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He earned his MSc. degree in Control Engineering and Ph.D. degree in Chemical Engineering from the University of Manchester Institute of Science and Technology, U.K. Before joining Texas Tech University in 2004, he taught at Colorado State University for more than twenty years. He has published widely in the area of bio-process control. Dr.

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Essentially all bioprocess strategies under consideration for commercial-scale ethanol production consist of the following three steps: (1) pretreatment, (2) enzymatic hydrolysis, and (3) subsequent fermentation to produce ethanol (Lynd 1996, Mielenz 2001, Sun and Cheng 2002, Wyman et al. 2005). Pretreatment of lignocellulosic materials is designed to release sugars and improve the digestibility of cellulose.

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It explores the engineering principles necessary for bioprocess synthesis and design, and illustrates the application of these principles to modern biotechnology for production of pharmaceuticals and biologics, solution of environmental problems, production of commodities, and medical applications.

*Shuler & Kargi, Bioprocess Engineering: Basic Concepts ...*

Bioprocess Engineering, Third Edition, is an extensive update of the world's leading introductory textbook on biochemical and bioprocess engineering and reflects key advances in productivity, innovation, and safety. The authors review relevant fundamentals of biochemistry, microbiology, and molecular biology, including enzymes, cell functions and growth, major metabolic pathways, alteration ...

This volume presents the reader with an overview of current chemical sensor technology and outlines a framework relating industrial bioprocess monitoring to modern process control technology. It deals with conventional multivariable control technology, focusing on bioprocess applications.

The goal of this textbook is to provide first-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 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 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 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 examples involve real-world situations.

Bioprocess Engineering involves the design and development of equipment and processes for the manufacturing of products such as food, feed, pharmaceuticals, nutraceuticals, chemicals, and polymers and paper from biological materials. It also deals with studying various biotechnological processes. "Bioprocess Kinetics and Systems Engineering" first of its kind contains systematic and comprehensive content on bioprocess kinetics, bioprocess systems, sustainability and reaction engineering. Dr. Shijie Liu reviews the relevant fundamentals of chemical kinetics-including batch and continuous reactors, biochemistry, microbiology, molecular biology, reaction engineering, and bioprocess systems engineering- introducing key principles that enable bioprocess engineers to engage in the analysis, optimization, design and consistent control over biological and chemical transformations. The quantitative treatment of bioprocesses is the central theme of this book, while more advanced techniques and 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 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

Examining energy, environment, and sustainability from the chemical engineering point of view, this book highlights critical issues faced by chemical engineers and biochemical engineers worldwide. The book covers recent trends in chemical engineering and bioprocess engineering, such as CFD simulation, statistical optimization, process control, waste water treatment, micro reactors, fluid bed drying, hydrodynamic studies of gas liquid mixture in

pipe, and more. Other chapters cover important ultrasound-assisted extraction, process intensification, polymers and coatings, as well as modelling of bioreactor and enzyme systems and biological nitrification.

This volume presents the reader with an overview of current chemical sensor technology and outlines a framework relating industrial bioprocess monitoring to modern process control technology. It deals with conventional multivariable control technology, focusing on bioprocess applications.

The field of process control has evolved gradually over the years, with emphasis on key aspects including designing and tuning of controllers. This textbook covers fundamental concepts of basic and multivariable process control, and important monitoring and diagnosis techniques. It discusses topics including state-space models, Laplace transform to convert state-space models to transfer function models, linearity and linearization, inversion formulae, conversion of output to time domain, stability analysis through partial fraction expansion, and stability analysis using Routh table and Nyquits plots. The text also covers basics of relative gain array, multivariable controller design and model predictive control. The text comprehensively covers minimum variable controller (MVC) and minimum variance benchmark with the help of solved examples for better understanding. Fundamentals of diagnosis of control loop problems are also explained and explanations are bolstered through solved examples. Pedagogical features including solved problems and unsolved exercises are interspersed throughout the text for better understanding. The textbook is primarily written for senior undergraduate and graduate students in the field of chemical engineering and biochemical engineering for a course on process control. The textbook will be accompanied by teaching resource such a collection of slides for the course material and a includesolution manual for the instructors.

Computational Intelligence (CI) and Bioprocess are well-established research areas which have much to offer each other. Under the perspective of the CI area, Biop- cess can be considered a vast application area with a growing number of complex and challenging tasks to be dealt with, whose solutions can contribute to boosting the development of new intelligent techniques as well as to help the refinement and s- cialization of many of the already existing techniques. Under the perspective of the Bioprocess area, CI can be considered a useful repertoire of theories, methods and techniques that can contribute and offer interesting alternative approaches for solving many of its problems, particularly those hard to solve using conventional techniques. Although throughout the past years CI and Bioprocess areas have accumulated substantial specific knowledge and progress has been quick and with a high degree of success, we believe there is still a long way to go in order to use the potentialities of the available CI techniques and knowledge at their full extent, as tools for supporting problem solving in bioprocesses. One of the reasons is the fact that both areas have progressed steadily and have been continuously accumulating and refining specific knowledge; another reason is the high level of technical expertise demanded by each of them. The acquisition of technical skills, experience and good insights in either of the two areas is very demanding and a hard task to be accomplished by any professional.

Neural networks have received a great deal of attention among scientists and engineers. In chemical engineering, neural computing has moved from pioneering projects toward mainstream industrial applications. This book introduces the fundamental principles of neural computing, and is the first to focus on its practical applications in bioprocessing and chemical engineering. Examples, problems, and 10 detailed case studies demonstrate how to develop, train, and apply neural networks. A disk containing input data files for all illustrative examples, case studies, and practice problems provides the opportunity for hands-on experience. An important goal of the book is to help the student or practitioner learn and implement neural networks quickly and inexpensively using commercially available, PC-based software tools. Detailed network specifications and training procedures are included for all neural network examples discussed in the book. Each chapter contains an introduction, chapter summary, references to further reading, practice problems, and a section on nomenclature Includes a PC-compatible disk containing input data files for examples, case studies, and practice problems Presents 10 detailed case studies Contains an extensive glossary, explaining terminology used in neural network applications in science and engineering Provides examples, problems, and ten detailed case studies of neural computing applications, including: Process fault-diagnosis of a chemical reactor Leonard Kramer fault-classification problem Process fault-diagnosis for an unsteady-state continuous stirred-tank reactor system Classification of protein secondary-structure categories Quantitative prediction and regression analysis of complex chemical kinetics Software-based sensors for quantitative predictions of product compositions from flourescent spectra in bioprocessing Quality control and optimization of an autoclave curing process for manufacturing composite materials Predictive modeling of an experimental batch fermentation process Supervisory control of the Tennessee Eastman plantwide control problem Predictive modeling and optimal design of extractive bioseparation in aqueous two-phase systems

Completely revised, updated, and enlarged, 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, demonstrating how a chemical engineer would address and solve problems. To create a logical and clear structure, the book is divided into three parts. The first deals with the basic concepts and principles of chemical engineering and can be read by those students with no prior knowledge of chemical engineering. The second part focuses on process aspects, such as heat and mass transfer, bioreactors, and separation methods. Finally, the third section describes practical aspects, including medical device production, downstream operations, and fermenter engineering. More than 40 exemplary solved exercises facilitate understanding of the complex engineering background, while self-study is supported by the inclusion of over 80 exercises at the end of each chapter, which are supplemented by the corresponding solutions. An excellent, comprehensive introduction to the principles of biochemical engineering.

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