provides practical guidance for students, researchers, and those in chemical engineering. The book includes a new section on sustainable energy, with sections on carbon capture and sequestration, as a result of increasing environmental awareness; and a companion website that includes problems, worked solutions, and Excel spreadsheets to enable students to carry out complex calculations.

12th International Symposium on Process Systems Engineering and 25th European Symposium on Computer Aided Process Engineering - 2015-05-28
25th European Symposium on Computer-Aided Process Engineering contains the papers presented at the 12th Process Systems Engineering (PSE) and 25th European Society of Computer Aided Process Engineering (ESCAPE) Joint Event held in Copenhagen, Denmark, 31 May - 4 June 2015. The purpose of these series is to bring together the international community of researchers and engineers who are interested in computing-based methods in process engineering. This conference highlights the contributions of the PSE/CAPE community towards the sustainability of modern society. Contributors from academia and industry establish the

core products of PSE/CAPE, define the new and changing scope of our results, and future challenges. Plenary and keynote lectures discuss real-world challenges (globalization, energy, environment, and health) and contribute to discussions on the widening scope of PSE/CAPE versus the consolidation of the core topics of PSE/CAPE. Highlights how the Process Systems Engineering/Computer-Aided Process Engineering community contributes to the sustainability of modern society Presents findings and discussions from both the 12th Process Systems Engineering (PSE) and 25th European Society of Computer-Aided Process Engineering (ESCAPE) Events Establishes the core products of Process Systems Engineering/Computer Aided Process Engineering Defines the future challenges of the Process Systems Engineering/Computer Aided Process Engineering community

Online Optimization of Large Scale Systems - Martin Grötschel 2013-03-14

In its thousands of years of history, mathematics has made an extraordinary career. It started from rules for bookkeeping and computation of areas to become the language of science. Its potential for decision support was fully recognized in the twentieth century only, vitally aided by the evolution of computing and communication technology. Mathematical optimization, in particular, has developed into a powerful machinery to help planners. Whether costs are to be reduced, profits to be

maximized, or scarce resources to be used wisely, optimization methods are available to guide decision making. Optimization is particularly strong if precise models of real phenomena and data of high quality are at hand - often yielding reliable automated control and decision procedures. But what, if the models are soft and not all data are around? Can mathematics help as well? This book addresses such issues, e. g. , problems of the following type: - An elevator cannot know all transportation requests in advance. In which order should it serve the passengers? - Wing profiles of aircrafts influence the fuel consumption. Is it possible to continuously adapt the shape of a wing during the flight under rapidly changing conditions? - Robots are designed to accomplish specific tasks as efficiently as possible. But what if a robot navigates in an unknown environment? - Energy demand changes quickly and is not easily predictable over time. Some types of power plants can only react slowly.

European Symposium on Computer Aided Process Engineering - 12 - J. Grievink 2002-04-29

This book contains 182 papers presented at the 12th Symposium of Computer Aided Process Engineering (ESCAPE-12), held in The Hague, The Netherlands, May 26-29, 2002. The objective of ESCAPE-12 is to highlight advances made in the development and use of computing methodologies and information technology in the area of Computer Aided

Process Engineering and Process Systems Engineering. The Symposium addressed six themes: (1) Integrated Product&Process Design; (2) Process Synthesis & Plant Design; (3) Process Dynamics & Control; (4) Manufacturing & Process Operations; (5) Computational Technologies; (6) Sustainable CAPE Education and Careers for Chemical Engineers. These themes cover the traditional core activities of CAPE, and also some wider conceptual perspectives, such as the increasing interplay between product and process design arising from the often complex internal structures of modern products; the integration of production chains creating the network structure of the process industry and optimization over life span dimensions, taking sustainability as the ultimate driver.

