

Separation Processes Mcgraw Hill Chemical Engineering Series

The Comprehensive Introduction to Standard and Advanced Separation for Every Chemical Engineer Separation Process Engineering, Second Edition helps readers thoroughly master both standard equilibrium staged separations and the latest new processes. The author explains key separation process with exceptional clarity, realistic examples, and end-of-chapter simulation exercises using Aspen Plus. The book starts by reviewing core concepts, such as equilibrium and unit operations; then introduces a step-by-step process for solving separation problems. Next, it introduces each leading processes, including advanced processes such as membrane separation, adsorption, and chromatography. For each process, the author presents essential principles, techniques, and equations, as well as detailed examples. Separation Process Engineering is the new, thoroughly updated edition of the author's previous book, Equilibrium Staged Separations. Enhancements include improved organization, extensive new coverage, and more than 75% new homework problems, all tested in the author's Purdue University classes. Coverage includes Detailed problems with real data, organized in a common format for easier understanding Modular simulation exercises that support courses taught with simulators without creating confusion in courses that do not use them Extensive new coverage of membrane separations, including gas permeation, reverse osmosis, ultrafiltration, pervaporation, and key applications A detailed introduction to adsorption, chromatography and ion exchange: everything students need to understand

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advanced work in these areas Discussions of standard equilibrium stage processes, including flash distillation, continuous column distillation, batch distillation, absorption, stripping, and extraction

The Definitive, Up-to-Date, Student-Friendly Guide to Separation Process Engineering With More Mass Transfer Coverage and a New Chapter on Crystallization Separation Process Engineering, Fourth Edition, is the most comprehensive, accessible guide available on modern separation processes and the fundamentals of mass transfer. In this completely updated edition, Phillip C. Wankat teaches each key concept through detailed, realistic examples using real data including up-to-date simulation practice and spreadsheet-based exercises. Wankat thoroughly covers each separation process, including flash, column, and batch distillation; exact calculations and shortcut methods for multicomponent distillation; staged and packed column design; absorption; stripping; and more. This edition provides expanded coverage of mass transfer and diffusion, so faculty can cover separations and mass transfer in one course. Detailed discussions of liquid-liquid extraction, adsorption, chromatography, and ion exchange prepare students for advanced work. Wankat presents coverage of membrane separations, including gas permeation, reverse osmosis, ultrafiltration, pervaporation, and applications. An updated chapter on economics and energy conservation in distillation adds coverage of equipment costs. This edition contains more than 300 new, up-to-date homework problems, extensively tested in undergraduate courses at Purdue University and the University of Canterbury (New Zealand). Coverage includes New chapter on crystallization from solution, including equilibrium, chemical purity, crystal size distribution, and pharmaceutical applications Thirteen up-to-date Aspen Plus process simulation labs, adaptable to any simulator Eight

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detailed Aspen Chromatography labs Extensive new coverage of ternary stage-by-stage distillation calculations Fraction collection and multicomponent calculations for simple batch distillation New mass transfer analysis sections on numerical solution for variable diffusivity Mass transfer to expanding or contracting objects, including ternary mass transfer Expanded coverage of pervaporation Updated Excel spreadsheets offering more practice with distillation, diffusion, mass transfer, and membrane separation problems Normal 0 false false false EN-US X-NONE X-NONE "

Utilizes simplified computer strategies to analyze, develop, and optimize industrial food processes. Discusses the integration and economic evaluation of the entire processing plant including effective use of water, energy, and raw materials; process profitability; and wastewater reduction. Offers detailed numerical examples for major food processes including heating, cooling, evaporation, dehydration, and thermal processing.

Mass transfer along with separation processes is an area that is often quite challenging to master, as most volumes currently available complicate the learning by teaching mass transfer linked with heat transfer, rather than focusing on more relevant techniques. With this thoroughly updated second edition, *Mass Transfer and Separation Processes: Principles and Applications* presents a highly thoughtful and instructive introduction to this sophisticated material by teaching mass transfer and separation processes as unique though related entities. In an ever increasing effort to demystify the subject, with this edition, the author— Avoids more complex separation processes Places a greater emphasis on the art of simplifying assumptions Conveys a greater sense of scale with the inclusion of numerous photos of actual installations Makes the math only as complicated as necessary while reviewing fundamental

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principles that may have been forgotten The book explores essential principles and reinforces the concepts with classical and contemporary illustrations drawn from the engineering, environmental, and biological sciences. The theories of heat conduction and transfer are utilized not so much to draw analogies but rather to make fruitful use of existing solutions not seen in other texts on the subject. Both an introductory resource and a reference, this important text serves environmental, biomedical, and engineering professionals, as well as anyone wishing to gain a grasp on this subject and its increasing relevance across a number of fields. It fills a void in traditional chemical engineering literature by providing access to the principles and working practices that allow mass transfer theory to be applied to separation processes.

