Modeling Analysis And Optimization Of Process And Energy

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Response Surface Methodology - Raymond H. Myers 2016-01-04
Praise for the Third Edition: "This new third edition has been substantially rewritten and updated with new topics and material, new examples and exercises, and to more fully illustrate modern applications of RSM."
- Zentralblatt Math Featuring a substantial revision, the Fourth Edition of Response Surface Methodology: Process and Product Optimization Using Designed Experiments presents updated coverage on the underlying theory and applications of response surface methodology (RSM). Providing the assumptions and conditions necessary to successfully apply RSM in modern applications, the new edition covers classical and modern response surface designs in order to present a clear connection between the designs and analyses in RSM. With multiple revised sections with new topics and expanded coverage, Response Surface Methodology: Process and Product Optimization Using Designed Experiments, Fourth Edition includes: Many updates on topics such as optimal designs, optimization techniques, robust parameter design, methods for design evaluation, computer-generated designs, multiple response optimization, and non-normal responses Additional coverage on topics such as experiments with computer models, definitive screening designs, and data measured with error Expanded integration of examples and experiments, which present up-to-date software applications, such as JMP®, SAS, and Design-Expert®, throughout An extensive references section to help readers stay up-to-date with leading research in the field of RSM An ideal textbook for upper-undergraduate and graduate-level courses in statistics, engineering, and chemical/physical sciences, Response Surface Methodology: Process and Product Optimization Using Designed Experiments, Fourth Edition is also a useful reference for applied statisticians and engineers in disciplines such as quality, process, and chemistry.

Advanced Optimization for Process Systems Engineering - Ignacio E. Grossmann 2021-03-25
A unique text covering basic and advanced concepts of optimization theory and methods for process systems engineers. With examples illustrating key concepts and algorithms, and exercises involving theoretical derivations, numerical problems and modeling systems, it is ideal for single-semester, graduate courses in process systems engineering.

Modeling, Simulation, and Optimization - Pandian Vasant 2017-12-07
This book features selected contributions in the areas of modeling, simulation, and optimization. The contributors discusses requirements in problem solving for modeling, simulation, and optimization. Modeling, simulation, and optimization have increased in demand in exponential ways and how potential solutions might be reached. They describe how new technologies in computing and engineering have reduced the dimension of data coverage worldwide, and how recent inventions in information and communication technology (ICT) have inched towards reducing the gaps and coverage of domains globally. The chapters cover how the digging of information in a large data and soft-computing techniques have contributed to a strength in prediction and analysis, for decision making in computer science, technology, management, social computing, green computing, and telecom. The book provides an insightful reference to the researchers in the fields of engineering and computer science. Researchers, academics, and professionals will benefit from this volume. Features selected expanded papers in modeling, simulation, and optimization from COMPSE 2016; Includes research into soft computing and its application in engineering and technology; Presents contributions from global experts in academia and industry in modeling, simulation, and optimization.

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.

Modeling, Assessment, and Optimization of Energy Systems - Hoseyn Sayyaadi 2020-09-19
Modelling, Assessment, and Optimization of Energy Systems provides comprehensive methodologies for the thermal modelling of energy systems based on thermodynamic, exergoeconomic and exergoenviromental approaches. It provides advanced analytical approaches, assessment criteria and the methodologies to obtain analytical expressions from the experimental data. The concept of single-objective and multi-objective optimization with application to energy systems is provided, along with decision-making tools for multi-objective problems, multi-criteria problems, for simplifying the optimization of large energy systems, and for exergoeconomic improvement integrated with a simulator EIS method. This book provides a comprehensive methodology for modeling, assessment, improvement of any energy system with guidance, and practical examples that provide detailed insights for energy engineering, mechanical engineering, chemical engineering and researchers in the field of analysis and optimization of energy systems. Offers comprehensive analytical tools for the modeling and simulation of energy systems with applications for decision-making tools Provides methodologies to obtain analytical models of energy systems for experimental data Covers decision-making tools in multi-objective problems

Aerospace System Analysis and Optimization in Uncertainty - Loïc Brevault 2020-07-15
Spotlighting the field of Multidisciplinary Design Optimization (MDO), this book illustrates and implements state-of-the-art methodologies within the complex process of aerospace system design under uncertainties. The book provides approaches to integrating a multitude of components and constraints with the ultimate goal of reducing design cycles. Insights on a vast assortment of problems are provided, including discipline modeling, sensitivity analysis, uncertainty propagation, reliability analysis, and global multidisciplinary optimization. The extensive range of topics covered include areas of current open research. This Work is destined to become a fundamental reference for aerospace systems engineers, researchers, as well as for practitioners and engineers working in areas of optimization and uncertainty. Part I is largely comprised of fundamentals. Part II presents methodologies for single discipline problems with a review of existing uncertainty propagation, reliability analysis, and optimization techniques. Part III is dedicated to the uncertainty-based MDO and related issues. Part IV deals with three MDO related issues: the multifidelity, the multi-objective optimization and the mixed continuous/discrete optimization and Part V is devoted to test cases for aerospace vehicle design.

