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### SOLUTIONS MANUAL TO ACCOMPANY CHEMICAL REACTION EN GINEERING

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#### CHEMICAL REACTION ENGINEERING

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*John Wiley & Sons* **Chemical reaction engineering is concerned with the exploitation of chemical reactions on a commercial scale. It's goal is the successful design and operation of chemical reactors. This text emphasizes qualitative arguments, simple design methods, graphical procedures, and frequent comparison of capabilities of the major reactor types. Simple ideas are treated first, and are then extended to the more complex.**

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#### CHEMICAL REACTION ENGINEERING, 3RD ED

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*John Wiley & Sons* **Market\_Desc: · Chemical Engineers in Chemical, Nuclear and Biomedical Industries Special Features: · Emphasis is placed throughout on the development of common design strategy for all systems, homogeneous and heterogeneous· This edition features new topics on biochemical systems, reactors with fluidized solids, gas/liquid reactors, and more on non ideal flow· The book explains why certain assumptions are made, why an alternative approach is not used, and to indicate the limitations of the treatment when applied to real situations About The Book: Chemical reaction engineering is concerned with the exploitation of chemical reactions on a commercial scale. Its goal is the successful design and operation of chemical reactors. This text emphasizes qualitative arguments, simple design methods, graphical procedures, and frequent comparison of capabilities of the major reactor types. Simple ideas are treated first, and are then extended to the more complex.**

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#### ENGINEERING FLOW AND HEAT EXCHANGE

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*Springer* **The third edition of Engineering Flow and Heat Exchange is the most practical textbook available on the design of heat transfer and equipment. This book is an excellent introduction to real-world applications for advanced undergraduates and an indispensable reference for professionals. The book includes comprehensive chapters on the different types and classifications of fluids, how to analyze fluids, and where a particular fluid fits into a broader picture. This book includes various a wide variety of problems and solutions - some whimsical and others directly from industrial applications. Numerous practical examples of heat transfer Different from other introductory books on fluids Clearly written, simple to understand, written for students to absorb material quickly Discusses non-Newtonian as well as Newtonian fluids Covers the entire field concisely Solutions manual with worked examples and solutions provided**

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#### ELEMENTS OF CHEMICAL REACTION ENGINEERING

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*Pearson Educación* **"The fourth edition of Elements of Chemical Reaction Engineering is a completely revised version of the book. It combines authoritative coverage of the principles of chemical reaction engineering with an unsurpassed focus on critical thinking and creative problem solving, employing open-ended questions and stressing the Socratic method. Clear and organized, it integrates text, visuals, and computer simulations to help readers solve even the most challenging problems through reasoning, rather than by memorizing equations."--BOOK JACKET.**

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## CHEMICAL ENGINEERING EDUCATION

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### TRACER TECHNOLOGY

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#### MODELING THE FLOW OF FLUIDS

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*Springer Science & Business Media* The tracer method was first introduced to measure the actual flow of fluid in a vessel, and then to develop a suitable model to represent this flow. Such models are used to follow the flow of fluid in chemical reactors and other process units, in rivers and streams, and through soils and porous structures. Also, in medicine they are used to study the flow of chemicals, harmful or not, in the blood streams of animals and man. Tracer Technology, written by Octave Levenspiel, shows how we use tracers to follow the flow of fluids and then we develop a variety of models to represent these flows. This activity is called tracer technology.

#### FLUIDIZATION ENGINEERING

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*Elsevier* Fluidization Engineering, Second Edition, expands on its original scope to encompass these new areas and introduces reactor models specifically for these contacting regimes. Completely revised and updated, it is essentially a new book. Its aim is to distill from the thousands of studies those particular developments that are pertinent for the engineer concerned with predictive methods, for the designer, and for the user and potential user of fluidized beds. Covers the recent advances in the field of fluidization. Presents the studies of developments necessary to the engineers, designers, and users of fluidized beds.

#### MASS-TRANSFER OPERATIONS

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#### FUNDAMENTALS OF CHEMICAL REACTION ENGINEERING

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*Courier Corporation* Appropriate for a one-semester undergraduate or first-year graduate course, this text introduces the quantitative treatment of chemical reaction engineering. It covers both homogeneous and heterogeneous reacting systems and examines chemical reaction engineering as well as chemical reactor engineering. Each chapter contains numerous worked-out problems and real-world vignettes involving commercial applications, a feature widely praised by reviewers and teachers. 2003 edition.

#### CHEMICAL REACTOR OMNIBOOK- SOFT COVER

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*Lulu.com* The Omnibook aims to present the main ideas of reactor design in a simple and direct way. It includes key formulas, brief explanations, practice exercises, problems from experience and it skims over the field touching on all sorts of reaction systems. Most important of all it tries to show the reader how to approach the problems of reactor design and what questions to ask. In effect it tries to show that a common strategy threads its way through all reactor problems, a strategy which involves three factors: identifying the flow pattern, knowing the kinetics, and developing the proper performance equation. It is this common strategy which is the heart of Chemical Reaction Engineering and identifies it as a distinct field of study.

