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*“Living cells and cellular biocatalysts (or enzymes) can be utilized effectively for the large-scale production of pharmaceuticals, agro-chemicals, chemicals, fuels, etc., using genetic, metabolic, and protein engineering in an eco-friendly manner. This has led to the emergence of the discipline of biochemical engineering. The authors have covered all basic unit operations and solved over 100 numerical problems normally encountered in modern biotechnological processes. The book includes mathematical formulations of various biochemical processes in a simple and lucid manner.”*

**Prof. S. N. Upadhyay**

**Indian Institute of Technology (BHU) Varanasi, India**

Developments in gene expression, protein engineering, and cell fusion have significantly improved product development in biochemical industries. This book discusses principles of chemical reaction engineering in detail, enhancing the understanding of biochemical engineering. It comprehensively covers all aspects of the applications of bioprocesses, such as mass and energy balances, reaction theory using both chemical and enzymatic reactions, microbial cell growth kinetics, transport phenomena, different control systems used in the fermentation industry, case studies of some industrial fermentation processes, different downstream processes, and effluent treatment. It mathematically analyzes the processes in simplified forms, understandable by most of the readers. It has a large number of problems, along with solutions, that will help the readers in applying the acquired knowledge in designing bioreactors. The book is useful for graduate-level and senior students of biotechnology and those pursuing courses in food and environmental engineering.



**Debabrata Das** is senior professor at the Indian Institute of Technology (IIT) Kharagpur, India. He has 31 years of experience in teaching biochemical engineering. He has made significant contribution to bioenergy production processes using fermentation technology. Prof. Das has authored more than 150 research papers in peer-reviewed journals, 5 books, and 36 book chapters.



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