Optimal Design An Introduction To The Theory For Parameter Estimation Ettore Majorana International Science Series

This book presents foundations and practical application of multi-objective optimization methods to Vehicle Design Problems, bolstered with an extensive collection of examples. Opening with a broad theoretical introduction to the optimization of complex mechanical systems and multi-objective optimization methods, the book presents several applications which are extensively exposed here for the first time. The book includes examples of proposed methods to the solution of real vehicle design problems.

The book is concerned with the statistical theory for locating spatial sensors. It bridges the gap between spatial statistics and optimum design theory. After introductions to those two fields the topics of exploratory designs and designs for spatial trend and variogram estimation are treated. Special attention is devoted to describing new methodologies to cope with the problem of correlated observations.

Optimal Design of Flexural Systems: Beams, Grillages, Slabs, Plates and Shells covers theoretical developments and optimal solutions for all boundary conditions that may be of practical or theoretical interest in the design of flexural systems. Organized into nine chapters, this book begins with a review of certain fundamental concepts of mechanics, calculus of variations, and optimal design. Subsequent chapters discuss in considerable details the theories of optimal plastic design, as well as the elastic and prestressed systems. Other chapters describe the theory of optimal flexure fields that give an absolute minimum statically admissible ""moment volume"" for plane systems, as well as the slabs and grillages optimized within various types of geometrical constraints. The last chapter evaluates experimental work and certain practical aspects of the optimization of flexural systems. This book will be of interest to graduate students, research workers, practicing engineers, and architects in structural engineering, architectural science, aerospace technology, solid mechanics, and applied mathematics.

Crime Reconstruction, Second Edition is an updated guide to the interpretation of physical evidence, written for the advanced student of forensic science, the practicing forensic generalist and those with multiple forensic specialists. It is designed to assist reconstructionists with understanding their role in the justice system; the development and refinement of case theory’ and the limits of physical evidence interpretation. Chisum and Turvey begin with chapters on the history and ethics of crime reconstruction and then shift to the more applied subjects of reconstruction methodology and practice standards. The volume concludes with chapters on courtroom conduct and evidence admissibility to prepare forensic reconstructionists for what awaits them when they take the witness stand. Crime Reconstruction, Second Edition, remains an unparalleled watershed collaborative effort by internationally known, qualified, and respected forensic science practitioner holding generations of case experience among them. Forensic pioneer such as W. Jerry Chisum, John D. DeHaan, John I. Thorton, and Brent E. Turvey contribute chapters on crime scene investigation, arson reconstruction, trace evidence interpretation, advanced bloodstain interpretation, and ethics. Other chapters cover the subjects of shooting incident reconstruction, interpreting digital evidence, staged crime scenes, and examiner bias. Rarely have so many forensic giants collaborated, and never before have the natural limits of physical evidence been made so clear. Updates to the majority of chapters, to comply with the NAS Report New chapters on forensic science, crime scene investigation, wound pattern analysis, sexual assault reconstruction, and report writing Updated with key terms, chapter summaries, discussion questions, and a comprehensive glossary; ideal for those teaching forensic science and crime reconstruction subjects at the college level Provides clear practice standards and ethical guidelines for the practicing forensic scientist

Introduction to Optimum Design, Fourth Edition, carries on the tradition of the most widely used textbook in engineering optimization and optimum design courses. It is intended for use in a first course on engineering design and optimization at the undergraduate or graduate level in engineering departments of all disciplines, with a primary focus on mechanical, aerospace, and civil engineering courses. Through a basic and organized approach, the text describes engineering design optimization in a rigorous, yet simplified manner, illustrates various concepts and procedures with simple examples, and demonstrates their applicability to engineering design problems. Formulation of a design problem as an optimization problem is emphasized and illustrated throughout the text using Excel and MATLAB as learning and teaching aids. This fourth edition has been reorganized, rewritten in parts, and enhanced with new material, making the book even more appealing to instructors regardless of course level. Includes basic concepts of optimality conditions and numerical methods that are described with simple and practical examples, making the material highly teachable and learnable Presents applications of optimization methods for structural, mechanical, aerospace, and industrial engineering problems Provides practical design examples that introduce students to the use of optimization methods early in the book Contains chapter on several advanced optimum design topics that serve the needs of instructors who teach more advanced courses