#### GNU OCTAVE

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#### BEGINNER'S GUIDE : BECOME A PROFICIENT OCTAVE USER BY LEARNING THIS HIGH-LEVEL SCIENTIFIC NUMERICAL TOOL FROM THE GROUND UP

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*Packt Publishing Ltd* Today, scientific computing and data analysis play an integral part in most scientific disciplines ranging from mathematics and biology to imaging processing and finance. With GNU Octave you have a highly flexible tool that can solve a vast number of such different problems as complex statistical analysis and dynamical system studies. The GNU Octave Beginner's Guide gives you an introduction that enables you to solve and analyze complicated numerical problems. The book is based on numerous concrete examples and at the end of each chapter you will find exercises to test your knowledge. It's easy to learn GNU Octave, with the GNU Octave Beginner's Guide to hand. Using real-world examples the GNU Octave Beginner's Guide will take you through the most important aspects of GNU Octave. This practical guide takes you from the basics where you are introduced to the interpreter to a more advanced level where you will learn how to build your own specialized and highly optimized GNU Octave toolbox package. The book starts by introducing you to work variables like vectors and matrices, demonstrating how to perform simple arithmetic operations on these objects before explaining how to use some of the

simple functionality that comes with GNU Octave, including plotting. It then goes on to show you how to write new functionality into GNU Octave and how to make a toolbox package to solve your specific problem. Finally, it demonstrates how to optimize your code and link GNU Octave with C and C++ code enabling you to solve even the most computationally demanding tasks. After reading GNU Octave Beginner's Guide you will be able to use and tailor GNU Octave to solve most numerical problems and perform complicated data analysis with ease.

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### **PHYSICAL AND CHEMICAL EQUILIBRIUM FOR CHEMICAL ENGINEERS**

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*John Wiley & Sons* Suitable for undergraduates, postgraduates and professionals, this is a comprehensive text on physical and chemical equilibrium. De Nevers is also the author of **Fluid Mechanics for Chemical Engineers**.

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### **THE ENGINEERING OF CHEMICAL REACTIONS**

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*Oxford University Press, USA* The Engineering of Chemical Reactions focuses explicitly on developing the skills necessary to design a chemical reactor for any application, including chemical production, materials processing, and environmental modeling.

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### **UNDERSTANDING ENGINEERING THERMO**

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*Prentice Hall* from the literature to show the power, scope, and utility of the subject. Understanding Engineering Thermo concentrates on a broad-based coverage of the first two laws of Thermo. While not intended to be the last word on the subject, this book provides a lively way to master the foundations of this sometimes dry topic. To broaden the book's applicability, Dr. Levenspiel includes thought-provoking problems from diverse fields, such as biology and nuclear energy on up to.

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### **UNIT OPERATIONS OF CHEMICAL ENGINEERING**

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### **INTRODUCTION TO CHEMICAL REACTION ENGINEERING AND KINETICS**

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*John Wiley & Sons Incorporated* Solving problems in chemical reaction engineering and kinetics is now easier than ever! As students read through this text, they'll find a comprehensive, introductory treatment of reactors for single-phase and multiphase systems that exposes them to a broad range of reactors and key design features. They'll gain valuable insight on reaction kinetics in relation to chemical reactor design. They will also utilize a special software package that helps them quickly solve systems of algebraic and differential equations, and perform parameter estimation, which gives them more time for analysis. Key Features Thorough coverage is provided on the relevant principles of kinetics in order to develop better designs of chemical reactors. E-Z Solve software, on CD-ROM, is included with the text. By utilizing this software, students can have more time to focus on the development of design models and on the interpretation of calculated results. The software also facilitates exploration and discussion of realistic, industrial design problems. More than 500 worked examples and end-of-chapter problems are included to help students learn how to apply the theory to solve design problems. A web site, [www.wiley.com/college/misss](http://www.wiley.com/college/misss), provides additional resources including sample files, demonstrations, and a description of the E-Z Solve software.

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### **CHEMICAL REACTOR ANALYSIS AND DESIGN**

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*John Wiley & Sons Incorporated* This is the Second Edition of the standard text on chemical reaction engineering, beginning with basic definitions and fundamental principles and continuing all the way to practical applications, emphasizing real-world aspects of industrial practice. The two main sections cover applied or engineering kinetics, reactor analysis and design. Includes updated coverage of computer modeling methods and many new worked examples. Most of the examples use real kinetic data from processes of industrial importance.

