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Vibration of Continuous Systems Engineering Optimization

S.S. Rao presents the principles of reliability-based engineering and design in a simple and straight-forward approach. He addresses the design of mechanical components and systems; Monte Carlo simulation; reliability-based optimum design; strength-based reliability and interface theory; reliability testing; time-dependent reliability of components and systems; failure modes, event tree and fault tree analysis; quality control and reliability; modeling of geometry; weakest-link and fail-safe systems; maintainability and availability; extremal distributions; random variables and probability distributions; functions of random variables; and basic probability theory. With 254 illustrations and an index.

Optimization—Theory and Practice Springer Science & Business Media

This book presents a unified introduction to the theory of mechanical vibrations. The general theory of the vibrating particle is the point of departure for the field of multidegree of freedom systems. Emphasis is placed in the text on the issue of continuum vibrations. The presented examples are aimed at helping the readers with understanding the theory. This book is of interest among others to mechanical, civil and aeronautical engineers concerned with the vibratory behavior of the structures. It is useful also for students from undergraduate to postgraduate level. The book is based on the teaching experience of the authors.

Optimization PHI Learning Pvt. Ltd.

This text enables readers to quickly master and apply all the important optimization methods in use today across a broad range of industries. Covering both the latest and classical optimization methods, the text starts off with the basics and then progressively builds to advanced principles and applications. This comprehensive text covers nonlinear, linear, geometric, dynamic, and stochastic programming techniques as well as more specialized methods such as multiobjective, genetic algorithms, simulated annealing, neural networks, particle swarm optimization, ant colony optimization, and fuzzy optimization. Each method is presented in clear, straightforward language, making even the more sophisticated techniques easy to grasp. Advanced Engineering Optimization Through Intelligent Techniques Alpha Science Int'l Ltd.

This book provides readers with an understanding of the fundamentals and applications of structural reliability, stochastic finite element method, reliability analysis via stochastic expansion, and optimization under uncertainty. It examines the use of stochastic expansions, including polynomial chaos expansion and Karhunen-Loeve expansion for the reliability analysis of practical engineering problems.

John Wiley & Sons

Gives a detailed mathematical exposition to various optimization techniques. This book includes topics such as: Single and multi-dimensional optimization, Linear programming, Nonlinear constrained optimization and Evolutionary algorithms.

Methods of Feasible Directions Springer

This book presents select peer-reviewed papers presented at the International Conference on Numerical Optimization in Engineering and Sciences (NOIEAS) 2019. The book covers a wide variety of numerical optimization techniques across all major engineering disciplines like mechanical, manufacturing, civil, electrical, chemical, computer, and electronics engineering. The major focus is on innovative ideas, current methods and latest results involving advanced optimization techniques. The contents provide a good balance between numerical models and analytical results obtained for different engineering problems and challenges. This book will be useful for students, researchers, and professionals interested in engineering optimization techniques.

Engineering Optimization Academic Press

Primarily designed as a text for the postgraduate students of mechanical engineering and related branches, it provides an excellent introduction to optimization methods—the overview, the history, and the development. It is equally suitable for the undergraduate students for their electives. The text then moves on to familiarize the students with the formulation of optimization problems, graphical solutions, analytical methods of nonlinear optimization, classical optimization techniques, single variable (one-dimensional) unconstrained optimization, multidimensional problems, constrained optimization, equality and inequality constraints. With complexities of human life, the importance of optimization techniques as a tool has increased manifold. The application of optimization techniques creates an efficient, effective and a better life. Features • Includes numerous illustrations and unsolved problems. • Contains university questions. • Discusses the topics with step-by-step procedures.

Optimization in Chemical Engineering Springer Nature

This volume provides valuable insight into diverse topics related to mechanical engineering and presents state-of-the-art work on sustainable development being carried out throughout the world by budding researchers and scientists. Divided into three sections, the volume covers machine design, materials and manufacturing, and thermal engineering. It presents innovative research work on machine design that is of relevance to such varied fields as the automotive industry, agriculture, and human anatomy. The second section addresses materials characterization, an important tool in assessing proper materials for application-oriented jobs, and emerging unconventional machining processes that are important in design engineering for new products and tools. The section on thermal engineering broadly covers the use of viable alternate fuels, such as HHO, biodiesel, etc., with the objective of reducing the burden on petroleum reserves and the environment.