The book is devoted to intelligent design of structures as a novel kind of designing based on computational intelligence. The proposed methodology based on computational intelligence has some heuristic and learning attributes typical for natural intelligence. Computer models of the structures are built on the base of the finite element method (FEM), the boundary element method (BEM) or coupling of FEM and BEM. The short description of possible discrete models of structures using these methods is included in the Chapter 2. Various kinds of intelligent approaches using sequential, parallel, distributed, fuzzy and hybrid evolutionary, immune and particle swarm algorithms and neural computing are presented in Chapter 3. Different kinds of optimization such as shape, topology, size and material optimization for structures under static and dynamical mechanical and thermo-mechanical loadings, structures with cracks and composite structures are considered in Chapter 4. Multi-objective optimization for coupled problems is also taken into account. Several numerical examples illustrating these kinds of optimization are presented for 2-D (plane-stress or plane-strain, plates, shells) as well as 3-D structures. Chapter 5 is devoted to special problems related to solving inverse problems in which boundary conditions, defects such as voids or cracks and material characteristics, are unknown. Closing comments summarizing the book are presented in Chapter 6.

Thermal System Design and Simulation covers the fundamental analyses of thermal energy systems that enable users to effectively formulate their own simulation and optimal design procedures. This reference provides thorough guidance on how to formulate optimal design constraints and develop strategies to solve them with minimal computational effort. The book uniquely illustrates the methodology of combining information flow diagrams to simplify system simulation procedures needed in optimal design. It also includes a comprehensive presentation on dynamics of thermal systems and the control systems needed to ensure safe operation at varying loads. Designed to give readers the skills to develop their own customized software for

simulating and designing thermal systems, this book is relevant for anyone interested in obtaining an advanced knowledge of thermal system analysis and design. Contains detailed models of simulation for equipment in the most commonly used thermal engineering systems Features illustrations for the methodology of using information flow diagrams to simplify system simulation procedures Includes comprehensive global case studies of simulation and optimization of thermal systems

The most comprehensive and applied discussion of stated choice experiment constructions available The Construction of Optimal Stated Choice Experiments provides an accessible introduction to the construction methods needed to create the best possible designs for use in modeling decision-making. Many aspects of the design of a generic stated choice experiment are independent of its area of application, and until now there has been no single book describing these constructions. This book begins with a brief description of the various areas where stated choice experiments are applicable, including marketing and health economics, transportation, environmental resource economics, and public welfare analysis. The authors focus on recent research results on the construction of optimal and near-optimal choice experiments and conclude with guidelines and insight on how to properly implement these results. Features of the book include: Construction of generic stated choice experiments for the estimation of main effects only, as well as experiments for the estimation of main effects plus two-factor interactions Constructions for choice sets of any size and for attributes with any number of levels A discussion of designs that contain a none option or a common base option Practical techniques for the implementation of the constructions Class-tested material that presents theoretical discussion of optimal design Complete and extensive references to the mathematical and statistical literature for the constructions Exercise sets in most chapters, which reinforce the understanding of the presented material The Construction of Optimal Stated Choice Experiments serves as an invaluable reference guide for applied statisticians and practitioners in the areas of marketing, health economics, transport, and environmental evaluation. It is also ideal as a supplemental text for courses in the design of experiments, decision support systems, and choice models. A companion web site is available for readers to access web-based software that can be used to implement the constructions described in the book.