This practical how-to-do book deals with the design of sustainable chemical processes by means of systematic methods aided by computer simulation. Ample case studies illustrate generic creative issues, as well as the efficient use of simulation techniques, with each one standing for an important issue taken from practice. The didactic approach guides readers from basic knowledge to mastering complex flow-sheets, starting with chemistry and thermodynamics, via process synthesis, efficient use of energy and waste minimization, right up to plant-wide control and process dynamics. The simulation results are compared with flow-sheets and performance indices of actual industrial licensed processes, while the complete input data for all the case studies is also provided, allowing readers to reproduce the results with their own simulators. For everyone interested in the design of innovative chemical processes.

Get Cutting-Edge Coverage of All Chemical Engineering Topics— from Fundamentals to the

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Latest Computer Applications First published in 1934, Perry's Chemical Engineers' Handbook has equipped generations of engineers and chemists with an expert source of chemical engineering information and data. Now updated to reflect the latest technology and processes of the new millennium, the Eighth Edition of this classic guide provides unsurpassed coverage of every aspect of chemical engineering—from fundamental principles to chemical processes and equipment to new computer applications. Filled with over 700 detailed illustrations, the Eighth Edition of Perry's Chemical Engineering Handbook features: Comprehensive tables and charts for unit conversion A greatly expanded section on physical and chemical data New to this edition: the latest advances in distillation, liquid-liquid extraction, reactor modeling, biological processes, biochemical and membrane separation processes, and chemical plant safety practices with accident case histories Inside This Updated Chemical Engineering Guide

- Conversion Factors and Mathematical Symbols
- Physical and Chemical Data
- Mathematics
- Thermodynamics
- Heat and Mass Transfer
- Fluid and Particle Dynamics
- Reaction Kinetics
- Process Control
- Process Economics
- Transport and Storage of Fluids
- Heat Transfer Equipment
- Psychrometry, Evaporative Cooling, and Solids Drying
- Distillation
- Gas Absorption and Gas-Liquid System Design
- Liquid-Liquid Extraction Operations and Equipment
- Adsorption and Ion Exchange
- Gas-Solid Operations and Equipment
- Liquid-Solid Operations and Equipment
- Solid-Solid Operations and Equipment
- Size Reduction and Size Enlargement
- Handling of Bulk Solids and Packaging of Solids and Liquids
- Alternative Separation Processes
- And Many Other Topics!

Completely rewritten to enhance clarity, this third edition provides engineers with a strong understanding of the field. With the help of an additional co-author, the text presents new

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information on bioseparations throughout the chapters. A new chapter on mechanical separations covers settling, filtration, and centrifugation, including mechanical separations in biotechnology and cell lysis. Boxes help highlight fundamental equations. Numerous new examples and exercises are integrated throughout as well. In addition, frequent references are made to the software products and simulators that will help engineers find the solutions they need.

Originally published: New York: McGraw-Hill, 1971. 2nd ed. Includes a new introduction.

"The most complete, up-to-date, problem-solving toolkit for chemical engineers and process designers. Industrial Chemical Process Design, Second Edition provides a step-by-step methodology and 25 downloadable, customizable, needs-specific software applications that offer quick, accurate solutions to complex process design problems. These applications uniquely fill the gaps left by large, very expensive commercial process simulation software packages used to select, size, and design industrial chemical process equipment. Written by a hands-on industry consultant and featuring more than 200 illustrations, this book thoroughly details:

- Sizing and cost estimating of process unit operation equipment
- Design and rating of fractionation equipment and three-phase separation equipment
- Chemical optimization
- Commercial distillation
- Packaged plant cost analysis
- Estimating cost for modular packages
- Performing operations such as liquid-liquid extraction and gas liquid separation vessel sizing and rating
- Green engineering

