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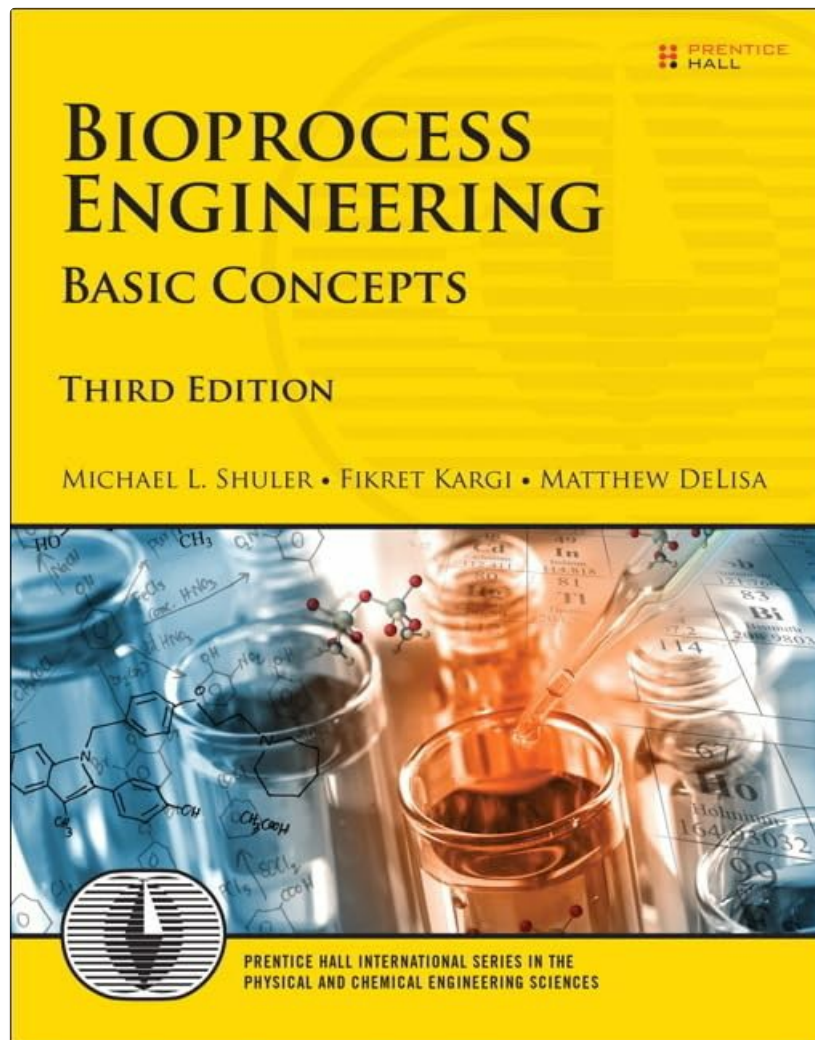
# Bioprocess Engineering: Basic Concepts

Third Edition

By Michael L. Shuler, Fikret Kargi, Matthew DeLisa

## INTRODUCTION AND OVERVIEW

This manual provides an overview of *Bioprocess Engineering, Third Edition*, a comprehensive textbook designed as a leading introduction to biochemical and bioprocess engineering. It reflects significant advancements in productivity, innovation, and safety within the field. The book is structured to guide readers through fundamental concepts to advanced applications, making it an essential resource for students and professionals.



This image displays the front cover of the textbook 'Bioprocess Engineering: Basic Concepts, Third Edition'. The cover features the title prominently, along with the authors' names. The lower half of the cover shows scientific glassware, including beakers and test tubes, with chemical structures and periodic table elements overlaid, symbolizing the book's content.

## CORE CONCEPTS AND FUNDAMENTALS

The textbook begins by reviewing essential fundamentals across biochemistry, microbiology, and molecular biology. Key topics covered include:

- Enzymes and their functions
- Cell functions and growth mechanisms
- Major metabolic pathways
- Alteration of cellular information
- Basic principles of biological tools for manipulating cell biology

These foundational elements are crucial for understanding the more complex bioprocesses discussed later in the text.

## ADVANCED TOPICS AND INNOVATIONS

The third edition incorporates significant advances and evolving techniques in bioprocess engineering. Notable areas of expanded coverage include:

- Production of biologicals and highly productive techniques for heterologous proteins
- Commercial applications of animal and plant cell cultures
- Improvements in recombinant DNA microbe engineering
- Techniques for consistent post-translational processing of proteins
- The role of small RNAs as regulators
- Transcription, translation, regulation, and differences between prokaryotes and eukaryotes
- Cell-free processes, metabolic engineering, and protein engineering
- Biofuels and energy, including enzyme kinetics and two-phase enzymatic reactions
- Synthetic biology
- Genomics and epigenomics
- Population balances and the Gompertz equation for batch growth
- Microreactors for scale-up/scale-down, including vaccine production
- Development of single-use technology in bioprocesses
- Stem cell technology and utilization
- Use of microfabrication, nanobiotechnology, and 3D printing techniques
- Advances in animal and plant cell biotechnology

## PEDAGOGICAL FEATURES

To enhance learning and comprehension, the textbook integrates various pedagogical tools:

- Extensive use of illustrations to clarify complex concepts
- Numerous examples demonstrating practical applications
- Practice problems to reinforce understanding
- References for further reading and in-depth study
- A detailed appendix describing traditional bioprocesses

## ABOUT THE AUTHORS

The book is authored by leading experts in the field:

### Dr. Michael L. Shuler

Samuel B. Eckert Professor of Engineering at Cornell University. He has held significant leadership roles, including directing the School of Chemical Engineering and founding the James and Marsha McCormick Chair for Biomedical Engineering. Dr. Shuler also directs the Center on the Microenvironment and Metastasis (CMM) and is an elected member of the National Academy of Engineering and the American Academy of Arts and Sciences.

### Fikret Kargi

Professor in the Department of Environmental Engineering at Dokuz Eylul University. His research interests span bioprocess engineering, environmental biotechnology, wastewater treatment, and waste bioprocessing. He holds a Ph.D. in Chemical/Biochemical Engineering from Cornell University.

### Matthew DeLisa

William L. Lewis Professor of Engineering in Cornell's Department of Chemical and Biomolecular Engineering. His work focuses on understanding and controlling protein biogenesis. He is recognized for commercially important technologies in drug discovery and seminal discoveries in cellular protein folding. Professor DeLisa is a fellow of the American Institute for Medical and Biological Engineering.

## BOOK SPECIFICATIONS

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