

A Reliability Based Multidisciplinary Design Optimization

"Motivated by the need of high reliability and safety in complex engineering systems, recently reliability-based design has been increasingly applied in multidisciplinary design optimization (MDO). However, a direct integration of reliability-based design that has been successful in many single disciplinary fields into MDO may present tremendous implementation and numerical difficulties. The reliability analysis and reliability based designs are highly expensive for MDO considering various disciplines that are dependent on each other or coupled. Hence, the present work proposes a methodology of Sequential Optimization and Reliability Assessment for multidisciplinary systems design, to improve the efficiency of reliability-based MDO. The central idea is to decouple the reliability analysis from MDO with sequential cycles of reliability analysis and deterministic MDO and hence to reduce the computational demand"--Abstract, leaf iii.

Multidisciplinary design optimization (MDO) can be used in computer aided engineering (CAE) to efficiently improve and balance performance of automotive structures. However, large-scale MDO is not yet generally integrated within automotive product development due to several challenges, of which excessive computing times is the

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most important one. In this thesis, a metamodel-based MDO process that fits normal company organizations and CAE-based development processes is presented. The introduction of global metamodels offers means to increase computational efficiency and distribute work without implementing complicated multi-level MDO methods. The presented MDO process is proven to be efficient for thickness optimization studies with the objective to minimize mass. It can also be used for spot weld optimization if the models are prepared correctly. A comparison of different methods reveals that topology optimization, which requires less model preparation and computational effort, is an alternative if load cases involving simulations of linear systems are judged to be of major importance. A technical challenge when performing metamodel-based design optimization is lack of accuracy for metamodels representing complex responses including discontinuities, which are common in for example crashworthiness applications. The decision boundary from a support vector machine (SVM) can be used to identify the border between different types of deformation behaviour. In this thesis, this information is used to improve the accuracy of feedforward neural network metamodels. Three different approaches are tested; to split the design space and fit separate metamodels for the different regions, to add estimated guiding samples to the fitting set along the boundary before a global metamodel is fitted, and to use a special SVM-based sequential sampling method. Substantial improvements in accuracy are observed, and it is found that implementing SVM-based sequential sampling and

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estimated guiding samples can result in successful optimization studies for cases where more conventional methods fail.

Multidisciplinary Design Optimization supported by Knowledge Based Engineering provides a comprehensive guide to the use of Multidisciplinary Design Optimization (MDO) in the modern design environment. The combination of MDO and Knowledge Based Engineering (KBE), two rapidly developing technologies, can help to improve the robustness of the conceptual design process and these technologies and some examples of their application are the subject of this book. Multidisciplinary Design Optimization supported by Knowledge Based Engineering is divided into 4 parts, covering fundamental concepts, system details, MDO/KBE in real-world environments, and examples of MDO/KBE real-world applications. The aim of the book is to support an engineer confronting a complex engineering design problem requiring the application of MDO methods and technology.

This book contains an edited version of the lectures and selected contributions presented during the Advanced Summer Institute (ASI) on "Product Engineering: Tools and Methods based on Virtual Reality" held at Chania (Greece), 30th May - 6th June 2007. The ASI was devoted to the Product Engineering field, with particular attention being given to the aspects related to Virtual Reality (VR) technologies, and their use and added value in engineering.

These IMechE conference transactions examine how major improvements have been

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made in product delivery processes by the effective use of both statistical and analytical methods, as well as examining the problems that can occur as a result of under utilization of information. This volume will be of great interest to managers, engineers, and statisticians at all levels, engaged in project management or the design and development of motor vehicles, their subsystems, and components. CONTENTS INCLUDE Applications of advanced modelling methods in engine development Application of adaptive online DoE techniques for engine ECU calibration Radial basis functions for engine modelling Designing for Six Sigma reliability Dimensional variation analysis for automotive hybrid aluminium body structures Reliability-based multidisciplinary design optimization of vehicle structures

This volume contains 28 papers by renowned international experts on the latest advances in structural reliability methods and applications, engineering risk analysis and decision making, new optimization techniques and various applications in civil engineering. Moreover, several contributions focus on the assessment and optimization of existing str

This book includes high-quality, peer-reviewed papers from the International Conference on Recent Advancement in Computer, Communication and Computational Sciences (RACCCS-2017), held at Aryabhata College of Engineering & Research Center, Ajmer, India on September 2–3, 2017, presenting the latest developments and technical solutions in computational sciences. Data science, data- and knowledge

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engineering require networking and communication as a backbone and have a wide scope of implementation in engineering sciences. Keeping this ideology in mind, the book offers insights that reflect the advances in these fields from upcoming researchers and leading academicians across the globe. Covering a variety of topics, such as intelligent hardware and software design, advanced communications, intelligent computing technologies, advanced software engineering, the web and informatics, and intelligent image processing, it helps those in the computer industry and academia use the advances of next-generation communication and computational technology to shape real-world applications.