Process Optimization - Enrique del Castillo 2007-09-14
This book covers several bases at once. It is useful as a textbook for a second course in experimental optimization techniques for industrial production processes. In addition, it is a superb reference volume for use by professors and graduate students in Industrial Engineering and Statistics departments. It will also be of huge interest to applied statisticians, process engineers, and quality engineers working in the

electronics and biotech manufacturing industries. In all, it provides an in-depth presentation of the statistical issues that arise in optimization problems, including confidence regions on the optimal settings of a process, stopping rules in experimental optimization, and more.

System Modeling and Optimization - Adam Korytowski 2009-10-15
rd This book constitutes a collection of extended versions of papers presented at the 23 IFIP TC7 Conference on System Modeling and Optimization, which was held in C- cow, Poland, on July 23–27, 2007. It contains 7 plenary and 22 contributed articles, the latter selected via a peer reviewing process. Most of the papers are concerned with optimization and optimal control. Some of them deal with practical issues, e. g. , p- formance-based design for seismic risk reduction, or evolutionary optimization in structural engineering. Many contributions concern optimization of infini- dimensional systems, ranging from a general overview of the variational analysis, through optimization and sensitivity analysis of PDE systems, to optimal control of neutral systems. A significant group of papers is devoted to shape analysis and opti- zation. Sufficient optimality conditions for ODE problems, and stochastic control methods applied to mathematical finance, are also investigated. The remaining papers are on mathematical programming, modeling, and information technology. The conference was the 23rd event in the series of such meetings biennially org- ized under the auspices of the Seventh Technical Committee "Systems Modeling and Optimization" of the International Federation for Information Processing (IFIP TC7).

Reliability Modeling, Analysis and Optimization -

Modeling Risk - Johnathan Mun 2006-07-21
This completely revised and updated edition of Applied Risk Analysis includes new case studies in modeling risk and uncertainty as well as a new risk analysis CD-ROM prepared by Dr. Mun. On the CD-ROM you'll find his Risk Simulator and Real Options Super Lattice Solver software as well as many useful spreadsheet models. "Johnathan Mun's book is a sparkling jewel in my finance library. Mun demonstrates a deep understanding of the underlying mathematical theory in his ability to reduce complex concepts to lucid explanations and applications. For this reason, he's my favorite writer in this field." —Janet Tavakoli, President, Tavakoli Structured Finance, Inc. and author of Collateralized Debt Obligations and Structured Finance "A must-read for product portfolio managers . . . it captures the risk exposure of strategic investments, and provides management with estimates of potential outcomes and options for risk mitigation." —Rafael E. Gutierrez, Executive Director of Strategic Marketing and Planning, Seagate Technology, Inc. "Once again, Dr. Mun has created a 'must-have, must-read' book for anyone interested in the practical application of risk analysis. Other books speak in academic generalities, or focus on one area of risk application. [This book] gets to the heart of the matter with applications for every area of risk analysis. You have a real option to buy almost any book?you should exercise your option and get this one!" —Glenn Kautt, MBA, CFP, EA, President and Chairman, The Monitor Group, Inc. Note: CD-ROM/DVD and other supplementary materials are not included as part of eBook file.

Energy Optimization in Process Systems - Stanislaw Sieniutycz 2009-05-06
Despite the vast research on energy optimization and process integration, there has to date been no synthesis linking these together. This book fills the gap, presenting optimization and integration in energy and process engineering. The content is based on the current literature and includes novel approaches developed by the authors. Various thermal and chemical systems (heat and mass exchangers, thermal and water networks, energy converters, recovery units, solar collectors, and separators) are considered. Thermodynamics, kinetics and economics are used to formulate and solve problems with constraints on process rates, equipment size, environmental parameters, and costs. Comprehensive coverage of dynamic optimization of energy conversion systems and separation units is provided along with suitable computational algorithms for deterministic and stochastic optimization approaches based on: nonlinear programming, dynamic programming, variational calculus, Hamilton-Jacobi-Bellman theory, Pontryagin's maximum principles, and special methods of process integration. Integration of heat energy and process water within a total site is shown to be a significant factor reducing production costs, in particular costs of utilities for the chemical industry. This integration involves systematic design and optimization of heat exchangers and water networks (HEN and WN). After presenting basic, insight-based Pinch Technology,

systematic, optimization-based sequential and simultaneous approaches to design HEN and WN are described. Special consideration is given to the HEN design problem targeting stage, in view of its importance at various levels of system design. Selected, advanced methods for HEN synthesis and retrofit are presented. For WN design a novel approach based on stochastic optimization is described that accounts for both grassroot and revamp design scenarios. Presents a unique synthesis of energy optimization and process integration that applies scientific information from thermodynamics, kinetics, and systems theory Discusses engineering applications including power generation, resource upgrading, radiation conversion and chemical transformation, in static and dynamic systems Clarifies how to identify thermal and chemical constraints and incorporate them into optimization models and solutions