Sorption Processes and Pollution - Grégorio Crini 2010

Intelligent Tuning and Adaptive Control - R. Devanathan 2014-05-23

This volume contains 67 papers reporting on the state-of-the-art research in the fields of adaptive control and intelligent tuning. Papers include applications in robotics, the processing industries and machine control.

Soft Computing Applications in Industry - Bhanu Prasad 2008-02-13

Softcomputing techniques play a vital role in the industry. This book presents several important papers presented by some of the well-known scientists from all over the globe. The main techniques of soft computing

presented include ant-colony optimization, artificial immune systems, artificial neural networks, Bayesian models. The book includes various examples and application domains such as bioinformatics, detection of phishing attacks, and fault detection of motors.

Engineering Optimization - Singiresu S. Rao 2009-07-20

Technology/Engineering/Mechanical Helps you move from theory to optimizing engineering systems in almost any industry Now in its Fourth Edition, Professor Singiresu Rao's acclaimed text *Engineering Optimization* enables readers to quickly master and apply all the important optimization methods in use today across a broad range of industries. Covering both the latest and classical optimization methods, the text starts off with the basics and then progressively builds to advanced principles and applications. This comprehensive text covers nonlinear, linear, geometric, dynamic, and stochastic programming techniques as well as more specialized methods such as multiobjective, genetic algorithms, simulated annealing, neural networks, particle swarm optimization, ant colony optimization, and fuzzy optimization. Each method is presented in clear, straightforward language, making even the more sophisticated techniques easy to grasp. Moreover, the author provides: Case examples that show how each method is applied to solve real-world problems across a variety of industries Review questions and problems at the end of each chapter to

engage readers in applying their newfound skills and knowledge. Examples that demonstrate the use of MATLAB® for the solution of different types of practical optimization problems. References and bibliography at the end of each chapter for exploring topics in greater depth. Answers to Review Questions available on the author's Web site to help readers to test their understanding of the basic concepts. With its emphasis on problem-solving and applications, *Engineering Optimization* is ideal for upper-level undergraduates and graduate students in mechanical, civil, electrical, chemical, and aerospace engineering. In addition, the text helps practicing engineers in almost any industry design improved, more efficient systems at less cost.

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.

Tubular Heat Exchangers - Samuel Jorge Marques Cartaxo 2022-04-19

This book explains basics from physical chemistry and fluid mechanics to understand, construct and apply tubular heat exchangers for the (chemical) industry. Examples from practice highlight the required equations, physical properties and raise critical steps for the design of for example tubular double-pipe, multi-tubes and finned heat exchangers. Exercises and corresponding solutions deepen the gained knowledge and clarify the described theory.

Stochastic and Global Optimization - G. Dzemyda 2006-04-11

In the paper we propose a model of tax incentives optimization for investment projects with a help of the mechanism of accelerated depreciation. Unlike the tax holidays which influence on effective income tax rate, accelerated - depreciation affects on taxable income. In modern economic practice the state actively use for an attraction of - vestment into the creation of new enterprises such mechanisms as accelerated depreciation and tax holidays. The problem under our consideration is the following. Assume that the state (region) is interested in realization of a certain investment project, for example, the creation of a new enterprise. In order to attract a potential investor the state decides to use a mechanism of accelerated tax depreciation. The following question arise. What is a

reasonable principle for choosing depreciation rate? From the state's point of view the future investor's behavior will be rational. It means that while looking at economic environment the investor choose such a moment for investment which maximizes his expected net present value (NPV) from the given project. For this case both criteria and "investment rule" depend on proposed (by the state) depreciation policy. For the simplicity we will suppose that the purpose of the state for a given project is a maximization of a discounted tax payments into the budget from the enterprise after its creation. Of course, these payments depend on the moment of investor's entry and, therefore, on the depreciation policy established by the state.

Recent Awards in Engineering - 1983

Biorefineries and Chemical Processes - Jhuma Sadhukhan 2014-08-25

As the range of feedstocks, process technologies and products expand, biorefineries will become increasingly complex manufacturing systems.