Multidisciplinary Design Optimization and Its Application in Deep Manned Submersible Design
Springer Nature

Recognition of the need to introduce the ideas of uncertainty in a wide variety of scientific fields today reflects in part some of the profound changes in science and engineering over the last decades. Nobody questions the ever-present need for a solid foundation in applied mechanics. Neither does anyone question nowadays the fundamental necessity to recognize that uncertainty exists, to learn to evaluate it rationally, and to incorporate it into design. This volume provides a timely and stimulating overview of the analysis of uncertainty in applied mechanics. It is not just one more rendition of the traditional treatment of the subject, nor is it intended to supplement existing structural engineering books. Its aim is to fill a gap in the existing

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professional literature by concentrating on the non-probabilistic model of uncertainty. It provides an alternative avenue for the analysis of uncertainty when only a limited amount of information is available. The first chapter briefly reviews probabilistic methods and discusses the sensitivity of the probability of failure to uncertain knowledge of the system. Chapter two discusses the mathematical background of convex modelling. In the remainder of the book, convex modelling is applied to various linear and nonlinear problems. Uncertain phenomena are represented throughout the book by convex sets, and this approach is referred to as convex modelling. This book is intended to inspire researchers in their goal towards further growth and development in this field.

Issues in Artificial Intelligence, Robotics and Machine Learning: 2013 Edition is a ScholarlyEditions™ book that delivers timely, authoritative, and comprehensive information about Expert Systems. The editors have built Issues in Artificial Intelligence, Robotics and Machine Learning: 2013 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about Expert Systems in this book to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Issues in Artificial Intelligence, Robotics and Machine Learning: 2013 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by

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This textbook is designed for students and industry practitioners for a first course in optimization integrating MATLAB® software.

The chapters which appear in this volume are selected studies presented at the First International Conference on Engineering and Applied Sciences Optimization (OPT-i), Kos, Greece, 4-6 June 2014 and works written by friends, former colleagues and students of the late Professor M. G. Karlaftis; all in the area of optimization that he loved and published so much in himself. The subject areas represented here range from structural optimization, logistics, transportation, traffic and telecommunication networks to operational research, metaheuristics, multidisciplinary and multiphysics design optimization, etc. This volume is dedicated to the life and the memory of Professor Matthew G. Karlaftis, who passed away a few hours before he was to give the opening speech at OPT-i. All contributions reflect the warmth and genuine friendship which he enjoyed from his associates and show how much his scientific contribution has been appreciated. He will be greatly missed and it is hoped that this volume will be received as a suitable memorial to his life and achievements.

The use of novel materials and new structural concepts nowadays is not restricted to highly technical areas like aerospace, aeronautical applications or the automotive

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industry, but affects all engineering fields including those such as civil engineering and architecture. Addressing issues involving advanced types of structures, particularly those based on new concepts or new materials and their system design, contributions highlight the latest developments in design, optimisation, manufacturing and experimentation. Also included are contributions on new software, numerical methods and different optimisation techniques. Optimisation problems of interest involve those related to size, shape and topology of structures and materials. Most high performance structures require the development of a generation of new materials, which can more easily resist a range of external stimuli or react in a non-conventional manner. Particular emphasis is placed on intelligent structures and materials as well as the application of computational methods for their modelling, control and management. Optimisation techniques have much to offer to those involved in the design of new industrial products. The formulation of optimum design has evolved from the time it was purely an academic topic, able now to satisfy the requirements of real life prototypes. The development of new algorithms and the appearance of powerful commercial computer codes, with easy to use graphical interfaces, have created a fertile field for the incorporation of optimisation in the design process in all engineering disciplines. This proceedings volume is the first from a new edition of the High Performance Design of Structures and Materials and the Optimum Design of Structures conferences, which follows the success of a number of meetings that originated in 1989. Topics covered

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include: Composite materials & structures; Material characterisation; Experiments and numerical analysis; Steel structures; High performance concretes; Natural fibre composites; Transformable structures; Lightweight structures; Timber structures; Environmentally friendly and sustainable structures; Emerging structural applications; Optimisation in civil engineering; Evolutionary methods in optimisation; Shape and topology optimisation; Aerospace structures; Structural optimisation; Biomechanics application; Material optimisation; Life cost optimisation; Intelligence structures and smart materials.