Advanced Modeling and Optimization of Manufacturing Processes - R. Venkata Rao 2010-12-01
Advanced Modeling and Optimization of Manufacturing Processes presents a comprehensive review of the latest international research and development trends in the modeling and optimization of manufacturing processes, with a focus on machining. It uses examples of various manufacturing processes to demonstrate advanced modeling and optimization techniques. Both basic and advanced concepts are presented for various manufacturing processes, mathematical models, traditional and non-traditional optimization techniques, and real case studies. The results of the application of the proposed methods are also covered and the book highlights the most useful modeling and optimization strategies for achieving best process performance. In addition to covering the advanced modeling, optimization and environmental aspects of machining processes, Advanced Modeling and Optimization of Manufacturing Processes also covers the latest technological advances, including rapid prototyping and tooling, micromachining, and nano-finishing. Advanced Modeling and Optimization of Manufacturing Processes is written for designers and manufacturing engineers who are responsible for the technical aspects of product realization, as it presents new models and optimization techniques to make their work easier, more efficient, and more effective. It is also a useful text for practitioners, researchers, and advanced students in mechanical, industrial, and manufacturing engineering.

Aimms Optimization Modeling - Johannes Bisschop 2006
The AIMMS Optimization Modeling book provides not only an introduction to modeling but also a suite of worked examples. It is aimed at users who are new to modeling and those who have limited modeling experience. Both the basic concepts of optimization modeling and more advanced modeling techniques are discussed. The Optimization Modeling book is AIMMS version independent.

Engineering Design Optimization - Joaquim R. R. A. Martins 2021-11-18
Based on course-tested material, this rigorous yet accessible graduate textbook covers both fundamental and advanced optimization theory and algorithms. It covers a wide range of numerical methods and topics, including both gradient-based and gradient-free algorithms, multidisciplinary design optimization, and uncertainty, with instruction on how to determine which algorithm should be used for a given application. It also provides an overview of models and how to prepare them for use with numerical optimization, including derivative computation. Over 400 high-quality visualizations and numerous examples facilitate understanding of the theory, and practical tips address common issues encountered in practical engineering design optimization and how to address them. Numerous end-of-chapter homework problems, progressing in difficulty, help put knowledge into practice. Accompanied online by a solutions manual for instructors and source code for problems, this is ideal for a one- or two-semester graduate course on optimization in aerospace, civil, mechanical, electrical, and chemical engineering departments.

Nonlinear Optimization - William P. Fox 2020-12-08
Optimization is the act of obtaining the "best" result under given circumstances. In design, construction, and maintenance of any engineering system, engineers must make technological and managerial decisions to minimize either the effort or cost required or to maximize benefits. There is no single method available for solving all optimization problems efficiently. Several optimization methods have been developed for different types of problems. The optimum-seeking methods are mathematical programming techniques (specifically, nonlinear programming techniques). Nonlinear Optimization: Models and Applications presents the concepts in several ways to foster understanding. Geometric interpretation: is used to re-enforce the concepts and to foster understanding of the mathematical procedures. The student sees that

many problems can be analyzed, and approximate solutions found before analytical solutions techniques are applied. Numerical approximations: early on, the student is exposed to numerical techniques. These numerical procedures are algorithmic and iterative. Worksheets are provided in Excel, MATLAB®, and MapleTM to facilitate the procedure. Algorithms: all algorithms are provided with a step-by-step format. Examples follow the summary to illustrate its use and application. Nonlinear Optimization: Models and Applications: Emphasizes process and interpretation throughout Presents a general classification of optimization problems Addresses situations that lead to models illustrating many types of optimization problems Emphasizes model formulations Addresses a special class of problems that can be solved using only elementary calculus Emphasizes model solution and model sensitivity analysis About the author: William P. Fox is an emeritus professor in the Department of Defense Analysis at the Naval Postgraduate School. He received his Ph.D. at Clemson University and has taught at the United States Military Academy and at Francis Marion University where he was the chair of mathematics. He has written many publications, including over 20 books and over 150 journal articles. Currently, he is an adjunct professor in the Department of Mathematics at the College of William and Mary. He is the emeritus director of both the High School Mathematical Contest in Modeling and the Mathematical Contest in Modeling.

Advances in Automation III - Andrey A. Radionov 2022
This book reports on innovative research and developments in automation. Spanning a wide range of disciplines, including communication engineering, power engineering, control engineering, instrumentation, signal processing and cybersecurity, it focuses on methods and findings aimed at improving the control and monitoring of industrial and manufacturing processes as well as safety. Based on the International Russian Automation Conference, held on September 5-11, 2021, in Sochi, Russia, the book provides academics and professionals with a timely overview of and extensive information on the state of the art in the field of automation and control systems, and fosters new ideas and collaborations between groups in different countries. .