New to the Second Edition: Added focus on sustainability with

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new green engineering coverage: crude oil database; vegetable oils and plant greenhouse production for use in automobile fuels; gasoline and diesel fuel database; greenhouse fuels; water removal treatment in three-phase vessel design New focus on engineering economics Simplified shell/tube design method and improved shell/tube exchanger software improvements Fluid flow coverage includes both single- and two-phase flow and the very desirable addition of complete process engineering of NO_x removal and catalytic SCR reactor processes necessary in all electric generator power plants and refinery furnace systems (per mandatory EPA regulations) Coverage of the Fischer-Tropsch process converting natural methane gas to crude oil products, liquids, gasoline, diesel, and jet fuel - all sulfur-free! Includes a plan to decrease reliance on crude oil imports Contains a packaged cost analysis natural gas-to-liquids plant turn-key software program "--

Chemical Engineering Design: Principles, Practice and Economics of Plant and Process Design is one of the best-known and most widely adopted texts available for students of chemical engineering. The text deals with the application of chemical engineering principles to the design of chemical processes and equipment. The third edition retains its hallmark features of scope, clarity and practical emphasis, while providing the latest US codes and standards, including API, ASME and ISA design codes and ANSI standards, as well as coverage of the latest aspects of process design, operations, safety, loss prevention, equipment selection, and more. The text is

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designed for chemical and biochemical engineering students (senior undergraduate year, plus appropriate for capstone design courses where taken), and professionals in industry (chemical process, biochemical, pharmaceutical, petrochemical sectors). Provides students with a text of unmatched relevance for chemical process and plant design courses and for the final year capstone design course Written by practicing design engineers with extensive undergraduate teaching experience Contains more than 100 typical industrial design projects drawn from a diverse range of process industries NEW TO THIS EDITION Includes new content covering food, pharmaceutical and biological processes and commonly used unit operations Provides updates on plant and equipment costs, regulations and technical standards Includes limited online access for students to Cost Engineering's Cleopatra Enterprise cost estimating software

Author's purpose is "to provide a vehicle for teaching, either through a formal course or through self-study, the techniques of, and principles of equipment design for, the mass-transfer operations of chemical engineering." As before, these operations are largely the responsibility of the chemical engineer, but increasingly practitioners of other engineering disciplines are finding them necessary for their work. This is especially true for those engaged in pollution control and environment protection, where separation processes predominate, and in, for example, extractive metallurgy, where more sophisticated and diverse methods of separation are increasingly relied upon.

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Process Technology provides a general overview about chemical and biochemical process technology. It focuses on the structure and development of production processes, main technological operations and the important aspects of process economics. The theoretical foundations in each chapter are supplemented by case studies and examples in a clear and instructive manner to illustrate the practical aspects. The author highlights operating principles, reasons for application and available industrial equipment of technological operations. Aim is to facilitate those without a process technology background in multi-disciplinary cooperation with (bio-) chemical engineers by providing an overview of this exciting field. The textbook is organized into seven distinct parts: Structure of the chemical industry and (bio-) chemical processes (Bio-) Chemical reaction engineering Molecular separations (distillation, extraction, absorption, adsorption) Mechanical separations (filtration, sedimentation, membranes) Particle and final product manufacturing Development, scale-up, design and safety of processes Major industrial process descriptions Separation Process Essentials provides an interactive approach for students to learn the main separation processes (distillation, absorption, stripping, and solvent extraction) using material and energy balances with equilibrium relationships, while referring readers to other more complete works when needed. Membrane separations are included as an example of non-equilibrium processes. This book reviews and builds on material learned in the first chemical engineering courses such as Material and Energy

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Balances and Thermodynamics as applied to separations. It relies heavily on example problems, including completely worked and explained problems followed by "Try This At Home" guided examples. Most examples have accompanying downloadable Excel spreadsheet simulations. The book also offers a complementary website, <http://separationsbook.com>, with supplementary material such as links to YouTube tutorials, practice problems, and the Excel simulations. This book is aimed at second and third year undergraduate students in Chemical engineering, as well as professionals in the field of Chemical engineering, and can be used for a one semester course in separation processes and unit operations.

Surveys the selection, design, and operation of most of the industrially important separation processes. Discusses the underlying principles on which the processes are based, and provides illustrative examples of the use of the processes in a modern context. Features thorough treatment of newer separation processes based on membranes, adsorption, chromatography, ion exchange, and chemical complexation. Includes a review of historically important separation processes such as distillation, absorption, extraction, leaching, and crystallization and considers these techniques in light of recent developments affecting them.