There has been an enormous growth in recent years in the literature on discrete optimal designs. The optimality problems have been formulated in various models arising in the experimental designs and substantial progress has been made towards solving some of these. The subject has now reached a stage of completeness which calls for a self-contained monograph on this topic. The aim of this monograph is to present the state of the art and to focus on more recent advances in this rapidly developing area. We start with a discussion of statistical optimality criteria in Chapter One. Chapters Two and Three deal with optimal block designs. Row-column designs are dealt with in Chapter Four. In Chapter Five we deal with optimal designs with mixed effects models. Repeated measurement designs are considered in Chapter Six. Chapter Seven deals with some special situations and Weighing designs are dis cussed in Chapter Eight. We have endeavoured to include all the major developments that have taken place in the last three decades. The book should be of use to research workers in several areas including combinatorics as well as to the experimenters in diverse fields of applications. Since the details of the construction of the designs are available in excellent books, we have only pointed out the designs which have optimality proper ties. We believe, this will be adequate for the experimenters.

Mathematics in Science and Engineering, Volume 3: The Optimal Design of Chemical Reactors: A Study in Dynamic Programming covers some of the significant problems of chemical reactor engineering from a unified point of view. This book discusses the principle of optimality in its general baring on chemical processes. Organized into nine chapters, this volume begins with an overview of the whole range of optimal problems in chemical reactor design. This text then provides the fundamental equations for reactions and reactors. Other chapters consider the objective function needed to define a realistic optimal problem and explain separately the main types of chemical reactors and their associated problems. This book discusses as well the three problems with a stochastic element. The final chapter deals with the optimal operation of existing reactors that may be regarded as partial designs in which only some of the variables can be optimally chosen. This book is a valuable resource for chemical engineers.

"This is an engaging and informative book on the modern practice of experimental design. The authors' writing style is entertaining, the consulting dialogs are extremely enjoyable, and the technical material is presented brilliantly but not overwhelmingly. The book is a joy to read. Everyone who practices or teaches DOE should read this book." - Douglas C. Montgomery, Regents Professor, Department of Industrial Engineering, Arizona State University "It's been said: 'Design for the experiment, don't experiment for the design.' This book ably demonstrates this notion by showing how tailor-made, optimal designs can be effectively employed to meet a client's actual needs. It should be required reading for anyone interested in using the design of experiments in industrial settings." —Christopher J. Nachtsheim, Frank A Donaldson Chair in Operations Management, Carlson School of Management, University of Minnesota This book demonstrates the utility of the computer-aided optimal design approach using real industrial examples. These examples address questions such as the following: How can I do screening inexpensively if I have dozens of factors to investigate? What can I do if I have day-to-day variability and I can only perform 3 runs a day? How can I do RSM cost effectively if I have categorical factors? How can I design and analyze experiments when there is a factor that can only be changed a few times over the study? How can I include both ingredients in a mixture and processing factors in the same study? How can I design an experiment if there are many factor combinations that are impossible to run? How can I make sure that a time trend due to warming up of equipment does not affect the conclusions from a study? How can I take into account batch information in when designing experiments involving multiple batches? How can I add runs to a botched experiment to resolve ambiguities? While answering these questions the book also shows how to evaluate and compare designs. This allows researchers to make sensible trade-offs between the cost of experimentation and the amount of information they obtain.

The present volume is a collective monograph devoted to applications of the optimal design theory in optimization and statistics. The chapters re?ect the topics discussed at the workshop “W-Optimum Design and Related Statistical Issues” that took place in Juan-les-Pins, France, in May 2005. The title of the workshop was chosen as a light-hearted celebration of the work of Henry Wynn. It was supported by the Laboratoire I3S (CNRS/Universit ? e de Nice, Sophia Antipolis), to which Henry is a frequent visitor. The topics covered partly re?ect the wide spectrum of Henry’s research - terests. Algorithms for constructing optimal designs are discussed in Chap. 1, where Henry’s contribution to the ?eld is acknowledged. Steepest-ascent - gorithms used to construct optimal designs are very much related to general gradientalgorithmsforconvexoptimization. Inthelasttenyears,asigni?cant part of Henry’s research was devoted to the study of the

asymptotic prop- ties of such algorithms. This topic is covered by Chaps. 2 and 3. The work by Alessandra Giovagnoli concentrates on the use of majorization and stoch- tic ordering, and Chap. 4 is a hopeful renewal of their collaboration. One of Henry’s major recent interests is what is now called algebraic statistics, the application of computational commutative algebra to statistics, and he was partly responsible for introducing the experimental design sub-area, reviewed in Chap. 5. One other sub-area is the application to Bayesian networks and Chap. 6 covers this, with Chap. 7 being strongly related.