Biorefineries and Chemical Processes: Design, Integration and Sustainability Analysis presents process modelling and integration, and whole system life cycle analysis tools for the synthesis, design, operation and sustainable development of biorefinery and chemical processes.

Topics covered include: Introduction: An introduction to the concept and development of biorefineries. Tools: Included here are the methods for

detailed economic and environmental impact analyses; combined economic value and environmental impact analysis; life cycle assessment (LCA); multi-criteria analysis; heat integration and utility system design; mathematical programming based optimization and genetic algorithms. Process synthesis and design: Focuses on modern unit operations and innovative process flowsheets. Discusses thermochemical and biochemical processing of biomass, production of chemicals and polymers from biomass, and processes for carbon dioxide capture. Biorefinery systems: Presents biorefinery process synthesis using whole system analysis. Discusses bio-oil and algae biorefineries, integrated fuel cells and renewables, and heterogeneous catalytic reactors. Companion website: Four case studies, additional exercises and examples are available online, together with three supplementary chapters which address waste and emission minimization, energy storage and control systems, and the optimization and reuse of water. This textbook is designed to bridge a gap between engineering design and sustainability assessment, for advanced students and practicing process designers and engineers.

Fourth European Symposium on Computer Aided Process Engineering, ESCAPE 4 - F. A. Perris 1994

The ESCAPE symposia address the applications of computer aids to all aspects of process engineering. The primary objective is the interchange

of information on industrial needs, new technology developments and research opportunities. With industrialists and academia contributing from all over the world, this set of proceedings provides an overview of current international computer-aided process engineering (CAPE). This book is intended for chemical and process engineers, design engineers and computer-aided specialists.

Chemical Process Equipment – Selection and Design (Revised 2nd Edition)

- James R. Couper 2009-08-11

A facility is only as efficient and profitable as the equipment that is in it: this highly influential book is a powerful resource for chemical, process, or plant engineers who need to select, design or configures plant successfully and profitably. It includes updated information on design methods for all standard equipment, with an emphasis on real-world process design and performance. The comprehensive and influential guide to the selection and design of a wide range of chemical process equipment, used by engineers globally • Copious examples of successful applications, with supporting schematics and data to illustrate the functioning and performance of equipment Revised edition, new material includes updated equipment cost data, liquid-solid and solid systems, and the latest information on membrane separation technology Provides equipment rating forms and manufacturers' data, worked examples, valuable shortcut methods, rules

of thumb, and equipment rating forms to demonstrate and support the design process Heavily illustrated with many line drawings and schematics to aid understanding, graphs and tables to illustrate performance data

Process Synthesis for Fuel Ethanol Production - C.A. Cardona 2009-12-03

Process engineering can potentially provide the means to develop economically viable and environmentally friendly technologies for the production of fuel ethanol. Focusing on a key tool of process engineering, Process Synthesis for Fuel Ethanol Production is a comprehensive guide to the design and analysis of the most advanced technologies for fuel

Optimization in Chemical Engineering - Suman Dutta 2016-03-11

In this book, optimization of chemical processes is performed using both classical and advanced algorithms.

Optimization in Food Engineering - Ferruh Erdogdu 2008-12-09

While mathematically sophisticated methods can be used to better understand and improve processes, the nonlinear nature of food processing models can make their dynamic optimization a daunting task. With contributions from a virtual who's who in the food processing industry, Optimization in Food Engineering evaluates the potential uses and limitations of optimization techniques for food processing, including classical methods, artificial intelligence-genetic algorithms, multi-objective optimization procedures, and computational fluid dynamics. The book