Information Systems Analysis and Modeling - Vladimir S. Lerner 2000
Informational Macrodynamics (IMD) presents the unified information systemic approach with common information language for modeling, analysis and optimization of a variety of interactive processes, such as physical, biological, economical, social, and informational, including human activities. Comparing it with thermodynamics, which deals with transformation energy and represents a theoretical foundation of physical technology, IMD deals with transformation information, and can be considered a theoretical foundation of Information Computer Technology (ICT). ICT includes but is not limited to applied computer science, computer information systems, computer and data communications, software engineering, and artificial intelligence. In ICT, information flows from different data sources, and interacts to create new information products. The information flows may interact physically or via their virtual connections, initiating an information dynamic process that can be distributed in space. As in physics, a problem is understanding general regularities of the information processes in terms of information law, for the engineering and technological design, control, optimization, and development of computer technology, operations, manipulations, and management of real information objects. Information Systems Analysis and Modeling: An Informational Macrodynamics Approach belongs to an interdisciplinary science that represents the new theoretical and computer-based methodology for system informational description and improvement, including various activities in such interdisciplinary areas as thinking, intelligent processes, management, and other nonphysical subjects with their mutual interactions, informational superimpositions, and the information transferred between interactions. Information Systems Analysis and Modeling: An Informational Macrodynamics Approach can be used as a textbook or secondary text in courses on computer science, engineering, business, management, education, and psychology and as a reference for research and industry.

Modeling, Control, and Optimization of Natural Gas Processing Plants - William A. Poe 2016-09-09
Modeling, Control, and Optimization of Natural Gas Processing Plants presents the latest on the evolution of the natural gas industry, shining a light on the unique challenges plant managers and owners face when looking for ways to optimize plant performance and efficiency, including topics such as the various feed gas compositions, temperatures, pressures, and throughput capacities that keep them looking for better

decision support tools. The book delivers the first reference focused strictly on the fast-growing natural gas markets. Whether you are trying to magnify your plants existing capabilities or are designing a new facility to handle more feedstock options, this reference guides you by combining modeling control and optimization strategies with the latest developments within the natural gas industry, including the very latest in algorithms, software, and real-world case studies. Helps users adapt their natural gas plant quickly with optimization strategies and advanced control methods Presents real-world application for gas process operations with software and algorithm comparisons and practical case studies Provides coverage on multivariable control and optimization on existing equipment Allows plant managers and owners the tools they need to maximize the value of the natural gas produced

System Modeling and Optimization - Rudolf F. Drenick 1982

Numerical Analysis and Optimization - Mehiddin Al-Baali 2021
This book gathers selected, peer-reviewed contributions presented at the Fifth International Conference on Numerical Analysis and Optimization (NAO-V), which was held at Sultan Qaboos University, Oman, on January 6-9, 2020. Each chapter reports on developments in key fields, such as numerical analysis, numerical optimization, numerical linear algebra, numerical differential equations, optimal control, approximation theory, applied mathematics, derivative-free optimization methods, programming models, and challenging applications that frequently arise in statistics, econometrics, finance, physics, medicine, biology, engineering and industry. Many real-world, complex problems can be formulated as optimization tasks, and can be characterized further as large scale, unconstrained, constrained, non-convex, nondifferentiable or discontinuous, and therefore require adequate computational methods, algorithms and software tools. These same tools are often employed by researchers working in current IT hot topics, such as big data, optimization and other complex numerical algorithms in the cloud, devising special techniques for supercomputing systems. This interdisciplinary view permeates the work included in this volume. The NAO conference series is held every three years at Sultan Qaboos University, with the aim of bringing together a group of international experts and presenting novel and advanced applications to facilitate interdisciplinary studies among pure scientific and applied knowledge. It is a venue where prominent scientists gather to share innovative ideas and know-how relating to new scientific methodologies, to promote scientific exchange, to discuss possible future cooperations, and to promote the mobility of local and young researchers.

Multiobjective Optimization - Jürgen Branke 2008-10-18
Multiobjective optimization deals with solving problems having not only one, but multiple, often conflicting, criteria. Such problems can arise in practically every field of science, engineering and business, and the need for efficient and reliable solution methods is increasing. The task is challenging due to the fact that, instead of a single optimal solution, multiobjective optimization results in a number of solutions with different trade-offs among criteria, also known as Pareto optimal or efficient solutions. Hence, a decision maker is needed to provide additional preference information and to identify the most satisfactory solution. Depending on the paradigm used, such information may be introduced before, during, or after the optimization process. Clearly, research and application in multiobjective optimization involve expertise in optimization as well as in decision support. This state-of-the-art survey originates from the International Seminar on Practical Approaches to Multiobjective Optimization, held in Dagstuhl Castle, Germany, in December 2006, which brought together leading experts from various contemporary multiobjective optimization fields, including evolutionary multiobjective optimization (EMO), multiple criteria decision making (MCDM) and multiple criteria decision aiding (MCDA). This book gives a unique and detailed account of the current status of research and applications in the field of multiobjective optimization. It contains 16 chapters grouped in the following 5 thematic sections: Basics on Multiobjective Optimization; Recent Interactive and Preference-Based Approaches; Visualization of Solutions; Modelling, Implementation and Applications; and Quality Assessment, Learning, and Future Challenges.