Mechanical Design Optimization Using Advanced Optimization Techniques CRC Press

A detailed review of a wide range of meta-heuristic and evolutionary algorithms in a systematic manner and how they relate to engineering optimization problems This book introduces the main metaheuristic algorithms and their applications in optimization. It describes 20 leading meta-heuristic and evolutionary algorithms and presents discussions and assessments of their performance in solving optimization problems from several fields of engineering. The book features clear and concise principles and presents detailed descriptions of leading methods such as the pattern search (PS) algorithm, the genetic algorithm (GA), the simulated annealing (SA) algorithm, the Tabu search (TS) algorithm, the ant colony optimization (ACO), and the particle swarm optimization (PSO) technique. Chapter 1 of Meta-heuristic and Evolutionary Algorithms for Engineering Optimization provides an overview of optimization and defines it by presenting examples of optimization problems in different engineering domains. Chapter 2 presents an introduction to meta-heuristic and evolutionary algorithms and links them to engineering problems. Chapters 3 to 22 are each devoted to a separate algorithm—and they each start with a brief literature review of the development of the algorithm, and its applications to engineering problems. The principles, steps, and execution of the algorithms are described in detail, and a pseudo code of the algorithm is presented, which serves as a guideline for coding the algorithm to solve specific applications. This book: Introduces state-of-the-art metaheuristic algorithms and their applications to engineering optimization; Fills a gap in the current literature by compiling and explaining the various meta-heuristic and evolutionary algorithms in a clear and systematic manner; Provides a step-by-step presentation of each algorithm and guidelines for practical implementation and coding of algorithms; Discusses and assesses the performance of metaheuristic algorithms in multiple problems from many fields of engineering; Relates optimization algorithms to engineering problems employing a unifying approach. Meta-heuristic and Evolutionary Algorithms for Engineering Optimization is a reference intended for students, engineers, researchers, and instructors in the fields of industrial engineering, operations research, optimization/mathematics, engineering optimization, and computer science. OMID BOZORG-HADDAD, PhD, is Professor in the Department of Irrigation and Reclamation Engineering at the University of Tehran, Iran. MOHAMMAD SOLGI, M.Sc., is Teacher Assistant for M.Sc. courses at the University of Tehran, Iran. HUGO A. LOÁICIGA, PhD, is Professor in the Department of Geography at the University of California, Santa Barbara, United States of America.

Reliability Engineering John Wiley & Sons

As technology presses forward, scientific projects are becoming increasingly complex. The international space station, for example, includes over 100 major components, carried aloft during 88 spaces flights which were organized by over 16 nations. The need for improved system integration between the elements of an overall larger technological system has sparked further development of systems of systems (SoS) as a solution for achieving interoperability and superior coordination between heterogeneous systems. Systems of Systems Engineering: Principles and Applications provides engineers with a definitive reference on this newly emerging technology, which is being embraced by such engineering giants as Boeing, Lockheed Martin, and Raytheon. The book covers the complete range of fundamental SoS topics, including modeling, simulation, architecture, control, communication, optimization, and applications. Containing the contributions of pioneers at the forefront of SoS development, the book also offers insight into applications in national security, transportation, energy, and defense as well as healthcare, the service industry, and information technology. System of systems (SoS) is still a relatively new concept, and in time numerous problems and open-ended issues must be addressed to realize its great potential. This book offers a first look at this rapidly developing technology so that engineers are better equipped to face such challenges.

Engineering Optimization Academic Press

Praise for the Third Edition ". . . guides and leads the reader through the learning path . . .

[e]xamples are stated very clearly and the results are presented with attention to detail." –MAA Reviews Fully updated to reflect new developments in the field, the Fourth Edition of Introduction to Optimization fills the need for accessible treatment of optimization theory and methods with an emphasis on engineering design. Basic definitions and notations are provided in addition to the related fundamental background for linear algebra, geometry, and calculus. This new edition explores the essential topics of unconstrained optimization problems, linear programming problems, and nonlinear constrained optimization. The authors also present an optimization perspective on global search methods and include discussions on genetic algorithms, particle swarm optimization, and the simulated annealing algorithm. Featuring an elementary introduction to artificial neural networks, convex optimization, and multi-objective optimization, the Fourth Edition also offers: A new chapter on integer programming Expanded coverage of one-dimensional methods Updated and expanded sections on linear matrix inequalities Numerous new exercises at the end of each chapter MATLAB exercises and drill problems to reinforce the discussed theory and algorithms Numerous diagrams and figures that complement the written presentation of key concepts MATLAB M-files for implementation of the discussed theory and algorithms (available via the book's website) Introduction to Optimization, Fourth Edition is an ideal textbook for courses on optimization theory and methods. In addition, the book is a useful reference for professionals in mathematics, operations research, electrical engineering, economics, statistics, and business.

