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this second edition now contains a subchapter on biorecognition assays, plus a chapter on bioprocess control added by the new co-author Jun-ichi Horiuchi, who is one of the leading experts in the field. The central theme of the textbook remains the application of chemical engineering principles to biological processes in general,

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of bioprocesses is the central theme of this  
book, while more advanced techniques and



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applications are covered with some depth. Many theoretical derivations and simplifications are used to demonstrate how empirical kinetic models are applicable to complicated bioprocess systems. Contains extensive illustrative drawings which make the understanding of the subject easy. Contains worked examples of the various

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process parameters, their significance and their specific practical use Provides the theory of bioprocess kinetics from simple concepts to complex metabolic pathways Incorporates sustainability concepts into the various bioprocesses

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year engineering students with a firm grounding in the fundamentals of chemical and bioprocess engineering. However, instead of being a general overview of the two topics, Fundamentals of Chemical and Bioprocess Engineering will identify and focus on specific areas in which attaining a solid competency is desired. This strategy is

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the direct result of studies showing that broad-based courses at the freshman level often leave students grappling with a lot of material, which results in a low rate of retention. Specifically, strong emphasis will be placed on the topic of material balances, with the intent that students exiting a course based upon this textbook will be

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significantly higher on Bloom's Taxonomy (knowledge, comprehension, application, analysis and synthesis, evaluation, creation) relating to material balances. In addition, this book also provides students with a highly developed ability to analyze problems from the material balances perspective, which leaves them with

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important skills for the future. The textbook consists of numerous exercises and their solutions. Problems are classified by their level of difficulty. Each chapter has references and selected web pages to vividly illustrate each example. In addition, to engage students and increase their comprehension and rate of retention, many

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The completion of the Human Genome Project and the rapid progress in cell biology and biochemical engineering, are major forces driving the steady increase of

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approved biotech products, especially biopharmaceuticals, in the market. Today mammalian cell products ( “ products from cells ” ), primarily monoclonals, cytokines, recombinant glycoproteins, and, increasingly, vaccines, dominate the biopharmaceutical industry. Moreover, a small number of products consisting of in



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vitro cultivated cells ( “ cells as product ” ) for regenerative medicine have also been introduced in the market. Their efficient production requires comprehensive knowledge of biological as well as biochemical mammalian cell culture fundamentals (e.g., cell characteristics and metabolism, cell line establishment, culture

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medium optimization) and related engineering principles (e.g., bioreactor design, process scale-up and optimization). In addition, new developments focusing on cell line development, animal-free culture media, disposables and the implications of changing processes (multi-purpose facilities) have to be taken into account. While a

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number of excellent books treating the basic methods and applications of mammalian cell culture technology have been published, only little attention has been afforded to their engineering aspects. The aim of this book is to make a contribution to closing this gap; it particularly focuses on the interactions between biological and

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biochemical and engineering principles in processes derived from cell cultures. It is not intended to give a comprehensive overview of the literature. This has been done extensively elsewhere.

Biotechnology has been labelled as one of the key technologies of the last two decades

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of the 20th Century, offering boundless solutions to problems ranging from food and agricultural production to pharmaceutical and medical applications, as well as environmental and bioremediation problems. Biological processes, however, are complex and the prevailing mechanisms are either unknown or poorly understood. This

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means that adequate techniques for data acquisition and analysis, leading to appropriate modeling and simulation packages that can be superimposed on the engineering principles, need to be routine tools for future biotechnologists. The present volume presents a masterly summary of the most recent work in the

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field, covering: instrumentation systems; enzyme technology; environmental biotechnology; food applications; and metabolic engineering.

This substantially revised text represents a broader based biological engineering title. It includes medicine and other applications

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that are desired in curricula supported by the American Society of Agricultural and Biological Engineers, as well as many bioengineering departments in both U.S. and worldwide departments. This new edition will focus



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