Providing chemical engineering undergraduate and graduate students with a basic understanding of how separation of a mixture of molecules, macromolecules or particles is achieved, this textbook is a comprehensive introduction to the engineering science of

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separation. • Students learn how to apply their knowledge to determine the separation achieved in a given device or process • Real-world examples are taken from biotechnology, chemical, food, petrochemical, pharmaceutical and pollution control industries • Worked examples, elementary separator designs and chapter-end problems are provided, giving students a practical understanding of separation. The textbook systematically develops different separation processes by considering the forces causing the separation and how this separation is influenced by the patterns of bulk flow in the separation device. Readers will be able to take this knowledge and apply it to their own future studies and research in separation and purification. Online resources include solutions to the exercises and guidance for computer simulations.

This title aims to teach how to invent optimal and sustainable chemical processes by making use of systematic conceptual methods and computer simulation techniques. The material covers five sections: process simulation; thermodynamic methods; process synthesis; process integration; and design project including case studies. It is primarily intended as a teaching support for undergraduate and postgraduate students following various process design courses and projects, but will also be of great value to professional engineers interested in the newest design methods. Provides an introduction to the newest design methods. Of great value to undergraduate and postgraduate students as well as professional engineers.

Numerous examples illustrate theoretical principles and design issues.

Written by a highly regarded author with industrial and academic experience, this new edition of an established bestselling book provides practical guidance for students, researchers, and those in chemical engineering. The book includes a new section on sustainable energy, with

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sections on carbon capture and sequestration, as a result of increasing environmental awareness; and a companion website that includes problems, worked solutions, and Excel spreadsheets to enable students to carry out complex calculations.

Chemical Process Equipment is a results-oriented reference for engineers who specify, design, maintain or run chemical and process plants. This book delivers information on the selection, sizing and operation of process equipment in a format that enables quick and accurate decision making on standard process and equipment choices, saving time, improving productivity, and building understanding. Coverage emphasizes common real-world equipment design rather than experimental or esoteric and focuses on maximizing performance. Legacy reference for chemical and related engineers who work with vendors to design, specify and make final equipment selection decisions Copious examples of successful applications, with supporting schematics and data to illustrate the functioning and performance of equipment Provides equipment rating forms and manufacturers' data, worked examples, valuable shortcut methods, and rules of thumb to demonstrate and support the design process Heavily illustrated with line drawings and schematics to aid understanding, as well as graphs and tables to illustrate performance data

Chemical separations are of central importance in many areas of environmental science, whether it is the clean up of polluted water or soil, the treatment of discharge streams from chemical processes, or modification of a specific process to decrease its environmental impact. This book is an introduction to chemical separations, focusing on their use in environmental applications. The authors first discuss the general aspects of separation technology as a unit operation. They also describe how property differences are used to generate separations, the

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use of separating agents, and the selection criteria for particular separation techniques. The general approach for each technology is to present the chemical and/or physical basis for the process and explain how to evaluate it for design and analysis. The book contains many worked examples and homework problems. It is an ideal textbook for undergraduate and graduate students taking courses on environmental separations or environmental engineering. Separation Process Principles with Applications Using Process Simulator, 4th Edition is the most comprehensive and up-to-date treatment of the major separation operations in the chemical industry. The 4th edition focuses on using process simulators to design separation processes and prepares readers for professional practice. Completely rewritten to enhance clarity, this fourth edition provides engineers with a strong understanding of the field. With the help of an additional co-author, the text presents new information on bioseparations throughout the chapters. A new chapter on mechanical separations covers settling, filtration and centrifugation including mechanical separations in biotechnology and cell lysis. Boxes help highlight fundamental equations. Numerous new examples and exercises are integrated throughout as well.

This textbook is targeted to undergraduate students in chemical engineering, chemical technology, and biochemical engineering for courses in mass transfer, separation processes, transport processes, and unit operations. The principles of mass transfer, both diffusional and convective have been comprehensively discussed. The application of these principles to separation processes is explained. The more common separation processes used in the chemical industries are individually described in separate chapters. The book also provides a good understanding of the construction, the operating principles, and the selection criteria of

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separation equipment. Recent developments in equipment have been included as far as possible. The procedure of equipment design and sizing has been illustrated by simple examples. An overview of different applications and aspects of membrane separation has also been provided. 'Humidification and water cooling', necessary in every process industry, is also described. Finally, elementary principles of 'unsteady state diffusion' and mass transfer accompanied by a chemical reaction are covered. SALIENT FEATURES :

- A balanced coverage of theoretical principles and applications.
- Important recent developments in mass transfer equipment and practice are included.
- A large number of solved problems of varying levels of complexities showing the applications of the theory are included.
- Many end-chapter exercises.
- Chapter-wise multiple choice questions.
- An Instructors manual for the teachers.