Optimization Cambridge University Press

An accessible introduction to metaheuristics and optimization, featuring powerful and modern algorithms for application across engineering and the sciences From engineering and computer science to economics and management science, optimization is a core component for problem solving. Highlighting the latest developments that have evolved in recent years, *Engineering Optimization: An Introduction with Metaheuristic Applications* outlines popular metaheuristic algorithms and equips readers with the skills needed to apply these techniques to their own optimization problems. With insightful examples from various fields of study, the author highlights key concepts and techniques for the successful application of commonly-used metaheuristic algorithms, including simulated annealing, particle swarm optimization, harmony search, and genetic algorithms. The author introduces all major metaheuristic algorithms and their applications in optimization through a presentation that is organized into three succinct parts: Foundations of Optimization and Algorithms provides a brief introduction to the underlying nature of optimization and the common approaches to optimization problems, random number generation, the Monte Carlo method, and the Markov chain Monte Carlo method Metaheuristic Algorithms presents common metaheuristic algorithms in detail, including genetic algorithms, simulated annealing, ant algorithms, bee algorithms, particle swarm optimization, firefly algorithms, and harmony search Applications outlines a wide range of applications that use metaheuristic algorithms to solve challenging optimization problems with detailed implementation while also introducing various modifications used for multi-objective optimization Throughout the book, the author presents worked-out examples and real-world applications that illustrate the modern relevance of the topic. A detailed appendix features important and popular algorithms using MATLAB® and Octave software packages, and a related FTP site houses MATLAB code and programs for easy implementation of the discussed techniques. In addition, references to the current literature enable readers to investigate individual algorithms and methods in greater detail. *Engineering Optimization: An Introduction with Metaheuristic Applications* is an excellent book for courses on optimization and computer simulation at the upper-undergraduate and graduate levels. It is also a valuable reference for researchers and practitioners working in the fields of mathematics, engineering, computer science, operations research, and management science who use metaheuristic algorithms to solve problems in their everyday work.

Mechanical Engineering for Sustainable Development: State-of-the-Art Research McGraw-Hill Companies

This well-received book, now in its second edition, continues to provide a number of optimization algorithms which are commonly used in computer-aided engineering design. The book begins with simple single-variable optimization techniques, and then goes on to give unconstrained and constrained optimization techniques in a step-by-step format so that they can be coded in any user-specific computer language. In addition to classical optimization methods, the book also discusses Genetic Algorithms and Simulated Annealing, which are widely used in engineering design problems because of their ability to find global optimum solutions. The second edition adds several new topics of optimization such as design and manufacturing, data fitting and regression, inverse problems, scheduling and routing, data mining, intelligent system design, Lagrangian duality theory, and quadratic programming and its extension to sequential quadratic programming. It also extensively revises the linear programming algorithms section in the Appendix. This edition also includes more number of exercise problems. The book is suitable for senior undergraduate/postgraduate students of mechanical, production and chemical engineering. Students in other branches of engineering offering optimization courses as well as designers and decision-makers will also find the book useful. Key Features Algorithms are presented in a step-by-step format to facilitate coding in a computer language. Sample computer programs in FORTRAN are appended for better comprehension. Worked-out examples are illustrated for easy understanding. The same example problems are solved with most algorithms for a comparative evaluation of the algorithms.

Constrained Optimization and Lagrange Multiplier Methods Springer Science & Business Media

Optimization is an important tool used in decision science and for the analysis of physical systems used in engineering. One can trace its roots to the Calculus of Variations and the work of Euler and Lagrange. This natural and reasonable approach to mathematical programming covers numerical methods for finite-dimensional optimization problems. It begins with very simple ideas progressing through more complicated concepts, concentrating on methods for both unconstrained and constrained optimization.

Convex Optimization Pearson Higher Ed

Optimization is used to determine the most appropriate value of variables under given conditions. The primary focus of using optimisation techniques is to measure the maximum or minimum value of a function depending on the circumstances. This book discusses problem formulation and problem solving with the help of algorithms such as secant method, quasi-Newton method, linear programming and dynamic programming. It also explains important chemical processes such as fluid flow systems, heat exchangers, chemical reactors and distillation systems using solved examples. The book begins by explaining the fundamental concepts followed by an elucidation of various modern techniques including trust-region methods, Levenberg-Marquardt algorithms, stochastic optimization, simulated annealing and statistical optimization. It studies the multi-objective optimization technique and its applications in chemical engineering and also discusses the theory and applications of various optimization software tools including LINGO, MATLAB, MINITAB and GAMS.