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.

Increasing demand on improving the resiliency of modern structures and infrastructure requires ever more critical and complex designs. Therefore, the need for accurate and efficient approaches to assess uncertainties in loads, geometry, material properties, manufacturing processes, and operational environments has increased significantly. Reliability-based techniques help develop more accurate initial guidance for robust design and help to identify the sources of significant uncertainty in structural systems. Reliability-Based Analysis and Design of Structures and Infrastructure presents an overview of the methods of classical reliability analysis and design most associated with structural reliability. It also introduces more

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modern methods and advancements, and emphasizes the most useful methods and techniques used in reliability and risk studies, while elaborating their practical applications and limitations rather than detailed derivations. Features: Provides a practical and comprehensive overview of reliability and risk analysis and design techniques. Introduces resilient and smart structures/infrastructure that will lead to more reliable and sustainable societies. Considers loss elimination, risk management and life-cycle asset management as related to infrastructure projects. Introduces probability theory, statistical methods, and reliability analysis methods. Reliability-Based Analysis and Design of Structures and Infrastructure is suitable for researchers and practicing engineers, as well as upper-level students taking related courses in structural reliability analysis and design.

A robustness and reliability based multidisciplinary analysis and optimization framework for aircraft design is presented. Robust design optimization and Reliability Based Design Optimization are merged into a unified formulation which streamlines the setup of optimization problems and aims at preventing foreseeable implementation issues in uncertainty based design. Surrogate models are evaluated to circumvent the intensive computations resulting from using direct evaluation in nondeterministic optimization. Three types of models are implemented in the framework: quadratic interpolation, regression Kriging and artificial neural networks. Regression Kriging presents the best compromise between performance and accuracy in deterministic wing design problems. The performance of the simultaneous implementation of robustness and reliability is evaluated using simple analytic problems and more complex wing design problems, revealing that performance benefits can still be achieved while satisfying probabilistic constraints rather than the simpler (and not as computationally

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intensive) robust constraints. The latter are proven to be unable to follow a reliability constraint as uncertainty in the input variables increases. The computational effort of the reliability analysis is further reduced through the implementation of a coordinate change in the respective optimization sub-problem. The computational tool developed is a stand alone application and it presents a user-friendly graphical user interface. The multidisciplinary analysis and design optimization tool includes modules for aerodynamics, structural, aeroelastic and cost analysis, that can be used either individually or coupled.

This book presents state-of-the-art probabilistic methods for the reliability analysis and design of engineering products and processes. It seeks to facilitate practical application of probabilistic analysis and design by providing an authoritative, in-depth, and practical description of what probabilistic analysis and design is and how it can be implemented. The text is packed with many practical engineering examples (e.g., electric power transmission systems, aircraft power generating systems, and mechanical transmission systems) and exercise problems. It is an up-to-date, fully illustrated reference suitable for both undergraduate and graduate engineering students, researchers, and professional engineers who are interested in exploring the fundamentals, implementation, and applications of probabilistic analysis and design methods. This book is a collective work by many leading scientists, analysts, mathematicians, and engineers who have been working at the front end of reliability science and engineering. The book covers conventional and contemporary topics in reliability science, all of which have seen extended research activities in recent years. The methods presented in this book are real-world examples that demonstrate improvements in essential reliability and availability for industrial equipment such as medical magnetic resonance imaging, power systems, traction

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drives for a search and rescue helicopter, and air conditioning systems. The book presents real case studies of redundant multi-state air conditioning systems for chemical laboratories and covers assessments of reliability and fault tolerance and availability calculations. Conventional and contemporary topics in reliability engineering are discussed, including degradation, networks, and dynamic reliability, resilience, and multi-state systems, all of which are relatively new topics to the field. The book is aimed at engineers and scientists, as well as postgraduate students involved in reliability design, analysis, and experiments and applied probability and statistics.