Chemical Engineering Volume 2 covers the properties of particulate systems, including the character of individual particles and their behaviour in fluids. Sedimentation of particles, both singly and at high concentrations, flow in packed and fluidised beds and filtration are then examined. The latter part of the book deals with separation processes, such as distillation and gas absorption, which illustrate applications of the fundamental principles of mass transfer introduced in Chemical Engineering Volume 1. In conclusion, several techniques of growing importance - adsorption, ion exchange, chromatographic and membrane separations, and process intensification - are described. A logical progression of chemical engineering concepts, volume 2 builds on fundamental principles

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contained in Chemical Engineering volume 1 and these volumes are fully cross-referenced Reflects the growth in complexity and stature of chemical engineering over the last few years Supported with further reading at the end of each chapter and graded problems at the end of the book

Edited to avoid duplication and favor comprehensiveness, 20 contributors detail the recovery, separation, and purification operations of bioprocess technology. Individual chapters in this classic yet still highly relevant work emphasize concepts that are becoming more and more important when applied to the large scale versions of techniques that are considered well established. Aside from fully discussing processes, Separation Processes in Biotechnology includes sections on concentration separation and operation, purification operations, and product release and recovery. It also discusses plant operation and equipment and delves into economic considerations

This work offers an accessible discussion of current and emerging separation processes used for waste minimization, showing how the processes work on a day-to-day basis and providing troubleshooting tips for equipment that doesn't function according to design specifications. It describes the fundamentals of over 30 processes, types of equipment available, vendors, and common problems encountered in operations with hazardous waste.

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Separation science plays a critical role in maintaining our standard of living and quality of life. Many industrial processes and general necessities such as chemicals, medicines, clean water, safe food, and energy sources rely on chemical separations. However, the process of chemical separations is often overlooked during product development and this has led to inefficiency, unnecessary waste, and lack of consensus among chemists and engineers. A reevaluation of system design, establishment of standards, and an increased focus on the advancement of separation science are imperative in supporting increased efficiency, continued U.S. manufacturing competitiveness, and public welfare. A Research Agenda for Transforming Separation Science explores developments in the industry since the 1987 National Academies report, *Separation and Purification: Critical Needs and Opportunities*. Many needs stated in the original report remain today, in addition to a variety of new challenges due to improved detection limits, advances in medicine, and a recent emphasis on sustainability and environmental stewardship. This report examines emerging chemical separation technologies, relevant developments in intersecting disciplines, and gaps in existing research, and provides recommendations for the application of improved separation science technologies and processes. This research serves as a foundation for transforming separation science, which could

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reduce global energy use, improve human and environmental health, and advance more efficient practices in various industries.

Separation operations are crucial throughout the process industry with respect to energy consumption, contribution to investments and ability to achieve the desired product with the right specifications. Our main objective in creating this graduate level textbook is to present an overview of the fundamentals underlying the most frequently used industrial separation methods. We focus on their physical principles and the basic computation methods that are required to assess their technical and economical feasibility. The textbook is organized into three main parts. Separation processes for homogeneous mixtures are treated in the parts on equilibrium based molecular separations and rate-controlled molecular separations. The part on mechanical separation technology presents an overview of the most important techniques for heterogeneous mixture separation. Each chapter provides a condensed overview of the most commonly used equipment types. The textbook is concluded with a final chapter on the main considerations in selecting an appropriate separation process for a separation task. As the design of separation processes can only be learned by doing, we have included exercises at the end of each chapter. Short answers are given at the end of this book; detailed solutions are given in a separate solution

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manual.

This much-needed book presents a clear and very practice-oriented overview of thermal separation processes. An extensive introduction elucidates the physical and physicochemical fundamentals of different unit operations used to separate homogenous mixtures. This is followed by a concise text with numerous explanatory figures and tables referring to process and design, flowsheets, basic engineering and examples of separation process applications. Very helpful guidance in the form of process descriptions, calculation models and operation data is presented in an easy-to-understand manner thereby assisting the practicing engineer in the choosing and evaluation of separation processes and facilitating the modeling and design of innovative equipment. A comprehensive reference list provides further opportunity for the following up of special separation problems. Chemical and mechanical engineers, chemists, physicists and biotechnologists in research and development, plant design and environmental protection, as well as students in chemical engineering and natural sciences will find this all-embracing reference guide of tremendous value and practical use.