This book presents efficient metaheuristic algorithms for optimal design of structures. Many of these algorithms are developed by the author and his colleagues, consisting of Democratic Particle Swarm Optimization, Charged System Search, Magnetic Charged System Search, Field of Forces Optimization, Dolphin Echolocation Optimization, Colliding Bodies Optimization, Ray Optimization. These are presented together with algorithms which were developed by other authors and have been successfully applied to various optimization problems. These consist of Particle Swarm Optimization, Big Bang-Big Crunch Algorithm, Cuckoo Search Optimization, Imperialist Competitive Algorithm, and Chaos Embedded Metaheuristic Algorithms. Finally a multi-objective optimization method is presented to solve large-scale structural problems based on the Charged System Search algorithm. The concepts and algorithms presented in this book are not only applicable to optimization of skeletal structures and finite element models, but can equally be utilized for optimal design of other systems such as hydraulic and electrical networks. In the second edition seven new chapters are added consisting of the new developments in the field of optimization. These chapters consist of the Enhanced Colliding Bodies Optimization, Global Sensitivity Analysis, Tug of War Optimization, Water Evaporation Optimization, Vibrating Particle System Optimization and Cyclical Parthenogenesis Optimization algorithms. A chapter is also devoted to optimal design of large scale structures.

Prior to the 1970's a substantial literature had accumulated on the theory of optimal design, particularly of optimal linear regression design. To a certain extent the study of the subject had been piecemeal, different criteria of optimality having been studied separately. Also to a certain extent the topic was regarded as being largely of theoretical interest and as having little value for the practising statistician. However during this decade two significant developments occurred. It was observed that the various different optimality criteria had several mathematical properties in common; and general algorithms for constructing optimal design measures were developed. From the first of these there emerged a general theory of remarkable simplicity and the second at least raised the possibility that the theory would have more practical value. With respect to the second point there does remain a limiting factor as far as designs that are optimal for parameter estimation are concerned, and this is that the theory assumes that the model be collected is known a priori. This of course underlying data to is seldom the case in practice and it often happens that designs which are optimal for parameter estimation allow no possibility of model validation. For this reason the theory of design for parameter estimation may well have to be combined with a theory of model validation before its practical potential is fully realized. Nevertheless discussion in this monograph is limited to the theory of design optimal for parameter estimation.

Experimental design is often overlooked in the literature of applied and mathematical statistics: statistics is taught and understood as merely a collection of methods for analyzing data. Consequently, experimenters seldom think about optimal design, including prerequisites such as the necessary sample size needed for a precise answer for an experi

In order to select an optimal structure among possible similar structures, one needs to compare the elastic behavior of the structures. A new criterion that describes elastic behavior is the rate of change of deformation. Using this criterion, the safe dimensions of a structure that are required by the stress distributed in a structure can be calculated. The new non-linear theory of elasticity allows one to determine the actual individual limit of elasticity/failure of a structure using a simple non-destructive method of measurement of deformation on the model of a structure while presently it can be done only with a destructive test for each structure. For building and explaining the theory, a new logical structure was introduced as the basis of the theory. One of the important physical implications of this logic is that it describes mathematically the universal domain of the possible stable physical relations.

The increasing cost of research means that scientists are in more urgent need of optimal design theory to increase the efficiency of parameter estimators and the statistical power of their tests. The objectives of a good design are to provide interpretable and accurate inference at minimal costs. Optimal design theory can help to identify a design with maximum power and maximum information for a statistical model and, at the same time, enable researchers to check on the model assumptions. This Book: Introduces optimal experimental design in an accessible format. Provides guidelines for practitioners to increase the efficiency of their designs, and demonstrates how optimal designs can reduce a study’s costs. Discusses the merits of optimal designs and compares them with commonly used designs. Takes the reader from simple linear regression models to advanced designs for multiple linear regression and nonlinear models in a systematic manner. Illustrates design techniques with practical examples from social and biomedical research to enhance the reader’s understanding. Researchers and students studying social, behavioural and biomedical sciences will find this book useful for understanding design issues and in putting optimal design ideas to practice.

