



Fuel Cells: Principles, Design, and Analysis (Mechanical and Aerospace Engineering Series)

By Shripad T. Revankar, Pradip Majumdar

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Fuel Cells: Principles, Design, and Analysis considers the latest advances in fuel cell system development and deployment, and was written with engineering and science students in mind. This book provides readers with the fundamentals of fuel cell operation and design, and incorporates techniques and methods designed to analyze different fuel cell systems. It builds on three main themes: basic principles, analysis, and design.

The section on basic principles contains background information on fuel cells, including fundamental principles such as electrochemistry, thermodynamics, and kinetics of fuel cell reactions as well as mass and heat transfer in fuel cells. The section on design explores important characteristics associated with various fuel cell components, electrodes, electrocatalysts, and electrolytes, while the section on analysis examines phenomena characterization and modeling both at the component and system levels.

- Includes objectives and a summary in each chapter
- Presents examples and problems demonstrating theory/principle applications
- Provides case studies on fuel cell analysis
- Contains mathematical methods including numerical methods and MATLAB® Simulink® techniques
- Offers references and material for further reading

Fuel Cells: Principles, Design, and Analysis presents the basic principles, examples, and models essential in the design and optimization of fuel cell systems. Based on more than ten years of the authors' teaching experience, this text is an ideal resource for junior- to senior-level undergraduate students and for graduate students pursuing advanced fuel cell research and study.

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Review

"This book covers all essential themes of fuel cells ranging from fundamentals to applications. It includes key advanced topics important for understanding correctly the underlying multi-science phenomena of fuel cell processes. The book does not only cope with traditional fuel cells but also discusses the future concepts of fuel cells. The book is rich on examples and solutions important for applying the theory into practical use."

?Peter Lund, Aalto University, Helsinki

"A good introduction to the range of disciplines needed to design, build and test fuel cells."

?Nigel Brandon, Imperial College

"This is a one of a kind book that is comprehensive in covering key topics on fuel cell from extensive reviews of electrochemistry and thermodynamics, to modeling and simulation, to fuel processing and environmental impact. The book lays out in-depth theoretical aspects on fuel cell multi-science processes and yet presents material easy to comprehend. It is well written and sufficiently consistent in style embedded with practical examples to serve as an excellent textbook for both undergraduate and graduate course works. The level of thoroughness and detail is impressive and material presented is useful for the broader fuel cell community, including engineers, industry and researchers."

?Suddhasatwa Basu, Ph.D., professor and head of the chemical engineering department, Indian Institute of Technology Delhi

About the Author

Shripad T. Revankar is a professor of nuclear engineering at Purdue University, West Lafayette, Indiana, and visiting professor at POSTECH, South Korea, in the Division of Advanced Nuclear Engineering. He received his MSc (1977), PhD (1983) in physics from Karnataka University, India, and M.Eng. (1982) in nuclear engineering from McMaster University Canada. He has published more than 300 refereed research papers in journal and conferences, is editor-in-chief of Frontier Energy-Nuclear Energy, serves on the editorial boards of eight international journals including *Heat Transfer Engineering*, *ASME Journal of Fuel Cell Science and Technology*, and is also an ASME Fellow and winner of several awards.

Pradip Majumdar is a professor and chair of mechanical engineering, and the director of the Heat and Mass Transfer Laboratory in the Department of Mechanical Engineering, Northern Illinois University, DeKalb, Illinois. He received his BS degree (1975) in mechanical engineering from B.E College, University of Calcutta, and MS (1980) and PhD (1986) degrees in mechanical engineering from Illinois Institute of Technology, Chicago. He has worked on a number of federal and industrial research projects and published over 100 refereed research papers in archival journals and conference proceedings. He serves as the editor-in-chief of the *Transactions of Fluid Mechanics, International Journal*.

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