Surrogates - Robert B. Gramacy 2020-03-10
Computer simulation experiments are essential to modern scientific discovery, whether that be in physics, chemistry, biology, epidemiology, ecology, engineering, etc. Surrogates are meta-models of computer

simulations, used to solve mathematical models that are too intricate to be worked by hand. Gaussian process (GP) regression is a supremely flexible tool for the analysis of computer simulation experiments. This book presents an applied introduction to GP regression for modelling and optimization of computer simulation experiments. Features: • Emphasis on methods, applications, and reproducibility. • R code is integrated throughout for application of the methods. • Includes more than 200 full colour figures. • Includes many exercises to supplement understanding, with separate solutions available from the author. • Supported by a website with full code available to reproduce all methods and examples. The book is primarily designed as a textbook for postgraduate students studying GP regression from mathematics, statistics, computer science, and engineering. Given the breadth of examples, it could also be used by researchers from these fields, as well as from economics, life science, social science, etc.

Design Reuse in Product Development Modeling, Analysis and Optimization - S. K. Ong 2008
Efficient management of product information is vital for manufacturing enterprises in this information age. Considering the proliferation of product information, tight production schedules, and intense market competition, human intelligence alone cannot meet the requirements of efficient product development. Technologies and tools that support information management are urgently needed. This volume presents the design reuse methodology to support product development. Significant efforts have been made to create an intelligent and optimal design environment by incorporating the contemporary technologies in product family design, artificial intelligence, neural networks, information theories, etc. This volume covers both theoretical topics and implementation strategies, with detailed case studies to help readers gain an insight in areas such as product information modeling, information analysis, engineering optimization, production cost estimation, and product performance evaluation.

Modeling, Simulation, and Optimization of Supercritical and Subcritical Fluid Extraction Processes - Zainuddin A. Manan 2021-09-22
This book provides a complete guide on tools and techniques for modeling of supercritical and subcritical fluid extraction (SSFE) processes and phenomena. It provides details for SSFE from managing the experiments to modeling and optimization. It includes the fundamentals of SSFE as well as the necessary experimental techniques to validate the models. The optimization section includes the use of process simulators, conventional optimization techniques and state-of-the-art genetic algorithm methods. Numerous practical examples and case studies on the application of the modeling and optimization techniques on the SSFE processes are also provided. Detailed thermodynamic modeling with and without co-solvent and non equilibrium system modeling is another feature of the book.

Modeling, Simulation and Optimization - Biplab Das 2021-03-17
This book includes selected peer-reviewed papers presented at the International Conference on Modeling, Simulation and Optimization, organized by National Institute of Technology, Silchar, Assam, India, during 3–5 August 2020. The book covers topics of modeling, simulation and optimization, including computational modeling and simulation, system modeling and simulation, device/VLSI modeling and simulation, control theory and applications, modeling and simulation of energy system and optimization. The book disseminates various models of diverse systems and includes solutions of emerging challenges of diverse scientific fields.

Recent Advances in Multidisciplinary Analysis and Optimization - 1989

Optimization of Energy Systems - Ibrahim Dinçer 2017-05-15
An essential resource for optimizing energy systems to enhance design capability, performance and sustainability Optimization of Energy Systems comprehensively describes the thermodynamic modelling, analysis and optimization of numerous types of energy systems in various applications. It provides a new understanding of the system and the process of defining proper objective functions for determination of the most suitable design parameters for achieving enhanced efficiency, cost effectiveness and sustainability. Beginning with a general summary of thermodynamics, optimization techniques and optimization methods for thermal components, the book goes on to describe how to determine the most appropriate design parameters for more complex energy systems using various optimization methods. The results of each chapter provide potential tools for design, analysis, performance improvement, and greenhouse gas

emissions reduction. Key features: Comprehensive coverage of the modelling, analysis and optimization of many energy systems for a variety of applications. Examples, practical applications and case studies to put theory into practice. Study problems at the end of each chapter that foster critical thinking and skill development. Written in an easy-to-follow style, starting with simple systems and moving to advanced energy systems and their complexities. A unique resource for understanding cutting-edge research in the thermodynamic analysis and optimization of a wide range of energy systems, Optimization of Energy Systems is suitable for graduate and senior undergraduate students, researchers, engineers, practitioners, and scientists in the area of energy systems.