Robust Industrial Control Systems: Optimal Design Approach for Polynomial Systems presents a comprehensive introduction to the use of frequency domain and polynomial system design techniques for a range of industrial control and signal processing applications. The solution of stochastic and robust optimal control problems is considered, building up from single-input problems and gradually developing the results for multivariable design of the later chapters. In addition to cataloguing many of the results in polynomial systems needed to calculate industrial controllers and filters, basic design procedures are also introduced which enable cost functions and system descriptions to be specified in order to satisfy industrial requirements. Providing a range of solutions to control and signal processing problems, this book: * Presents a comprehensive introduction to the polynomial systems approach for the solution of H_2 and H_infinity optimal control problems. * Develops robust control design procedures using frequency domain methods. * Demonstrates design examples for gas turbines, marine systems, metal processing, flight control, wind turbines, process control and manufacturing systems. * Includes the analysis of multi-degrees of freedom controllers and the computation of restricted structure controllers that are simple to implement. * Considers time-varying control and signal processing problems. * Addresses the control of non-linear processes using both multiple model concepts and new optimal control solutions. Robust Industrial Control Systems: Optimal Design Approach for Polynomial Systems is essential reading for professional engineers requiring an introduction to optimal control theory and insights into its use in the design of real industrial processes. Students and researchers in the field will also find it an excellent reference tool.

Praise for the First Edition: "If you . . . want an up-to-date, definitive reference written by authors who have contributed much to this field, then this book is an essential addition to your library." —Journal of the American Statistical Association Fully updated to reflect the major progress in the use of statistically designed experiments for product and process improvement, Experiments, Second Edition introduces

some of the newest discoveries—and sheds further light on existing ones—on the design and analysis of experiments and their applications in system optimization, robustness, and treatment comparison. Maintaining the same easy-to-follow style as the previous edition while also including modern updates, this book continues to present a new and integrated system of experimental design and analysis that can be applied across various fields of research including engineering, medicine, and the physical sciences. The authors modernize accepted methodologies while refining many cutting-edge topics including robust parameter design, reliability improvement, analysis of non-normal data, analysis of experiments with complex aliasing, multilevel designs, minimum aberration designs, and orthogonal arrays. Along with a new chapter that focuses on regression analysis, the Second Edition features expanded and new coverage of additional topics, including: Expected mean squares and sample size determination One-way and two-way ANOVA with random effects Split-plot designs ANOVA treatment of factorial effects Response surface modeling for related factors Drawing on examples from their combined years of working with industrial clients, the authors present many cutting-edge topics in a single, easily accessible source. Extensive case studies, including goals, data, and experimental designs, are also included, and the book's data sets can be found on a related FTP site, along with additional supplemental material. Chapter summaries provide a succinct outline of discussed methods, and extensive appendices direct readers to resources for further study. Experiments, Second Edition is an excellent book for design of experiments courses at the upper-undergraduate and graduate levels. It is also a valuable resource for practicing engineers and statisticians.

"Covers design methods for optimal (or quasioptimal) control algorithms in the form of synthesis for deterministic and stochastic dynamical systems-with applications in aerospace, robotic, and servomechanical technologies. Providing new results on exact and approximate solutions of optimal control problems."

New global standards are the basis for new MES products that have appeared in the last five years in the marketplace Features a comprehensive presentation of available MES technologies

Principles of Optimal Design puts the concept of optimal design on a rigorous foundation and demonstrates the intimate relationship between the mathematical model that describes a design and the solution methods that optimize it. Since the first edition was published, computers have become ever more powerful, design engineers are tackling more complex systems, and the term optimization is now routinely used to denote a design process with increased speed and quality. This second edition takes account of these developments and brings the original text thoroughly up to date. The book now includes a discussion of trust region and convex approximation algorithms. A new chapter focuses on how to construct optimal design models. Three new case studies illustrate the creation of optimization models. The final chapter on optimization practice has been expanded to include computation of derivatives, interpretation of algorithmic results, and selection of algorithms and software. Both students and practising engineers will find this book a valuable resource for design project work.