Decision modeling is a key area in the developing field of AI, and this timely work connects researchers and professionals with the very latest research. It constitutes the refereed proceedings of the 4th International Conference on Modeling Decisions for Artificial Intelligence, held in Kitakyushu, Japan, in August 2007. The 42 revised full papers presented together with 4 invited lectures are devoted to theory and tools, as well as applications. Optimization and uncertainty analysis considering multiple design criteria involves seamless integration of often conflicting disciplines. Over the last 3 years Wright State University has been applying analysis tools to predict the behavior of critical disciplines to produce highly robust torpedo designs using robust multi-disciplinary design optimization. Multidisciplinary optimization and system reliability analysis were emphasized during the third year of the grant period and more reliable torpedo designs were obtained for all the different disciplines. An optimal configuration of a supercavitating torpedo model that fits in a cavity generated by the cavitator was obtained. An evidence theory based method to determine the reliability of the cavitator is presented. Structural optimization of the lightweight torpedo model was done for it

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to be safe from underwater explosions and to reduce the acoustic signature. Also, reliability based optimization was performed for the lightweight torpedo model using system reliability constraints.

A rigorous yet accessible graduate textbook covering both fundamental and advanced optimization theory and algorithms.

Multidisciplinary Design Optimization supported by Knowledge Based Engineering supports engineers confronting this daunting and new design paradigm. It describes methodology for conducting a system design in a systematic and rigorous manner that supports human creativity to optimize the design objective(s) subject to constraints and uncertainties. The material presented builds on decades of experience in Multidisciplinary Design Optimization (MDO) methods, progress in concurrent computing, and Knowledge Based Engineering (KBE) tools. Key features: Comprehensively covers MDO and is the only book to directly link this with KBE methods Provides a pathway through basic optimization methods to MDO methods Directly links design optimization methods to the massively concurrent computing technology Emphasizes real world engineering design practice in the application of optimization methods Multidisciplinary Design Optimization supported by Knowledge Based Engineering is a one-stop-shop guide to the state-of-the-art

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tools in the MDO and KBE disciplines for systems design engineers and managers. Graduate or post-graduate students can use it to support their design courses, and researchers or developers of computer-aided design methods will find it useful as a wide-ranging reference.

Optimization methodologies are fundamental instruments to tackle the complexity of today's engineering processes. Engineering Optimization 2014 is dedicated to optimization methods in engineering, and contains the papers presented at the 4th International Conference on Engineering Optimization (ENGOPT2014, Lisbon, Portugal, 8-11 September 2014). The book will be of interest to engineers, applied mathematicians, and computer scientists working on research, development and practical applications of optimization methods in engineering.

This book systematically discusses nonlinear interval optimization design theory and methods. Firstly, adopting a mathematical programming theory perspective, it develops an innovative mathematical transformation model to deal with general nonlinear interval uncertain optimization problems, which is able to equivalently convert complex interval uncertain optimization problems to simple deterministic optimization problems. This model is then used as the basis for various interval uncertain optimization algorithms for engineering applications, which address the

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low efficiency caused by double-layer nested optimization. Further, the book extends the nonlinear interval optimization theory to design problems associated with multiple optimization objectives, multiple disciplines, and parameter dependence, and establishes the corresponding interval optimization models and solution algorithms. Lastly, it uses the proposed interval uncertain optimization models and methods to deal with practical problems in mechanical engineering and related fields, demonstrating the effectiveness of the models and methods. This book reports on new theories and applications in the field of intelligent systems and computing. It covers computational and artificial intelligence methods, as well as advances in computer vision, current issues in big data and cloud computing, computation linguistics, and cyber-physical systems. It also reports on data mining and knowledge extraction technologies, as well as central issues in intelligent information management. Written by active researchers, the respective chapters are based on papers presented at the International Conference on Computer Science and Information Technologies (CSIT 2018), held on September 11–14, 2018, in Lviv, Ukraine, and jointly organized by the Lviv Polytechnic National University, Ukraine, the Kharkiv National University of Radio Electronics, Ukraine, and the Technical University of Lodz, Poland, under patronage of Ministry of Education and Science of Ukraine. Given its breadth of

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coverage, the book provides academics and professionals with extensive information and a timely snapshot of the field of intelligent systems, and is sure to foster new discussions and collaborations among different groups.

