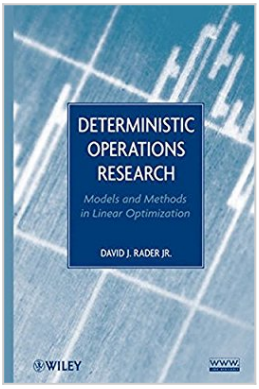

Deterministic Operations Research: Models and Methods in Linear Optimization

By David J. Rader

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Uniquely blends mathematical theory and algorithm design for understanding and modeling real-world problems

Optimization modeling and algorithms are key components to problem-solving across various fields of research, from operations research and mathematics to computer science and engineering. Addressing the importance of the algorithm design process. *Deterministic Operations Research* focuses on the design of solution methods for both continuous and discrete linear optimization problems. The result is a clear-cut resource for understanding three cornerstones of deterministic operations research: modeling real-world problems as linear optimization problem; designing the necessary algorithms to solve these problems; and using mathematical theory to justify algorithmic development.

Treating real-world examples as mathematical problems, the author begins with an introduction to operations research and optimization modeling that includes applications form sports scheduling an the airline industry. Subsequent chapters discuss algorithm design for continuous linear optimization problems, covering topics such as convexity. Farkas' Lemma, and the study of polyhedral before culminating in a discussion of the Simplex Method. The book also addresses linear programming duality theory and its use in algorithm design as well as the Dual Simplex Method. Dantzig-Wolfe decomposition, and a primal-dual interior point algorithm. The final chapters present network optimization and integer programming problems, highlighting various specialized topics including label-correcting algorithms for the shortest path problem, preprocessing and probing in integer programming, lifting of valid inequalities, and branch and cut algorithms.

Concepts and approaches are introduced by outlining examples that demonstrate and motivate theoretical concepts. The accessible presentation of advanced ideas makes core aspects easy to understand and encourages readers to understand how to think about the problem, not just what to think. Relevant historical summaries can be found throughout the book, and each chapter is designed as the continuation of the "story" of how to both model and solve optimization problems by using the specific problems-linear and integer programs-as guides. The book's various examples are accompanied by the appropriate models and

calculations, and a related Web site features these models along with Maple™ and MATLAB® content for the discussed calculations.

Thoroughly class-tested to ensure a straightforward, hands-on approach, *Deterministic Operations Research* is an excellent book for operations research of linear optimization courses at the upper-undergraduate and graduate levels. It also serves as an insightful reference for individuals working in the fields of mathematics, engineering, computer science, and operations research who use and design algorithms to solve problem in their everyday work.

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Editorial Review

Review

“Dr. Phillips has used other texts, but he is especially enthused with this book, influenced by student feedback. He says, “Algorithmic ideas are introduced at a pace that emphasizes and encourages intuitive understanding.” (*Informs Journal on Computing*, 1 June 2012)

"The book is aimed at serving upper-undergraduate and graduate students of all fields as a comprehensive textbook or as a reference for studies on the subject." (Zentralblatt MATH, 2011)

"The result is a clear-cut resource for understanding three cornerstones of deterministic operations research: modeling real-world problems as linear optimization problems; designing the necessary algorithms to solve these problems; and using mathematical theory to justify algorithmic development." (InfoTECH Spotlight - TMCnet, 8 February 2011)

From the Back Cover

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About the Author
David J. Rader Jr., PhD, is Associate Professor of Mathematics at Rose-Hulman Institute of Technology, where he is also the editor of the Rose-Hulman Institute of *Technology Undergraduate Mathematics Journal.* Dr. Rader currently focuses his research in the areas of nonlinear 0-1 optimization, computational integer programming, and exam time timetabling.

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