Beyond Reengineering - Michael Hammer 2009-06-02
Reengineering has captured the imagination of managers and shareholders alike, sending corporations on journeys of radical business redesign that have already begun to transfigure global industry. Yet aside from earning them improvements in their business performance, the shift into more-process-centered organizations is causing fundamental changes in the corporate world, changes that business leaders are only now beginning to understand. What will the revolutions final legacy be? Beyond Reengineering addresses this question, exploring reengineering's effects on such areas as: Jobs: What does process-centering do to the nature of jobs? What does a process-centered workplace feel like? Managers: What is the new role of the manager in a process-centered company? Education: What skills are vital in the process-centered working world, and how can young or inexperienced workers prepare? Society: What are the implications of process-centering for employment and the economy as a whole? Investment: What are the characteristics of a successful 21st-century corporation? An informed look at one of the most profound changes to ever sweep the corporate world, Beyond Reengineering is the business manual for the 21st century.

Aerospace System Analysis and Optimization in Uncertainty - Loïc Brevault 2020-08-26
Spotlighting the field of Multidisciplinary Design Optimization (MDO), this book illustrates and implements state-of-the-art methodologies within the complex process of aerospace system design under uncertainties. The book provides approaches to integrating a multitude of components and constraints with the ultimate goal of reducing design cycles. Insights on a vast assortment of problems are provided, including discipline modeling, sensitivity analysis, uncertainty propagation, reliability analysis, and global multidisciplinary optimization. The extensive range of topics covered include areas of current open research. This Work is destined to become a fundamental reference for aerospace systems engineers, researchers, as well as for practitioners and engineers working in areas of optimization and uncertainty. Part I is largely comprised of fundamentals. Part II presents methodologies for single discipline problems with a review of existing uncertainty propagation, reliability analysis, and optimization techniques. Part III is dedicated to the uncertainty-based MDO and related issues. Part IV deals with three MDO related issues: the multifidelity, the multi-objective optimization and the mixed continuous/discrete optimization and Part V is devoted to test cases for aerospace vehicle design.

Modeling and Optimization in Manufacturing - Catalin I. Pruncu 2021-03-30
Discover the state-of-the-art in multiscale modeling and optimization in manufacturing from two leading voices in the field Modeling and Optimization in Manufacturing delivers a comprehensive approach to various manufacturing processes and shows readers how multiscale modeling and optimization processes help improve upon them. The book elaborates on the foundations and applications of computational modeling and optimization processes, as well as recent developments in the field. It offers discussions of manufacturing processes, including forming, machining, casting, joining, coating, and additive manufacturing, and how computer simulations have influenced their development. Examples for each category of manufacturing are provided in the text, and industrial applications are described for the reader. The distinguished authors also provide an insightful perspective on likely future trends and developments in manufacturing modeling and optimization, including the use of large materials databases and machine learning. Readers will also benefit from the inclusion of: A thorough introduction to the origins of manufacturing, the history of traditional and advanced manufacturing, and recent progress in manufacturing An exploration of advanced manufacturing and the environmental impact and significance of manufacturing Practical discussions of the economic importance of advanced manufacturing An

examination of the sustainability of advanced manufacturing, and developing and future trends in manufacturing Perfect for materials scientists, mechanical engineers, and process engineers, Modeling and Optimization in Manufacturing will also earn a place in the libraries of engineering scientists in industries seeking a one-stop reference on multiscale modeling and optimization in manufacturing.

Introduction to Process Control - Victor A. Skormin 2016-10-05

This textbook is intended for an introductory graduate level on process control, taught in most engineering curricula. It focuses on the statistical techniques and methods of control and system optimization needed for the mathematical modeling, analysis, simulation, control and optimization of multivariable manufacturing processes. In four sections, it covers: Relevant mathematical methods, including random events, variables and processes, and their characteristics; estimation and confidence intervals; Bayes applications; correlation and regression analysis; statistical cluster analysis; and singular value decomposition for classification applications. Mathematical description of manufacturing processes, including static and dynamic models; model validation; confidence intervals for model parameters; principal component analysis; conventional and recursive least squares procedures; nonlinear least squares; and continuous-time, discrete-time, s-domain and Z-domain models. Control of manufacturing processes, including transfer function/transfer matrix models; state-variable models; methods of discrete-time classical control; state variable discrete-time control; state observers/estimators in control systems; methods of decoupling control; and methods of adaptive control. Methods and applications of system optimization, including unconstrained and constrained optimization; analytical and numerical optimization procedures; use of penalty functions; methods of linear programming; gradient methods; direct search methods; genetic optimization; methods and applications of dynamic programming; and applications to estimation, design, control, and planning. Each section of the book will include end-of-chapter exercises, and the book will be suitable for any systems, electrical, chemical, or industrial engineering program, as it focuses on the processes themselves, and not on the product being manufactured. Students will be able to obtain a mathematical model of any manufacturing process, to design a computer-based control system for a particular continuous manufacturing process, and be able to formulate an engineering problem in terms of optimization, as well as the ability to choose and apply the appropriate optimization technique.

