Nonlinear Programming: Concepts, Algorithms, and Applications to Chemical Processes (MPS-SIAM Series on Optimization)

By Lorenz T. Biegler

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This book addresses modern nonlinear programming (NLP) concepts and algorithms, especially as they apply to challenging applications in chemical process engineering. The author provides a firm grounding in fundamental NLP properties and algorithms, and relates them to real-world problem classes in process optimization, thus making the material understandable and useful to chemical engineers and experts in mathematical optimization.

Nonlinear Programming: Concepts, Algorithms, and Applications to Chemical Processes shows readers which NLP methods are best suited for specific applications, how large-scale problems should be formulated and what features of these problems should be emphasized, and how existing NLP methods can be extended to exploit specific structures of large-scale optimization models.

Audience: The book is intended for chemical engineers interested in using NLP algorithms for specific applications, experts in mathematical optimization who want to understand process engineering problems and develop better approaches to solving them, and researchers from both fields interested in developing better methods and problem formulations for challenging engineering problems.

Contents: Preface; Chapter 1: Introduction to Process Optimization; Chapter 2: Concepts of Unconstrained Optimization; Chapter 3: Newton-Type Methods for Unconstrained Optimization; Chapter 4: Concepts of Constrained Optimization; Chapter 5: Newton Methods for Equality Constrained Optimization; Chapter 6: Numerical Algorithms for Constrained Optimization; Chapter 7: Steady State Process Optimization; Chapter 8: Introduction to Dynamic Process Optimization; Chapter 9: Dynamic Optimization Methods with Embedded DAE Solvers; Chapter 10: Simultaneous Methods for Dynamic Optimization; Chapter 11: Process Optimization with Complementarity Constraints; Bibliography; Index

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Editorial Review

About the Author
Lorenz T. Biegler is the Bayer Professor of Chemical Engineering at Carnegie Mellon University and a Fellow of the American Institute of Chemical Engineers. He has authored or coauthored over 200 journal articles and two books. His research interests lie in the field of computer-aided process engineering, including flowsheet optimization, optimization of systems of differential and algebraic equations, reactor network synthesis and algorithms for constrained, nonlinear process control.

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