



Introduction to Optimum Design

By *Jasbir Arora*

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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.

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Editorial Review

Review

"I feel that Dr. Arora presented significant amounts of material in a clear and straightforward manner. The book is definitely a reference that practitioners would like to have and depend upon, especially with the plethora of examples and applications. As an educator, Dr. Arora's book also has a tremendous number of problems at the end of the chapters and examples that I would try to use in class...the book is a solid introduction to optimization algorithms." - Georges Fadel, Associate Editor, Journal of Mechanical Design

"Arora's introduction of a much-anticipated second edition of Introduction to Optimum Design will not only satisfy established users of his well-received first edition, but moreover, significant updates, supplementary material, and fine-tuning of the pedagogical aspects of the presentation will certainly broaden its appeal...among some of the distinguishing characteristics of Arora's book are its adaptability to audiences with diverse backgrounds, as well as the extent to which it makes the topic clear and approachable...The book would also be excellent as a self-study reference for the practicing engineer...In summary, when considering the pedagogical refinements of the book, the expanded and updated software examples, as well as the extended survey of emerging computational methods, Arora's Introduction to Optimum Design, 2nd Ed., furthers its goal of describing engineering design optimization in a rigorous yet simplified manner which is both highly accessible to and useful for a wide audience." - David F. Thompson, Graduate Program Director, University of Cincinnati

"I have used several optimization books over the past 10 years to support my various graduate optimization courses. Of all the books that I have used, I prefer Dr. Arora's Introduction to Optimum Design, 2nd Ed...The strength of this book lies in his attention to detail using numeric exercises to demonstrate the numerical processes used in the various optimization methods. I particularly like his choice of nomenclature throughout the book, as it conforms to the standard symbols and function names used in classical optimization literature. The application exercises presented cover a broad range in technologies, which makes it a good textbook for any engineering discipline." - Tom R. Mincer, California State University

"...this book is well written and covers just about every topic that one needs to know about the optimum design process. It includes a good balance of theory and application. The book will therefore be appealing to all users." - Practice Periodical On Structural Design and Construction - ASCE, Nov. 2005

About the Author

Jasbir Singh Arora is an F. Wendell Miller Professor of Engineering, a Professor of Civil and Environmental Engineering, and a Professor of Mechanical and Industrial Engineering at the University of Iowa. He obtained his PhD in Mechanics and Hydraulics from the University of Iowa. Dr. Arora is the Associate Director of the Center for Computer Aided Design. He is a Senior Advisor for the International Journal of Structural and Multidisciplinary Optimization and he is on the Editorial Board of the International Journal for Numerical Methods in Engineering. He is a Fellow of the American Society of Civil Engineers and the American Society of Mechanical Engineers, and a Senior Member of the American Institute of Aeronautics and Astronautics. Dr. Arora is an internationally recognized researcher in the field of optimization and his book Introduction to Optimum Design, 3rd Edition (Academic Press, 2012, 978-0-12-381375-6) is used worldwide. Jasbir Singh Arora is an F. Wendell Miller Professor of Engineering, a Professor of Civil and Environmental Engineering, and a Professor of Mechanical and Industrial Engineering at the University of Iowa. He obtained his PhD in Mechanics and Hydraulics from the University of Iowa. Dr. Arora is the

Associate Director of the Center for Computer Aided Design. He is a Senior Advisor for the International Journal of Structural and Multidisciplinary Optimization and he is on the Editorial Board of the International Journal for Numerical Methods in Engineering. He is a Fellow of the American Society of Civil Engineers and the American Society of Mechanical Engineers, and a Senior Member of the American Institute of Aeronautics and Astronautics. Dr. Arora is an internationally recognized researcher in the field of optimization and his book Introduction to Optimum Design, 3rd Edition (Academic Press, 2012, 978-0-12-381375-6) is used worldwide.

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Engineering students and practitioners studying optimization and mechanical engineering design.

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