Optimal Design for Nonlinear Response Models discusses the theory and applications of model-based experimental design with a strong emphasis on biopharmaceutical studies. The book draws on the authors' many years of experience in academia and the pharmaceutical industry. While the focus is on nonlinear models, the book begins with an explanation of

Design Optimization deals with the application of the ideas of optimization to design, taking as its central theme the notion that design can be treated as a goal-seeking, decision-making activity. Emphasis is on design optimization rather than on optimization techniques. This book consists of nine chapters, each focusing on a particular class of design optimization and demonstrating how design optimization problems are formulated and solved. The applications range from architecture and structural engineering to mechanical engineering, chemical engineering, building design and layout, and siting policy. The first five chapters are all concerned with design problems where it is convenient to express the goals in a single objective or criterion to be optimized. In particular, optimal space planning and shape optimization of structures are discussed, along with approximation concepts for optimum structural design; application of nonlinear programming to design; and generalized Steiner network problems in engineering design. The last four chapters focus on multicriteria programming; multicriteria optimization for engineering and architectural design; and a system for integrated optimal design. This monograph will be of interest to designers and others concerned with the use of optimization concepts and tools in design optimization.

Optimal Design and Retrofit of Energy Efficient Buildings, Communities, and Urban Centers presents current techniques and technologies for energy efficiency in buildings. Cases introduce and demonstrate applications in both the design of new buildings and retrofit of existing structures. The book begins with an introduction that includes energy consumption statistics, building energy efficiency codes, and standards and labels from around the world. It then highlights the need for integrated and comprehensive energy analysis approaches. Subsequent sections present an overview of advanced energy efficiency technologies for buildings, including dynamic insulation materials, phase change materials, LED lighting and daylight controls, Life Cycle Analysis, and more. This book provides researchers and professionals with a coherent set of tools and techniques for enhancing energy efficiency in new and existing buildings. The case studies presented help practitioners implement the techniques and technologies in their own projects. Introduces a holistic analysis approach to energy efficiency for buildings using the concept of energy productivity Provides coverage of individual buildings, communities and urban centers Includes both the design of new buildings and retrofitting of existing structures to improve energy efficiency Describes state-of-the-art energy efficiency technologies Presents several cases studies and examples that illustrate the analysis techniques and impact of energy efficiency technologies and controls

Optimal Structural Design can be referred to as one of the most important and promising branches of applied mathematics and mechanics. The basic problem of optimal design is to construct a structure that satisfied a system of given constraints and provides the best quality and performance. This book reflects the culmination of Russian activity in the field of optimal structural design.

Introduction to Optimum Design, Third Edition describes an organized approach to engineering design optimization in a rigorous yet simplified manner. It illustrates various concepts and procedures with simple examples and demonstrates their applicability to engineering design problems. Formulation of a design problem as an optimization problem is emphasized and illustrated throughout the text. Excel and MATLAB® are featured as learning and teaching aids. Basic concepts of optimality conditions and numerical methods are described with simple and practical examples, making the material highly teachable and learnable Includes applications of optimization methods for structural, mechanical, aerospace, and industrial engineering problems Introduction to MATLAB Optimization Toolbox Practical design examples introduce students to the use of optimization methods early in the book New example problems throughout the text are enhanced with detailed illustrations Optimum design with Excel Solver has been expanded into a full chapter New chapter on several advanced optimum design topics serves the needs of instructors who teach more advanced courses

This book provides a comprehensive treatment of the design of blocked and split-plot experiments. The optimal design approach advocated in the book will help applied statisticians from industry, medicine, agriculture, chemistry and many other fields of study in setting up tailor-made experiments. The book also contains a theoretical background, a thorough review of the recent work in the area of blocked and split-plot experiments, and a number of interesting theoretical results.