Modelling, Analysis and Optimization of Biosystems - Werner Krabs 2007-08-10

In general, several mathematical models can be designed in order to describe a biological or medical process and there is no unique criterion which model gives the best description. This book presents several of these models and shows applications of them to different biological and medical problems. The book shows that operations research expertise is necessary in respect to modeling, analysis and optimization of biosystems.

Petroleum Refinery Process Modeling - Y. A. Liu 2018-06-05

A comprehensive review of the theory and practice of the simulation and optimization of the petroleum refining processes Petroleum Refinery Process Modeling offers a thorough review of how to quantitatively model key refinery reaction and fractionation processes. The text introduces the basics of dealing with the thermodynamics and physical property predictions of hydrocarbon components in the context of process modeling. The authors - three experts on the topic - outline the procedures and include the key data required for building reaction and fractionation models with commercial software. The text shows how to filter through the extensive data available at the refinery and using plant data to begin calibrating available models and extend the models to include key fractionation sub-models. It provides a sound and informed basis to understand and exploit plant phenomena to improve yield, consistency, and performance. In addition, the authors offer information on applying models in an overall refinery context through refinery planning based on linear programming. This important resource: -Offers the basic information of thermodynamics and physical property predictions of hydrocarbon components in the context of process modeling -Uses the key concepts of fractionation lumps and physical properties to develop detailed models and workflows for atmospheric (CDU) and vacuum (VDU) distillation units -Discusses modeling FCC, catalytic reforming and hydroprocessing units Written for chemical engineers, process engineers, and engineers for measurement and control, this resource explores the advanced simulation tools and techniques that are available to support experienced and aid new operators and engineers.

Engineering Optimization - R. Russell Rhinehart 2018-03-14

An Application-Oriented Introduction to Essential Optimization Concepts and Best Practices Optimization is an inherent human tendency that gained new life after the advent of calculus; now, as the world grows increasingly reliant on complex systems, optimization has become both more important and more challenging than ever before. Engineering Optimization provides a practically-focused introduction to modern engineering optimization best practices, covering fundamental analytical and numerical techniques throughout each stage of the optimization process. Although essential algorithms are explained in detail, the focus lies more in the human function: how to create an appropriate objective function, choose decision variables, identify and incorporate constraints, define convergence, and other critical issues that define the success or failure of an optimization project. Examples, exercises, and homework throughout reinforce the author's "do, not study" approach to learning, underscoring the application-oriented discussion that provides a deep, generic understanding of the optimization process that can be applied to any field. Providing excellent reference for students or professionals, Engineering Optimization: Describes and develops a variety of algorithms, including gradient based (such as Newton's, and Levenberg-Marquardt), direct search (such as Hooke-Jeeves, Leapfrogging, and Particle Swarm), along with surrogate functions for surface characterization Provides guidance on optimizer choice by application, and explains how to determine appropriate optimizer parameter values Details current best practices for critical stages of specifying an optimization procedure, including decision variables, defining constraints, and relationship modeling Provides access to software and Visual Basic macros for Excel on the companion website, along with solutions to examples presented in the book Clear explanations, explicit equation derivations, and practical examples make this book ideal for use as part of a class or self-study, assuming a basic understanding of statistics, calculus, computer programming, and engineering models. Anyone seeking best practices for "making the best choices" will find value in this introductory resource.

Performance Modeling, Analysis and Optimization for Asynchronous Circuits:Static and Statistical Analysis Approaches - Eslam Yahya 2015-10-18

Asynchronous circuits provide efficient solutions for many of the recent nanometric technologies, although the lack of analysis and optimization tools has limited the commercial spread of this technology. This book helps readers to understand the difficulties of modeling and analyzing asynchronous circuits. A new modeling methodology is introduced; it is used to build Asynchronous Static Timing Analysis (ASTA) and Asynchronous Statistical Static Timing Analysis (ASSTA). These fast and accurate methods are used to optimize the circuit speed against its hardware size. In addition, the book investigates the handshaking protocol effect on different asynchronous circuit performance metrics (speed, power consumption, EMI and robustness against process variability). The book is accompanied by AHMOSE (Asynchronous High-speed Modeling and Optimization Tool-set), a demonstrative software, which provides to the user a better understanding and usage of the explained methods.