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### **INTRODUCTION TO PROBABILITY MODELS**

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*Elsevier* Ross's classic bestseller has been used extensively by professionals and as the primary text for a first undergraduate course in applied probability. With the addition of several new sections relating to actuaries, this text is highly recommended by the Society of Actuaries.

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## DIGITAL DESIGN: PRINCIPLES AND PRACTICES, 4/E

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Pearson Education India

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### INTRODUCTION TO PARTICLE TECHNOLOGY

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*John Wiley & Sons* Particle technology is a term used to refer to the science and technology related to the handling and processing of particles and powders. The production of particulate materials, with controlled properties tailored to subsequent processing and applications, is of major interest to a wide range of industries, including chemical and process, food, pharmaceuticals, minerals and metals companies and the handling of particles in gas and liquid solutions is a key technological step in chemical engineering. This textbook provides an excellent introduction to particle technology with worked examples and exercises. Based on feedback from students and practitioners worldwide, it has been newly edited and contains new chapters on slurry transport, colloids and fine particles, size enlargement and the health effects of fine powders. Topics covered include: Characterization (Size Analysis) Processing (Granulation, Fluidization) Particle Formation (Granulation, Size Reduction) Storage and Transport (Hopper Design, Pneumatic Conveying, Standpipes, Slurry Flow) Separation (Filtration, Settling, Cyclones) Safety (Fire and Explosion Hazards, Health Hazards) Engineering the Properties of Particulate Systems (Colloids, Respirable Drugs, Slurry Rheology) This book is essential reading for undergraduate students of chemical engineering on particle technology courses. It is also valuable supplementary reading for students in other branches of engineering, applied chemistry, physics, pharmaceuticals, mineral processing and metallurgy. Practitioners in industries in which powders are handled and processed may find it a useful starting point for gaining an understanding of the behavior of particles and powders. Review of the First Edition taken from High Temperatures - High pressures 1999 31 243 - 251 ".This is a modern textbook that presents clear-cut knowledge. It can be successfully used both for teaching particle technology at universities and for individual study of engineering problems in powder processing."

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### PROCESS CONTROL

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### MODELING, DESIGN, AND SIMULATION

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*Prentice Hall Professional* Process Control: Modeling, Design, and Simulation is the first complete introduction to process control that fully integrates software tools-helping you master critical techniques hands-on, using MATLAB-based computer simulations. Author B. Wayne Bequette includes process control diagrams, dynamic modeling, feedback control, frequency response analysis techniques, control loop tuning, and start-to-finish chemical process control case studies.

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### CHEMICAL REACTIONS AND CHEMICAL REACTORS

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*Wiley* Focused on the undergraduate audience, Chemical Reaction Engineering provides students with complete coverage of the fundamentals, including in-depth coverage of chemical kinetics. By introducing heterogeneous chemistry early in the book, the text gives students the knowledge they need to solve real chemistry and industrial problems. An emphasis on problem-solving and numerical techniques ensures students learn and practice the skills they will need later on, whether for industry or graduate work.

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### MOLECULAR SYMMETRY AND GROUP THEORY

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### APPROACHES IN SPECTROSCOPY AND CHEMICAL REACTIONS

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*Walter de Gruyter GmbH & Co KG* The mathematical fundamentals of molecular symmetry and group theory are comprehensively described in this book. Applications are given in context of electronic and vibrational spectroscopy as well as chemical reactions following orbital symmetry rules. Exercises and examples compile and deepen the content in a lucid manner.

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### INFORMATION TECHNOLOGY PROJECT MANAGEMENT

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### PROVIDING MEASURABLE ORGANIZATIONAL VALUE

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*John Wiley & Sons* The 5th Edition of Jack Marchewka's Information Technology Project Management focuses on how to create measurable organizational value (MOV) through IT projects. The author uses the concept of MOV, combined with his own research, to create a solid foundation for making decisions throughout the project's lifecycle. The book's

integration of project management and IT concepts provides students with the tools and techniques they need to develop in this field.

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## **PROCESS ENGINEERING AND INDUSTRIAL MANAGEMENT**

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*John Wiley & Sons* **Process Engineering**, the science and art of transforming raw materials and energy into a vast array of commercial materials, was conceived at the end of the 19th Century. Its history in the role of the Process Industries has been quite honorable, and techniques and products have contributed to improve health, welfare and quality of life. Today, industrial enterprises, which are still a major source of wealth, have to deal with new challenges in a global world. They need to reconsider their strategy taking into account environmental constraints, social requirements, profit, competition, and resource depletion. "Systems thinking" is a prerequisite from process development at the lab level to good project management. New manufacturing concepts have to be considered, taking into account LCA, supply chain management, recycling, plant flexibility, continuous development, process intensification and innovation. This book combines experience from academia and industry in the field of industrialization, i.e. in all processes involved in the conversion of research into successful operations. Enterprises are facing major challenges in a world of fierce competition and globalization. Process engineering techniques provide Process Industries with the necessary tools to cope with these issues. The chapters of this book give a new approach to the management of technology, projects and manufacturing.