Optimal DesignAn Introduction to the Theory for Parameter EstimationSpringer Science & Business Media

A contemporary evaluation of switching power design methods with real world applications • Written by a leading author renowned in his field • Focuses on switching power supply design, manufacture and debugging • Switching power supplies have relevance for contemporary applications including mobile phone chargers, laptops and PCs • Based on the authors' successful "Switching Power Optimized

Design 2nd Edition" (in Chinese) • Highly illustrated with design examples of real world applications

Design of water distribution networks is traditionally based on trial-and-approach in which the designer assumes, based on experience and judgment, sizes of different elements and successively modifies them until a network with satisfactory hydraulic performance is obtained. This text covers: - Essential hydraulic, economic optimization principles. - Theory is developed gradually for optimal design of simple, single-source branched networks subjected to single loading to complex, multiple-source looped networks subjected to multiple loading. - Strengthening and expansion of existing networks and also reliability-based design. - Several illustrative examples enabling the reader to apply them in practice- approximately 100 line drawings.

This book highlights numerical models as powerful tools for the optimal design of Micro-Electro-Mechanical Systems (MEMS). Most MEMS experts have a background in electronics, where circuit models or behavioral models (i.e. lumped-parameter models) of devices are preferred to field models. This is certainly convenient in terms of preliminary design, e.g. in the prototyping stage. However, design optimization should also take into account fine-sizing effects on device behavior and therefore be based on distributed-parameter models, such as finite-element models. The book shows how the combination of automated optimal design and field-based models can produce powerful design toolboxes for MEMS. It especially focuses on illustrating theoretical concepts with practical examples, fostering comprehension through a problem-solving approach. By comparing the results obtained using different methods, readers will learn to identify their respective strengths and weaknesses. In addition, special emphasis is given to evolutionary computing and nature-inspired optimization strategies, the effectiveness of which has already been amply demonstrated. Given its scope, the book provides PhD students, researchers and professionals in the area of computer-aided analysis with a comprehensive, yet concise and practice-oriented guide to MEMS design and optimization. To benefit most from the book, readers should have a basic grasp of electromagnetism, vector analysis and numerical methods.

This book contains the edited version of lectures and selected papers presented at the NATO ADVANCED STUDY INSTITUTE ON COMPUTER AIDED OPTIMAL DESIGN: Structural and Mechanical Systems, held in Tr6ia, Portugal, 29th June to 11th July 1986, and organized by CEMUL -Center of Mechanics and Materials of the Technical University of Lisbon. The Institute was attended by 120 participants from 21 countries, including leading scientists and engineers from universities, research institutions and industry, and Ph.D. students. Some participants presented invited and contributed papers during the Institute and almost all participated actively in discussions on scientific aspects during the Institute. The Advanced Study Institute provided a forum for interaction among eminent scientists and engineers from different schools of thought and young reseachers. The Institute addressed the foundations and current state of the art of essential techniques related to computer aided optimal design of structural and mechanical systems, namely: Vari ational and Finite Element Methods in Optimal Design, Numerical Optimization Techniques, Design Sensitivity Analysis, Shape Optimal Design, Adaptive Finite Element Methods in Shape Optimization, CAD Technology, Software Development Techniques, Integrated Computer Aided Design and Knowledge Based Systems. Special topics of growing importance were also pre sented.

Most available books in chemical engineering mainly pertain to continuous processes, with batch distillation relegated to a small section. Filling this void in the chemical engineering literature, Batch Distillation: Simulation, Optimal Design, and Control, Second Edition helps readers gain a solid, hands-on background in batch processing. The second edition of this bestseller explores numerous new developments in batch distillation that have emerged since the publication of the first edition. New to the Second Edition Special sections on complex column configurations and azeotropic, extractive, and reactive distillation A chapter on various kinds of uncertainties in batch distillation A chapter covering software packages for batch distillation simulation, design, optimization, and control Separate chapters on complex columns and complex systems Up-to-date references and coverage of recent research articles This edition continues to explain how to effectively design, synthesize, and make operations decisions related to batch processes. Through careful treatments of uncertainty analysis, optimization, and optimal control methods, the author gives readers the necessary tools for making the best decisions in practice. While primarily designed for a graduate course in batch distillation, the text can also be used in undergraduate chemical engineering courses. In addition, researchers and academics faced with batch distillation research problems and practicing chemical engineers tackling problems in actual day-to-day operations will find the book to be a useful reference source.