Modeling Risk - Johnathan Mun 2010-06-15

An updated guide to risk analysis and modeling Although risk was once seen as something that was both unpredictable and uncontrollable, the evolution of risk analysis tools and theories has changed the way we look at this important business element. In the Second Edition of Analyzing and Modeling Risk, expert Dr. Johnathan Mun provides up-to-date coverage of risk analysis as it is applied within the realms of business risk analysis and offers an intuitive feel of what risk looks like, as well as the different ways of quantifying it. This Second Edition provides professionals in all industries a more comprehensive guide on such key concepts as risk and return, the fundamentals of model building, Monte Carlo simulation, forecasting, time-series and regression analysis, optimization, real options, and more. Includes new examples, questions, and exercises as well as updates using Excel 2007 Book supported by author's proprietary risk analysis software found on the companion CD-ROM Offers both a qualitative and quantitative description of risk Filled with in-depth insights and practical advice, this reliable resource covers all of the essential tools and techniques that risk managers need to successfully conduct risk analysis. Note: CD-ROM/DVD and other supplementary materials are not included as part of eBook file.

Statistical Performance Modeling and Optimization - Xin Li 2007

Statistical Performance Modeling and Optimization reviews various statistical methodologies that have

been recently developed to model, analyze and optimize performance variations at both transistor level and system level in integrated circuit (IC) design. The following topics are discussed in detail: sources of process variations, variation characterization and modeling, Monte Carlo analysis, response surface modeling, statistical timing and leakage analysis, probability distribution extraction, parametric yield estimation and robust IC optimization. These techniques provide the necessary CAD infrastructure that facilitates the bold move from deterministic, corner-based IC design toward statistical and probabilistic design. Statistical Performance Modeling and Optimization reviews and compares different statistical IC analysis and optimization techniques, and analyzes their trade-offs for practical industrial applications. It serves as a valuable reference for researchers, students and CAD practitioners.

Modeling and Analysis of Chemical Engineering Processes - K. Balu 2007
The chemical process industry faces serious problems with regard to new materials and efficient methods of production due to increasing costs of energy, stringent environmental regulations and global competition. A clear understanding of the processes is required in order to solve these problems. One way is through crisp modeling method; another is through an optimal operation of the process to improve profitability and efficiency. The book is in two parts. The first part discusses the methods of modeling chemical engineering processes through well known mathematical methods involving numerical calculations. This includes the recent concepts of Fuzzy logic and neural nets. The second part describes the efficient optimization methods, which are available for the effective application in many chemical processes. This involves methods of search for extrema as well as optimization, with and without constraint relations. Most books on nonlinear programming are of theoretical type, and the exact procedures of computation are often obscure. But in this book, a number of problems have been worked out. In addition to this, computer programs are included for almost all the topics. Due to the intricacy of optimization programs, the flow charts and the program in clear BASIC language have been provided so that the reader can understand the mathematical methods. The book will be useful for students and practising engineers in the field of chemical engineering, biotechnology, environmental engineering, and applied mathematics

Business Process Modeling, Simulation and Design - Manuel Laguna 2018-12-07
Business Process Modeling, Simulation and Design, Third Edition provides students with a comprehensive coverage of a range of analytical tools used to model, analyze, understand, and ultimately design business processes. The new edition of this very successful textbook includes a wide range of approaches such as graphical flowcharting tools, cycle time and capacity analyses, queuing models, discrete-event simulation, simulation-optimization, and data mining for process analytics. While most textbooks on business process management either focus on the intricacies of computer simulation or managerial aspects of business processes, this textbook does both. It presents the tools to design business processes and management techniques on operating them efficiently. The book focuses on the use of discrete event simulation as the main tool for analyzing, modeling, and designing effective business processes. The integration of graphic user-friendly simulation software enables a systematic approach to create optimal designs.

Markov Models & Optimization - M.H.A. Davis 1993-08-01
This book presents a radically new approach to problems of evaluating and optimizing the performance of continuous-time stochastic systems. This approach is based on the use of a family of Markov processes called Piecewise-Deterministic Processes (PDPs) as a general class of stochastic system models. A PDP is a Markov process that follows deterministic trajectories between random jumps, the latter occurring either spontaneously, in a Poisson-like fashion, or when the process hits the boundary of its state space. This formulation includes an enormous variety of applied problems in engineering, operations research, management science and economics as special cases; examples include queueing systems, stochastic scheduling, inventory control, resource allocation problems, optimal planning of production or exploitation of renewable or non-renewable resources, insurance analysis, fault detection in process systems, and tracking of maneuvering targets, among many others. The first part of the book shows how these applications lead to the PDP as a system model, and the main properties of PDPs are derived. There is particular emphasis on the so-called extended generator of the process, which gives a general method for calculating expectations and distributions of system performance functions. The second half of the book is devoted to control theory for PDPs, with a view to controlling PDP models for optimal performance: characterizations are obtained of optimal strategies both for continuously-acting controllers and for control by intervention (impulse control). Throughout the book, modern methods of stochastic analysis are used, but all the necessary theory is developed from scratch and presented in a self-contained way. The book will be useful to engineers and scientists in the application areas as well as to mathematicians interested in applications of stochastic analysis.