Authored by the most active scholars in their respective areas, this volume covers the most recent developments, both theoretical and applicative, in multidisciplinary reliability evaluation areas, many of which are cutting-edge and not discussed elsewhere in book form. The broad coverage includes the latest thoughts on design for low probability and high consequence events like the failure of the World Trade Center as well as risk acceptability based on the Life Quality Index. Other chapters discuss the development of the performance-based design concept, and the generally overlooked area of the reliability evaluation of bridges and offshore structures. Since the finite element method is routinely used for structural analyses, emphasis is put on discussing reliability evaluation using finite elements including consideration of the mesh-free finite element method. Corrosion and fatigue reliability evaluation techniques are other urgent issues that are dealt with in depth. Risk-based optimization using lifecycle cost analysis is presented. Among the many additional included topics, a chapter is devoted to health assessment of existing structures, currently one of the most active research areas. Contents: Risk and Risk Perception for Low Probability, High

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Consequence Events in the Built Environment (R B Corotis)Socio-Economic Risk Acceptability Criteria (R Rackwitz)Reliability in Structural Performance Evaluation and Design (Y K Wen)Performance-Based Reliability Evaluation of Structure-Foundation Systems (M Chowdhury & A Haldar)Application of Probabilistic Methods in Bridge Engineering (M Ghosn)Stochastic Response of Fixed Offshore Structures (S-T Quek et al.)Application of Reliability Methods to Fatigue Analysis and Design (P H Wirsching)Probabilistic Models for Corrosion in Structural Reliability Assessment (R E Melchers)Seismic Risk Assessment of Realistic Frame Structures Using a Hybrid Reliability Method (J Huh & A Haldar)Meshfree Methods in Computational Stochastic Mechanics (S Rahman)Reliability Analysis Using Information from Experts (J Mohammadi & E Desantiago)Risk-Based Optimization of Life-Cycle Cost for Deteriorating Civil Engineering Infrastructures (R Rackwitz)Structural Health Assessment under Uncertainty (H Katkhuda & A Haldar) Readership: Undergraduates, graduates, researchers and practitioners in the field of reliability in civil, mechanical, offshore, materials, chemical and other related engineering areas. Keywords:Performance-Based Design;Low Probability High Consequence Events;Life Quality Index;Socio-economic Risk Acceptability Criteria;Reliability of Bridges;Fixed Offshore Structures;Stochastic Finite Element Analysis;Mesh-Free Finite Element Methods;Fatigue Analysis and

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Design;Corrosion;Structural Health Assessment;Reliability Analysis Using Information from Experts;Renewal Model in Reliability-Based Optimization;Lifecycle Cost AnalysisKey Features:Discussions on the most recent developments in multi-disciplinary risk and reliability engineering areasChapters authored by the most active scholars in the areaTopics covered are not available in other booksIncludes subjects reflecting the most recent research interests in the field

This book investigates Reliability-based Multidisciplinary Design Optimization (RBMDO) theory and its application in the design of deep manned submersibles (DMSs). Multidisciplinary Design Optimization (MDO) is an effective design method for large engineering systems like aircraft, warships, and satellites, which require designers and engineers from various disciplines to cooperate with each other. MDO can be used to handle the conflicts that arise between these disciplines, and focuses on the optimal design of the system as a whole. However, it can also push designs to the brink of failure. In order to keep the system balanced, Reliability-based Design (RBD) must be incorporated into MDO. Consequently, new algorithms and methods have to be developed for RBMDO theory. This book provides an essential overview of MDO, RBD, and RBMDO and subsequently introduces key algorithms and methods by means of

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case analyses. In closing, it introduces readers to the design of DMSs and applies RBMDO methods to the design of the manned hull and the general concept design. The book is intended for all students and researchers who are interested in system design theory, and for engineers working on large, complex engineering systems.

Uncertainties play a dominant role in the design and optimization of structures and infrastructures. In optimum design of structural systems due to variations of the material, manufacturing variations, variations of the external loads and modelling uncertainty, the parameters of a structure, a structural system and its environment are not given, fixed coefficients, but random variables with a certain probability distribution. The increasing necessity to solve complex problems in Structural Optimization, Structural Reliability and Probabilistic Mechanics, requires the development of new ideas, innovative methods and numerical tools for providing accurate numerical solutions in affordable computing times. This book presents the latest findings on structural optimization considering uncertainties. It contains selected contributions dealing with the use of probabilistic methods for the optimal design of different types of structures and various considerations of uncertainties. The first part is focused on reliability-based design optimization and the second part on robust design optimization.