The First Comprehensive Book on the Subject Focusing on the underlying structure of a system, Optimal Design of Queueing Systems explores how to set the parameters of a queueing system, such as arrival and service rates, before putting it into operation. It considers various objectives, comparing individually optimal (Nash equilibrium), socially optimal, class optimal, and facility optimal flow allocations. After an introduction to basic design models, the book covers the optimal arrival rate model for a single-facility, single-class queue as well as dynamic algorithms for finding individually or socially optimal arrival rates and prices. It then examines several special cases of multiclass queues, presents models in which the service rate is a decision variable, and extends models and techniques to multifacility queueing systems. Focusing on networks of queues, the final chapters emphasize the qualitative properties of optimal solutions. Written by a long-time, recognized researcher on models for the optimal design and control of queues and networks of queues, this book frames the issues in the general setting of a queueing system. It shows how design models can control flow to achieve a variety of objectives.

The contributions in this book discuss large-scale problems like the optimal design of domes, antennas, transmission line towers, barrel vaults and steel frames with different types of limitations such as strength, buckling, displacement and natural frequencies. The authors use a set of definite algorithms for the optimization of all types of structures. They also add a new enhanced version of VPS and information about configuration processes to all chapters. Domes are of special interest to engineers as they enclose a maximum amount of space with a minimum surface and have proven to be very economical in terms of consumption of constructional materials. Antennas and transmission line towers are the one of the most popular structure since these steel lattice towers are inexpensive, strong, light and wind resistant. Architects and engineers choose barrel vaults as viable and often highly suitable forms for covering not only low-cost industrial buildings, warehouses, large-span hangars, indoor sports stadiums, but also large cultural and

leisure centers. Steel buildings are preferred in residential as well as commercial buildings due to their high strength and ductility particularly in regions which are prone to earthquakes.

Optimal Reliability Design provides a detailed introduction to systems reliability and reliability optimization. State-of-the-art techniques for maximizing system reliability are described, focusing on component reliability enhancement and redundancy arrangement. The authors present several case studies and show how optimization techniques are applied in practice. They also pay particular attention to finding methods that give the optimal trade-off between reliability and cost. The book is suitable for use on graduate-level courses in reliability engineering and operations research. It will also be a valuable reference for practising engineers.

Optimum Design 2000

Optimization is a mathematical tool developed in the early 1960's used to find the most efficient and feasible solutions to an engineering problem. It can be used to find ideal shapes and physical configurations, ideal structural designs, maximum energy efficiency, and many other desired goals of engineering. This book is intended for use in a first course on engineering design and optimization. Material for the text has evolved over a period of several years and is based on classroom presentations for an undergraduate core course on the principles of design. Virtually any problem for which certain parameters need to be determined to satisfy constraints can be formulated as a design optimization problem. The concepts and methods described in the text are quite general and applicable to all such formulations. Inasmuch, the range of application of the optimum design methodology is almost limitless, constrained only by the imagination and ingenuity of the user. The book describes the basic concepts and techniques with only a few simple applications. Once they are clearly understood, they can be applied to many other advanced applications that are discussed in the text. * Allows engineers involved in the design process to adapt optimum design concepts in their work using the material in the text. * Basic concepts of optimality conditions and numerical methods are described with simple examples, making the material high teachable and learnable. * Classroom-tested for many years to attain optimum pedagogical effectiveness.

Upper-level undergraduate text introduces aspects of optimal control theory: dynamic programming, Pontryagin's minimum principle, and numerical techniques for trajectory optimization. Numerous figures, tables. Solution guide available upon request. 1970 edition.