begins by delineating the fundamentals and methods for analytical and numerical procedures. It then covers optimization techniques and how they specifically apply to food processing. The final section digs deep into fundamental food processes and provides detailed explanation and examples from the most experienced and published authors in the field. This includes a range of processes from optimization strategies for improving the performance of batch reactors to the optimization of conventional thermal processing, microwave heating, freeze drying, spray drying, and refrigeration systems, to structural optimization techniques for developing beverage containers, optimization approaches for impingement processing, and optimal operational planning methodologies. Each chapter presents the required parameters for the given process with the optimization procedure to apply. An increasing part of the food processor's job is to optimize systems to squeeze more dollars out of overhead to offset rising utility and transportation costs. Logically combining optimization techniques from many sources into a single volume focused on food production processes, this book provides real solutions to increases in energy, healthcare, and product liability costs that impact the bottom line in food production.

Chemical Engineering Design - Gavin Towler 2012-01-25

Chemical Engineering Design, Second Edition, deals with the application

of chemical engineering principles to the design of chemical processes and equipment. Revised throughout, this edition has been specifically developed for the U.S. market. It provides the latest US codes and standards, including API, ASME and ISA design codes and ANSI standards. It contains new discussions of conceptual plant design, flowsheet development, and revamp design; extended coverage of capital cost estimation, process costing, and economics; and new chapters on equipment selection, reactor design, and solids handling processes. A rigorous pedagogy assists learning, with detailed worked examples, end of chapter exercises, plus supporting data, and Excel spreadsheet calculations, plus over 150 Patent References for downloading from the companion website. Extensive instructor resources, including 1170 lecture slides and a fully worked solutions manual are available to adopting instructors. This text is designed for chemical and biochemical engineering students (senior undergraduate year, plus appropriate for capstone design courses where taken, plus graduates) and lecturers/tutors, and professionals in industry (chemical process, biochemical, pharmaceutical, petrochemical sectors). New to this edition: Revised organization into Part I: Process Design, and Part II: Plant Design. The broad themes of Part I are flowsheet development, economic analysis, safety and environmental impact and optimization. Part II contains chapters on equipment design

and selection that can be used as supplements to a lecture course or as essential references for students or practicing engineers working on design projects. New discussion of conceptual plant design, flowsheet development and revamp design Significantly increased coverage of capital cost estimation, process costing and economics New chapters on equipment selection, reactor design and solids handling processes New sections on fermentation, adsorption, membrane separations, ion exchange and chromatography Increased coverage of batch processing, food, pharmaceutical and biological processes All equipment chapters in Part II revised and updated with current information Updated throughout for latest US codes and standards, including API, ASME and ISA design codes and ANSI standards Additional worked examples and homework problems The most complete and up to date coverage of equipment selection 108 realistic commercial design projects from diverse industries A rigorous pedagogy assists learning, with detailed worked examples, end of chapter exercises, plus supporting data and Excel spreadsheet calculations plus over 150 Patent References, for downloading from the companion website Extensive instructor resources: 1170 lecture slides plus fully worked solutions manual available to adopting instructors

Software Architectures and Tools for Computer Aided Process Engineering
- Bertrand Braunschweig 2002-10-30

The idea of editing a book on modern software architectures and tools for CAPE (Computer Aided Process Engineering) came about when the editors of this volume realized that existing titles relating to CAPE did not include references to the design and development of CAPE software. Scientific software is needed to solve CAPE related problems by industry/academia for research and development, for education and training and much more. There are increasing demands for CAPE software to be versatile, flexible, efficient, and reliable. This means that the role of software architecture is also gaining increasing importance. Software architecture needs to reconcile the objectives of the software; the framework defined by the CAPE methods; the computational algorithms; and the user needs and tools (other software) that help to develop the CAPE software. The object of this book is to bring to the reader, the software side of the story with respect to computer aided process engineering.

Developments in Food Engineering - T. Yano, R. Matsuno and K. Nakamura 2013-11-21

The necessity of prediction and fine control in the food manufacturing process is becoming more important than ever before, and food researchers and engineers must confront difficulties arising from the specificity of food materials and the sensitivity of human beings to taste.