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Comprising twenty-one, self-contained chapters by prominent authors in the field, it forms a complete collection of state-of-the-art theoretical advances and applications in the fields of structural optimization, structural reliability, and probabilistic computational mechanics. It is recommended to researchers, engineers, and students in civil, mechanical, naval and aerospace engineering and to professionals working on complicated costs-effective design problems.

Inhaltsangabe: Introduction: In handling real-world optimization problems, it is often the case that the underlying decision variables and parameters cannot be controlled exactly as specified. For example, if a deterministic consideration of an optimization problem results in an optimal dimension of a cylindrical member to have a 50 mm diameter, there exists no manufacturing process which will guarantee the production of a cylinder having exactly a 50 mm diameter. Every manufacturing process has a finite machine precision and the dimensions are expected to vary around the specified value. Similarly, the strength of a material often does not remain fixed for the entire length of the material and is expected to vary from point to point. When such variations in decision variables and parameters are expected in practice, an obvious question arises: How reliable is the optimized design against failure when the suggested parameters cannot be adhered to? This question is important because in most optimization problems the deterministic optimum lies at the intersection of a number of constraint boundaries. Thus, if no uncertainties in parameters and variables are expected, the optimized solution is the best choice, but if uncertainties are expected, in most occasions, the optimized solution will be found to be infeasible, violating one or more constraints. These

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uncertainties, which are either controllable (e.g. dimensions) or uncontrollable (e.g. material properties), are present and need to be accounted for in the design process. Assuming that the variables follow a probability distribution in practice, reliability-based design optimization (RBDO) methods find a reliable solution which is feasible with a pre-specified probability. In most RBDO problems, failure probability and costs are violating objectives, which means that when one is lowered, the other may rise. Therefore, it is important to identify the uncertain variables which have an impact on the problem and describe them with different probability distributions based on statistical calculations. Then, the ordinary deterministic constraint is replaced by a stochastic constraint which is only restricting the probability of failure for a solution, not the failure itself. This can be done for each constraint or for the complete set of constraints, for the complete structure. Different methods for evaluating the reliability of a solution exist. If the cumulative density function (CDF) with its [...]

The volume includes papers from the WSCMO conference in Braunschweig 2017 presenting research of all aspects of the optimal design of structures as well as multidisciplinary design optimization where the involved disciplines deal with the analysis of solids, fluids or other field problems. Also presented are practical applications of optimization methods and the corresponding software development in all branches of technology.

Product Realization: A Comprehensive Approach is based on selected papers presented at the International Conference on Comprehensive Product Realization 2007 (ICCPR2007). The extended papers will provide the opportunity for scholars from all around the world to discuss their academic programs, identify research opportunities, and initiate joint research programs in the area of comprehensive product realization. Engineering design has evolved from an

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isolated semi-empirical activity to a highly interconnected, multidisciplinary product realization collaborative process. The scope of the book will focus on a number of themes within the framework of the conference that are deemed essential to educating the next generation of students and practicing engineers in the area of product realization.

This book features high-quality research papers presented at the 4th International Conference on Advanced Computing and Intelligent Engineering (ICACIE 2019), Department of Computer Science, Rama Devi Women's University, Bhubaneswar, Odisha, India. It includes sections describing technical advances and contemporary research in the fields of advanced computing and intelligent engineering, which are based on the presented articles. Intended for postgraduate students and researchers working in the discipline of computer science and engineering, the book also appeals to researchers in the domain of electronics as it covers hardware technologies and future communication technologies.

This book presents high-quality papers from the Seventh Asia International Symposium on Mechatronics (AISM 2019). It discusses the latest technological trends and advances in electromechanical coupling and environmental adaptability design for electronic equipment, sensing and measurement, mechatronics in manufacturing and automation, micro-mechatronics, energy harvesting & storage, robotics, automation and control systems. It includes papers based on original theoretical, practical and experimental simulations, development, applications, measurements, and testing. The applications and solutions discussed here provide excellent reference material for future product developments.

In this book, the authors present in detail several recent methodologies and algorithms that they developed during the last fifteen years. The deterministic methods account for

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uncertainties through empirical safety factors, which implies that the actual uncertainties in materials, geometry and loading are not truly considered. This problem becomes much more complicated when considering biomechanical applications where a number of uncertainties are encountered in the design of prosthesis systems. This book implements improved numerical strategies and algorithms that can be applied to biomechanical studies.

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