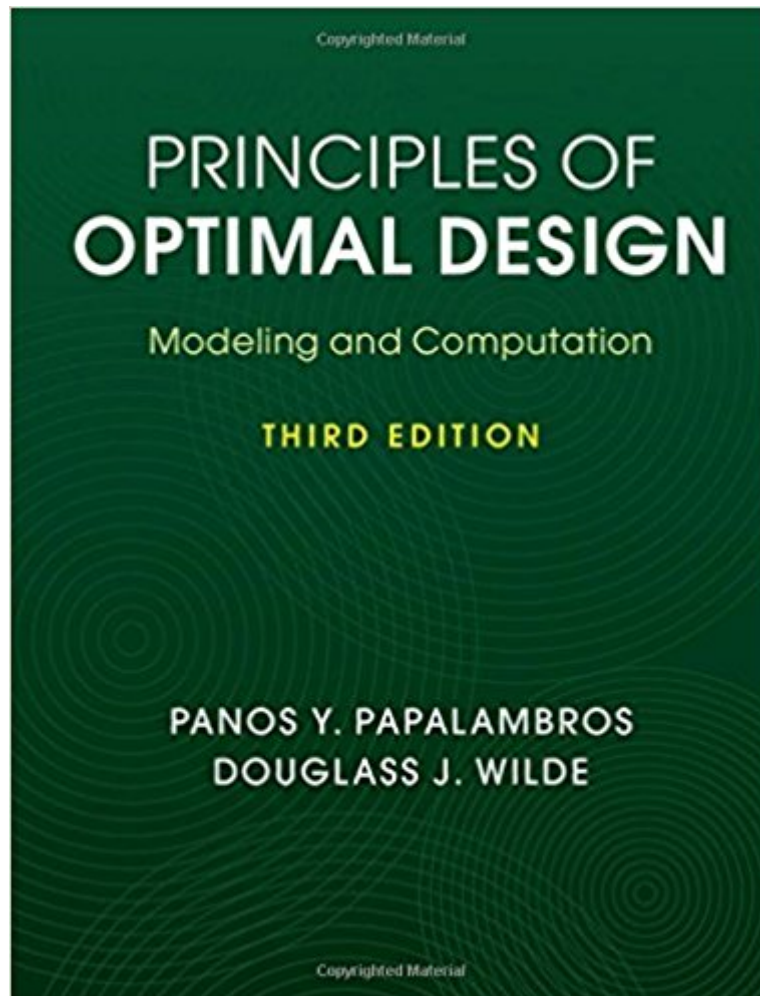




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# Principles Of Optimal Design: Modeling And Computation



## Synopsis

Design optimization is a standard concept in engineering design, and in other disciplines which utilize mathematical decision-making methods. This textbook focuses on the close relationship between a design problem's mathematical model and the solution-driven methods which optimize it. Along with extensive material on modeling problems, this book also features useful techniques for checking whether a model is suitable for computational treatment. Throughout, key concepts are discussed in the context of why and when a particular algorithm may be successful, and a large number of examples demonstrate the theory or method right after it is presented. This book also contains step-by-step instructions for executing a design optimization project - from building the problem statement to interpreting the computer results. All chapters contain exercises from which instructors can easily build quizzes, and a chapter on 'principles and practice' offers the reader tips and guidance based on the authors' vast research and instruction experience.

## Book Information

Hardcover: 450 pages

Publisher: Cambridge University Press; 3 edition (January 9, 2017)

Language: English

ISBN-10: 1107132673

ISBN-13: 978-1107132672

Product Dimensions: 7 x 1.2 x 10 inches

Shipping Weight: 2.9 pounds (View shipping rates and policies)

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'Principles of Optimal Design, third edition, offers an excellent combination of depth and breadth of fundamentals of mathematical modeling of systems design. Students and practitioners will find the textbook a great starting point to learn about the systems design methods and optimization theories from the fundamentals to the advanced numerical methods. The recent addition of the decomposition-based optimization method and analytical target cascading is a nice expansion to the traditional optimization methods. I use this textbook to teach graduate and advanced

undergraduate students who have basic understanding of numerical analysis. Students appreciate the spectrum of contents and they become ready to apply what they learn from the textbook to complex systems design cases. I highly recommend the textbook.' Harrison Hyung, University of Illinois, Urbana-Champaign 'Principles of Optimal Design has always been a well-structured textbook that introduces students to the fundamentals of optimal design while remaining accessible and enjoyable to read. The latest edition adds many brief but exciting glimpses of more advanced topics in optimization. These additions have transformed the book from a 'foundation' on which students can firmly stand to a 'catapult' that can propel them to exciting, new, and advanced topics in the broad discipline of optimal design.' Hosam Fathy, Penn State College of Engineering 'This third edition brings to the reader an impressive array of new and useful topics in optimal design. For example, and among others, new chapters on non-gradient based methods and decomposition-based optimization (or multi-disciplinary optimization, MDO) have been added. The book can be used both as a textbook for a graduate level course in all engineering fields, but also as a must have reference material. I highly recommend it!' Shapour Azarm, University of Maryland 'The Principles of Optimal Design, third edition, is an excellent first text for undergraduates and graduate students alike interested in gaining a firm grasp of practical design optimization methods. It blends the latest modeling techniques with a rigorous treatment of the mathematical analysis, allowing one to adeptly navigate the varied landscapes of modern design problems. From machine learning, automotive systems, financial portfolios, to even the modeling of human purchasing behavior, I have used this text to teach my students how to systematically apply the design process to a broad range of engineering problems.' George J. Delagrammatikas, The Cooper Union for the Advancement of Science and Art, New York 'This book, almost thirty years after its first edition, remains the only comprehensive text on engineering design optimization. In our 'one-click' software era, it provides theory fundamentals that tend to be neglected, while complementing them with rigorous modeling and computation techniques. I cannot think of a better textbook for engineering optimization courses, including a plethora of excellent examples and exercises. The third edition is enhanced with new and extremely useful material on recent developments in derivative-free optimization and optimal system design.' Michael Kokkolaras, McGill University, Canada 'I've found Principles of Optimal Design to be an excellent, comprehensive explanation of design optimization methods, grounded in rigorous mathematics, yet still accessible. The addition of a gradient-free optimization chapter is a welcome addition to the book.' John Whitefoot, University of Pittsburgh 'I've recommended this book to several students. It's a great resource for students who need to use optimization for practical purposes, such as a senior project or an assignment at their co-op job. The

book has a good balance between the underlying theory and the application of that theory to actual problems.' Diane Peters, University of Michigan

Optimization is a standard concept in engineering design, and in other disciplines which use mathematical decision-making methods. This textbook presents the key concepts and algorithms available for solving design optimization problems. Featuring simple examples, it is intended for fourth- or fifth-year students and professional engineers.

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