Fortunately, an overview of world research reveals that the mechanisms of the many complex phenomena found in the food manufacturing process have been gradually elucidated by skilful experiments using new analytical tools, methods and theoretical analyses. This book, the proceedings of the 6th International Congress on Engineering and Food (ICEF6), held for the first time in Asia - in Chiba, Japan May 23 -27, 1993 - summarizes the frontiers of world food engineering in 1993. Congress was joined by the 4th International Conference on Fouling and Cleaning. There were 476 active members from 31 countries participating in the Congress. The editors hope that readers will find this book to be a useful review of the current state of food engineering, and will consider future developments in this research field. The editors extend thanks to the members of the organizing committee of ICEF6, and the advisors, Dr. Ryozo Toei, Professor Emeritus of Kyoto University and Dr. Masao Fujimaki, Professor Emeritus of the University of Tokyo. They also acknowledge the international advisory board members who helped the organizing committee in many ways, and the 10 foundations and 66 companies that financially supported the ICEF6. Finally, the editors are indebted to the reviewers of the manuscripts of these proceedings.

Process Dynamics and Control - Dale E. Seborg 2016-09-13

The new 4th edition of Seborg's Process Dynamics Control provides full

topical coverage for process control courses in the chemical engineering curriculum, emphasizing how process control and its related fields of process modeling and optimization are essential to the development of high-value products. A principal objective of this new edition is to describe modern techniques for control processes, with an emphasis on complex systems necessary to the development, design, and operation of modern processing plants. Control process instructors can cover the basic material while also having the flexibility to include advanced topics.

Advanced Control of Chemical Processes (ADCHEM'91) - K. Najim

2014-05-23

This volume contains 40 papers which describe the recent developments in advanced control of chemical processes and related industries. The topics of adaptive control, model-based control and neural networks are covered by 3 survey papers. New adaptive, statistical, model-based control and artificial intelligence techniques and their applications are detailed in several papers. The problem of implementation of control algorithms on a digital computer is also considered.

Process Dynamics and Control, 4th Edition - Dale E. Seborg 2016-11-16

The new 4th edition of Seborg's Process Dynamics Control provides full topical coverage for process control courses in the chemical engineering curriculum, emphasizing how process control and its related fields of

process modeling and optimization are essential to the development of high-value products. A principal objective of this new edition is to describe modern techniques for control processes, with an emphasis on complex systems necessary to the development, design, and operation of modern processing plants. Control process instructors can cover the basic material while also having the flexibility to include advanced topics.

Process Analysis and Simulation in Chemical Engineering - Iván Darío Gil Chaves 2015-11-27

This book offers a comprehensive coverage of process simulation and flowsheeting, useful for undergraduate students of Chemical Engineering and Process Engineering as theoretical and practical support in Process Design, Process Simulation, Process Engineering, Plant Design, and Process Control courses. The main concepts related to process simulation and application tools are presented and discussed in the framework of typical problems found in engineering design. The topics presented in the chapters are organized in an inductive way, starting from the more simplistic simulations up to some complex problems.

Advances in Chemical Engineering - 1992-09-08

Advances in Chemical Engineering

Optimization of Chemical Processes - Thomas F. Edgar 2001

This book is an update of a successful first edition that has been

extremely well received by the experts in the chemical process industries. The authors explain both the theory and the practice of optimization, with the focus on the techniques and software that offer the most potential for success and give reliable results. Applications and case studies in optimization are presented with new examples taken from the areas of microelectronics processing and molecular modeling. Ample references are cited for those who wish to explore the theoretical concepts in more detail.

Chemical Process Design and Integration - Robin Smith 2016-08-02

Written by a highly regarded author with industrial and academic experience, this new edition of an established bestselling book provides practical guidance for students, researchers, and those in chemical engineering. The book includes a new section on sustainable energy, with sections on carbon capture and sequestration, as a result of increasing environmental awareness; and a companion website that includes problems, worked solutions, and Excel spreadsheets to enable students to carry out complex calculations.