You can maximize industrial profitability by choosing the right separation process with this authoritative guide. This book will help engineers, chemists, managers,

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and technicians in the chemical, petroleum, pharmaceutical, food, and paper industries maximize profitability by optimizing performance of separation processes. Focusing on the latest distillation, extraction, adsorption, and membrane processes, this up-to-the-minute guide helps you select a cost-effective process; choose a cost-cutting configuration; keep up with cutting-edge technology; and follow up on your choices. Written by two of the leading separation process chemical engineers in the world, this handbook is truly worth its weight in gold to anyone involved in separation process technology.

Separation processes— or processes that use physical, chemical, or electrical forces to isolate or concentrate selected constituents of a mixture—are essential to the chemical, petroleum refining, and materials processing industries. In this volume, an expert panel reviews the separation process needs of seven industries and identifies technologies that hold promise for meeting these needs, as well as key technologies that could enable separations. In addition, the book recommends criteria for the selection of separations research projects for the Department of Energy's Office of Industrial Technology.

Focuses on novel techniques and reviews established methods for surfactant-based separation processes that can be widely applied in industry. Describes new extraction techniques, micellar-enhanced ultrafiltration and admicellar

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chromatography, protein extraction using reverse micelles, surfactant-en
Synthetic Membranes and Membrane Separation Processes addresses both fundamental and practical aspects of the subject. Topics discussed in the book cover major industrial membrane separation processes, including reverse osmosis, ultrafiltration, microfiltration, membrane gas and vapor separation, and pervaporation. Membrane materials, membrane preparation, membrane structure, membrane transport, membrane module and separation design, and applications are discussed for each separation process. Many problem-solving examples are included to help readers understand the fundamental concepts of the theory behind the processes. The book will benefit practitioners and students in chemical engineering, environmental engineering, and materials science.

Separation Process Technology McGraw-Hill Professional Publishing

A practical, concise guide to chemical engineering principles and applications
Chemical Engineering: The Essential Reference is the condensed but authoritative chemical engineering reference, boiled down to principles and hands-on skills needed to solve real-world problems. Emphasizing a pragmatic approach, the book delivers critical content in a convenient format and presents on-the-job topics of importance to the chemical engineer of tomorrow—OM&I (operation, maintenance, and inspection) procedures, nanotechnology, how to

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purchase equipment, legal considerations, the need for a second language and for oral and written communication skills, and ABET (Accreditation Board for Engineering and Technology) topics for practicing engineers. This is an indispensable resource for anyone working as a chemical engineer or planning to enter the field. Praise for *Chemical Engineering: The Essential Reference*:

“Current and relevant...over a dozen topics not normally addressed...invaluable to my work as a consultant and educator.” —Kumar Ganesan, Professor and Department Head, Department of Environmental Engineering, Montana Tech of the University of Montana “A much-needed and unique book, tough not to like...loaded with numerous illustrative examples...a book that looks to the future and, for that reason alone, will be of great interest to practicing engineers.”

—Anthony Buonicore, Principal, Buonicore Partners
Coverage includes: Basic calculations and key tables
Process variables
Numerical methods and optimization
Oral and written communication
Second language(s)
Chemical engineering processes
Stoichiometry
Thermodynamics
Fluid flow
Heat transfer
Mass transfer operations
Membrane technology
Chemical reactors
Process control
Process design
Biochemical technology
Medical applications
Legal considerations
Purchasing equipment
Operation, maintenance, and inspection (OM&I) procedures
Energy management
Water management
Nanotechnology

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Project management Environment management Health, safety, and accident management Probability and statistics Economics and finance Ethics Open-ended problems

Appropriate for one-year transport phenomena (also called transport processes) and separation processes course. First semester covers fluid mechanics, heat and mass transfer; second semester covers separation process principles (includes unit operations). The title of this Fourth Edition has been changed from Transport Processes and Unit Operations to Transport Processes and Separation Process Principles (Includes Unit Operations). This was done because the term Unit Operations has been largely superseded by the term Separation Processes which better reflects the present modern nomenclature being used. The main objectives and the format of the Fourth Edition remain the same. The sections on momentum transfer have been greatly expanded, especially in the sections on fluidized beds, flow meters, mixing, and non-Newtonian fluids. Material has been added to the chapter on mass transfer. The chapters on absorption, distillation, and liquid-liquid extraction have also been enlarged. More new material has been added to the sections on ion exchange and crystallization. The chapter on membrane separation processes has been greatly expanded especially for gas-membrane theory.

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