Reliability-based Structural Design CRC Press

The book details deep learning models like ANN, RNN, LSTM, in many industrial sectors such as transportation, healthcare, military, agriculture, with valid and effective results, which will help researchers find solutions to their deep learning research problems. We have entered the era of smart world devices, where robots or machines are being used in most applications to solve real-world problems. These smart machines/devices reduce the burden on doctors, which in turn make their lives easier and the lives of their patients better, thereby increasing patient longevity, which is the ultimate goal of computer vision. Therefore, the goal in writing this book is to attempt to provide complete information on reliable deep learning models required for e-healthcare applications. Ways in which deep learning can enhance healthcare images or text data for making useful decisions are discussed. Also presented are reliable deep learning models, such as neural networks, convolutional neural networks, backpropagation, and recurrent neural networks, which are increasingly being used in medical image processing, including for colorization of black and white X-ray images, automatic machine translation images, object classification in photographs/images (CT scans), character or useful generation (ECG), image caption generation, etc. Hence, reliable deep learning methods for the perception or production of better results are a necessity for highly effective e-healthcare applications. Currently, the most difficult data-related problem that needs to be solved concerns the rapid increase of data occurring each day via billions of smart devices. To address the growing amount of data in healthcare applications, challenges such as not having standard tools, efficient algorithms, and a sufficient number of skilled data scientists need to be overcome. Hence, there is growing interest in investigating deep learning models and their use in e-healthcare applications. Audience Researchers in artificial intelligence, big data, computer science, and electronic engineering, as well as industry engineers in transportation, healthcare, biomedicine, military, agriculture.

Applied Numerical Methods for Engineers and Scientists Princeton University Press

Computational optimization is an important paradigm with a wide range of applications. In virtually all branches of engineering and industry, we almost always try to optimize something - whether to minimize the cost and energy consumption, or to maximize profits, outputs, performance and efficiency. In many cases, this search for optimality is challenging, either because of the high computational cost of evaluating objectives and constraints, or because of the nonlinearity, multimodality, discontinuity and uncertainty of the problem functions in the real-world systems. Another complication is that most problems are often NP-hard, that is, the solution time for finding the optimum increases exponentially with the problem size. The development of efficient algorithms and specialized techniques that address these difficulties is of primary importance for contemporary engineering, science and industry. This book consists of 12 self-contained chapters, contributed from worldwide experts who are working in these exciting areas. The book strives to review and discuss the latest developments concerning optimization and modelling with a focus on methods and algorithms for computational optimization. It also covers well-chosen, real-world applications in science, engineering and industry. Main topics include derivative-free optimization, multi-objective evolutionary algorithms, surrogate-based methods, maximum simulated likelihood estimation, support vector machines, and metaheuristic algorithms. Application case studies include aerodynamic shape optimization, microwave engineering, black-box optimization, classification, economics, inventory optimization and structural optimization. This graduate level book can serve as an excellent reference for lecturers, researchers and students in computational science, engineering and industry.

Computational Interaction Springer Science & Business Media

The revised and updated new edition of the popular optimization book for engineers The thoroughly revised and updated fifth edition of *Engineering Optimization: Theory and Practice* offers engineers a guide to the important optimization methods that are commonly used in a wide range of industries. The author—a noted expert on the topic—presents both the classical and most recent optimizations approaches. The book introduces the basic methods and includes information on more advanced principles and applications. The fifth edition presents four new chapters: Solution of Optimization Problems Using MATLAB; Metaheuristic Optimization Methods; Multi-Objective Optimization Methods; and Practical Implementation of Optimization. All of the book's topics are designed to be self-contained units with the concepts described in detail with derivations

presented. The author puts the emphasis on computational aspects of optimization and includes design examples and problems representing different areas of engineering. Comprehensive in scope, the book contains solved examples, review questions and problems. This important book: Offers an updated edition of the classic work on optimization Includes approaches that are appropriate for all branches of engineering Contains numerous practical design and engineering examples Offers more than 140 illustrative examples, 500 plus references in the literature of engineering optimization, and more than 500 review questions and answers Demonstrates the use of MATLAB for solving different types of optimization problems using different techniques Written for students across all engineering disciplines, the revised edition of *Engineering Optimization: Theory and Practice* is the comprehensive book that covers the new and recent methods of optimization and reviews the principles and applications.

Engineering Optimization Pearson

This is the eBook of the printed book and may not include any media, website access codes, or print supplements that may come packaged with the bound book. Reliability Engineering is intended for use as an introduction to reliability engineering, including the aspects analysis, design, testing, production and quality control of engineering components and systems. Numerous analytical and numerical examples and problems are used to illustrate the principles and concepts. Expanded explanations of the fundamental concepts are given throughout the book, with emphasis on the physical significance of the ideas. The mathematical background necessary in the area of probability and statistics is covered briefly to make the presentation complete and self-contained. Solving probability and reliability problems using MATLAB and Excel is also presented.

Engineering Optimization Oxford University Press

A focused presentation of how sparse optimization methods can be used to solve optimal control and estimation problems.