Optimization for Chemical and Biochemical Engineering - Vassilios S. Vassiliadis 2020-10-31

Discover the subject of optimization in a new light with this modern and unique treatment. Includes a thorough exposition of applications and algorithms in sufficient detail for practical use, while providing you with all

the necessary background in a self-contained manner. Features a deeper consideration of optimal control, global optimization, optimization under uncertainty, multiobjective optimization, mixed-integer programming and model predictive control. Presents a complete coverage of formulations and instances in modelling where optimization can be applied for quantitative decision-making. As a thorough grounding to the subject, covering everything from basic to advanced concepts and addressing real-life problems faced by modern industry, this is a perfect tool for advanced undergraduate and graduate courses in chemical and biochemical engineering.

Multi-Objective Optimization - Gade Pandu Rangaiah 2009

Optimization has been playing a key role in the design, planning and operation of chemical and related processes for nearly half a century. Although process optimization for multiple objectives was studied by several researchers back in the 1970s and 1980s, it has attracted active research in the last 10 years, spurred by the new and effective techniques for multi-objective optimization. In order to capture this renewed interest, this monograph presents the recent and ongoing research in multi-optimization techniques and their applications in chemical engineering. Following a brief introduction and general review on the development of multi-objective optimization applications in chemical engineering since

2000, the book gives a description of selected multi-objective techniques and then goes on to discuss chemical engineering applications. These applications are from diverse areas within chemical engineering, and are presented in detail. All chapters will be of interest to researchers in multi-objective optimization and/or chemical engineering; they can be read individually and used in one's learning and research. Several exercises are included at the end of many chapters, for use by both practicing engineers and students.

Multi-objective Optimization: Techniques And Applications In Chemical Engineering (Second Edition) - Rangaiah Gade Pandu 2016-12-22

Optimization is now essential in the design, planning and operation of chemical and related processes. Although process optimization for multiple objectives was studied in the 1970s and 1980s, it has attracted active research in the last 15 years, spurred by the new and effective techniques for multi-objective optimization (MOO). To capture this renewed interest, this monograph presents recent research in MOO techniques and applications in chemical engineering. Following a brief introduction and review of MOO applications in chemical engineering since 2000, the book presents selected MOO techniques and many chemical engineering applications in detail. In this second edition, several chapters from the first edition have been updated, one chapter is completely revised and three

new chapters have been added. One of the new chapters describes three MS Excel programs useful for MOO of application problems. All the chapters will be of interest to researchers in MOO and/or chemical engineering. Several exercises are included at the end of many chapters, for use by both practicing engineers and students.

Optimizing Thermal, Chemical, and Environmental Systems - Stanislaw Sieniutycz 2017-11-13

Optimizing Thermal, Chemical and Environmental Systems treats the evaluation of power or energy limits for processes that arise in various thermal, chemical and environmental engineering systems (heat and mass exchangers, power converters, recovery units, solar collectors, mixture separators, chemical reactors, catalyst regenerators, etc.). The book is an indispensable source for researchers and students, providing the necessary information on what has been achieved to date in the field of process optimization, new research problems, and what kind of further studies should be developed within quite specialized optimizations.

Summarizes recent achievements of advanced optimization techniques
Links exergy definitions in reversible systems with classical problems of extremum work
Includes practical problems and illustrative examples to clarify applications
Provides a unified description of classical and work-assisted heat and mass exchangers
Written by a first-class expert in the

field of advanced methods in thermodynamics

Differential and Differential-Algebraic Systems for the Chemical Engineer - Guido Buzzi-Ferraris 2015-01-12

Engineers and other applied scientists are frequently faced with models of complex systems for which no rigorous mathematical solution can be calculated. To predict and calculate the behaviour of such systems, numerical approximations are frequently used, either based on measurements of real life systems or on the behaviour of simpler models. This is essential work for example for the process engineer implementing simulation, control and optimization of chemical processes for design and operational purposes. This fourth in a suite of five practical guides is an engineer's companion to using numerical methods for the solution of complex mathematical problems. It explains the theory behind current numerical methods and shows in a step-by-step fashion how to use them. The volume focuses on differential and differential-algebraic systems, providing numerous real-life industrial case studies to illustrate this complex topic. It describes the methods, innovative techniques and strategies that are all implemented in a freely available toolbox called BzzMath, which is developed and maintained by the authors and provides up-to-date software tools for all the methods described in the book. Numerous examples, sample codes, programs and applications are taken

from a wide range of scientific and engineering fields, such as chemical engineering, electrical engineering, physics, medicine, and environmental science. As a result, engineers and scientists learn how to optimize processes even before entering the laboratory. With additional online material including the latest version of BzzMath Library, installation tutorial, all examples and sample codes used in the book and a host of further examples.

Chemical Engineering and Chemical Process Technology - Volume IV -
Ryzhard Pohorecki 2010-11-30

Chemical Engineering and Chemical Process Technology is a theme component of Encyclopedia of Chemical Sciences, Engineering and Technology Resources in the global Encyclopedia of Life Support Systems (EOLSS), which is an integrated compendium of twenty Encyclopedias. Chemical engineering is a branch of engineering, dealing with processes in which materials undergo changes in their physical or chemical state. These changes may concern size, energy content, composition and/or other application properties. Chemical engineering deals with many processes belonging to chemical industry or related industries (petrochemical, metallurgical, food, pharmaceutical, fine chemicals, coatings and colors, renewable raw materials, biotechnological, etc.), and finds application in manufacturing of such products as acids, alkalis, salts,

fuels, fertilizers, crop protection agents, ceramics, glass, paper, colors, dyestuffs, plastics, cosmetics, vitamins and many others. It also plays significant role in environmental protection, biotechnology, nanotechnology, energy production and sustainable economical development. The Theme on Chemical Engineering and Chemical Process Technology deals, in five volumes and covers several topics such as: Fundamentals of Chemical Engineering; Unit Operations – Fluids; Unit Operations – Solids; Chemical Reaction Engineering; Process Development, Modeling, Optimization and Control; Process Management; The Future of Chemical Engineering; Chemical Engineering Education; Main Products, which are then expanded into multiple subtopics, each as a chapter. These five volumes are aimed at the following five major target audiences: University and College students Educators, Professional practitioners, Research personnel and Policy analysts, managers, and decision makers and NGOs.

European Symposium on Computer Aided Process Engineering - 10 - S.
Pierucci 2000-05-10

This book includes papers presented at ESCAPE-10, the 10th European Symposium on Computer Aided Process -Engineering, held in Florence, Italy, 7-10th May, 2000. The scientific program reflected two complementary strategic objectives of the 'Computer Aided Process Engineering' (CAPE) Working Party: one checked the status of historically

consolidated topics by means of their industrial application and their emerging issues, while the other was addressed to opening new windows to the CAPE audience by inviting adjacent Working Parties to co-operate in the creation of the technical program. The former CAPE strategic objective was covered by the topics: Numerical Methods, Process Design and Synthesis, Dynamics & Control, Process Modeling, Simulation and Optimization. The latter CAPE strategic objective derived from the European Federation of Chemical Engineering (EFCE) promotion of scientific activities which autonomously and transversely work across the Working Parties' terms of references. These activities enhance the exchange of the know-how and knowledge acquired by different Working Parties in homologous fields. They also aim to discover complementary facets useful to the dissemination of tools and of novel procedures. As a consequence, the Working Parties 'Environmental Protection', 'Loss Prevention and Safety Promotion' and 'Multiphase Fluid Flow' were invited to assist in the organization of sessions in the area of: A Process Integrated Approach for: Environmental Benefit, Loss Prevention and Safety, Computational Fluid Dynamics. A total of 473 abstracts from all over the world were evaluated by the International Scientific Committee. Out of them 197 have been finally selected for the presentation and reported into this book. Their authors come from thirty different countries.

The selection of the papers was carried out by twenty-eight international reviewers. These proceedings will be a major reference document to the scientific and industrial community and will contribute to the progress in Computer Aided Process Engineering.

19th European Symposium on Computer Aided Process Engineering -
Jacek Jezowski 2009-06-12

The 19th European Symposium on Computer Aided Process Engineering contains papers presented at the 19th European Symposium of Computer Aided Process Engineering (ESCAPE 19) held in Cracow, Poland, June 14-17, 2009. The ESCAPE series serves as a forum for scientists and engineers from academia and industry to discuss progress achieved in the area of CAPE. * CD-ROM that accompanies the book contains all research papers and contributions * International in scope with guest speeches and keynote talks from leaders in science and industry *

Presents papers covering the latest research, key top areas and developments in computer aided process engineering (CAPE)

Multi-Objective Optimization in Chemical Engineering - Gade Pandu Rangaiah 2013-03-20

For reasons both financial and environmental, there is a perpetual need to optimize the design and operating conditions of industrial process systems in order to improve their performance, energy efficiency, profitability, safety

and reliability. However, with most chemical engineering application problems having many variables with complex inter-relationships, meeting these optimization objectives can be challenging. This is where Multi-Objective Optimization (MOO) is useful to find the optimal trade-offs among two or more conflicting objectives. This book provides an overview of the recent developments and applications of MOO for modeling, design and operation of chemical, petrochemical, pharmaceutical, energy and related processes. It then covers important theoretical and computational developments as well as specific applications such as metabolic reaction networks, chromatographic systems, CO₂ emissions targeting for petroleum refining units, ecodesign of chemical processes, ethanol purification and cumene process design. Multi-Objective Optimization in Chemical Engineering: Developments and Applications is an invaluable resource for researchers and graduate students in chemical engineering as well as industrial practitioners and engineers involved in process design, modeling and optimization.

Optimization in Chemical Engineering - Suman Dutta 2016-03-11

Optimization is used to determine the most appropriate value of variables under given conditions. The primary focus of using optimisation techniques is to measure the maximum or minimum value of a function depending on the circumstances. This book discusses problem formulation and problem

solving with the help of algorithms such as secant method, quasi-Newton method, linear programming and dynamic programming. It also explains important chemical processes such as fluid flow systems, heat exchangers, chemical reactors and distillation systems using solved examples. The book begins by explaining the fundamental concepts followed by an elucidation of various modern techniques including trust-region methods, Levenberg–Marquardt algorithms, stochastic optimization, simulated annealing and statistical optimization. It studies the multi-objective optimization technique and its applications in chemical engineering and also discusses the theory and applications of various optimization software tools including LINGO, MATLAB, MINITAB and GAMS.

Industrial Crystallization Process Monitoring and Control - Angelo Chianese 2012-04-06

Crystallization is an important technique for separation and purification of substances as well as for product design in chemical, pharmaceutical and biotechnological process industries. This ready reference and handbook draws on research work and industrial practice of a large group of experts in the various areas of industrial crystallization processes, capturing the essence of current trends, the markets, design tools and technologies in this key field. Along the way, it outlines trouble free production, provides

laboratory controls, analyses case studies and discusses new challenges. First the instrumentation and techniques used to measure the crystal size distribution, the nucleation and solubility points, and the chemical composition of the solid and liquid phase are outlined. Then the main

techniques adopted to control industrial crystallizers, starting from fundamental approaches to the most advanced ones, including the multivariable predictive control are described. An overview of the main crystallizer types is given with details of the main control schemes adopted in industry as well as the more suitable sensors and actuators.