**Contents** Part 1: The Company as of Today 1. The Industrial Company: its Purpose, History, Context, and its Tomorrow?, Jean-Pierre Dal Pont. 2. The Two Modes of Operation of the Company - Operational and Entrepreneurial, Jean-Pierre Dal Pont. 3. The Strategic Management of the Company: Industrial Aspects, Jean-Pierre Dal Pont. Part 2: Process Development and Industrialization 4. Chemical Engineering and Process Engineering, Jean-Pierre Dal Pont. 5. Foundations of Process Industrialization, Jean-François Joly. 6. The Industrialization Process: Preliminary Projects, Jean-Pierre Dal Pont and Michel Royer. 7. Lifecycle Analysis and Eco-Design: Innovation Tools for Sustainable Industrial Chemistry, Sylvain Caillol. 8. Methods for Design and Evaluation of Sustainable Processes and Industrial Systems, Catherine Azzaro-Pantel. 9. Project Management Techniques: Engineering, Jean-Pierre Dal Pont. Part 3: The Necessary Adaptation of the Company for the Future 10. Japanese Methods, Jean-Pierre Dal Pont. 11. Innovation in Chemical Engineering Industries, Oliver Potier and Mauricio Camargo. 12. The Place of Intensified Processes in the Plant of the Future, Laurent Falk. 13. Change Management, Jean-Pierre Dal Pont. 14. The Plant of the Future, Jean-Pierre Dal Pont.

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## **MASS TRANSFER**

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### **PRINCIPLES AND OPERATIONS**

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*PHI Learning Pvt. Ltd.* This book introduces the fundamental principles of the mass transfer phenomenon and its diverse applications in process industry. It covers the full spectrum of techniques for chemical separations and extraction. Beginning with molecular diffusion in gases, liquids and solids within a single phase, the mechanism of inter-phase mass transfer is explained with the help of several theories. The separation operations are explained comprehensively in two distinct ways—stage-wise contact and continuous differential contact. The primary design requirements of gas-liquid equipment are discussed. The book provides a detailed discussion on all individual gas-liquid, liquid-liquid, solid-gas, and solid-liquid separation processes. The students are also exposed to the underlying principles of the membrane-based separation processes. The book is replete with real applications of separation processes and equipment. Problems are worked out in each chapter. Besides, problems with answers, short questions, multiple choice questions with answers are given at the end of each chapter. The text is intended for a course on mass transfer, transport and separation processes prescribed for the undergraduate and postgraduate students of chemical engineering.

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### **ESSENTIALS OF CHEMICAL REACTION ENGINEERING**

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*Prentice Hall* Today's Definitive, Undergraduate-Level Introduction to Chemical Reaction Engineering Problem-Solving For 30 years, H. Scott Fogler's Elements of Chemical Reaction Engineering has been the #1 selling text for courses in chemical reaction engineering worldwide. Now, in Essentials of Chemical Reaction Engineering, Second Edition, Fogler has distilled this classic into a modern, introductory-level guide specifically for undergraduates. This is the ideal resource for today's students: learners who demand instantaneous access to information and want to enjoy learning as they deepen their critical thinking and creative problem-solving skills. Fogler successfully integrates text, visuals, and computer simulations, and links theory to practice through many relevant examples. This updated second edition covers mole balances, conversion and reactor sizing, rate laws and stoichiometry, isothermal reactor design, rate data collection/analysis, multiple reactions, reaction mechanisms, pathways, bioreactions and bioreactors, catalysis, catalytic reactors, nonisothermal reactor designs, and more. Its multiple improvements include a new discussion of activation energy, molecular simulation, and stochastic modeling, and a significantly revamped chapter on heat effects in chemical reactors. To promote the transfer of key skills to real-life settings, Fogler presents three styles of problems:

Straightforward problems that reinforce the principles of chemical reaction engineering Living Example Problems (LEPs) that allow students to rapidly explore the issues and look for optimal solutions Open-ended problems that encourage students to use inquiry-based learning to practice creative problem-solving skills About the Web Site (umich.edu/~elements/5e/index.html) The companion Web site offers extensive enrichment opportunities and additional content, including Complete PowerPoint slides for lecture notes for chemical reaction engineering classes Links to additional software, including Polymath, MATLAB, Wolfram Mathematica, AspenTech, and COMSOL Multiphysics Interactive learning resources linked to each chapter, including Learning Objectives, Summary Notes, Web Modules, Interactive Computer Games, Computer Simulations and Experiments, Solved Problems, FAQs, and links to LearnChemE Living Example Problems that provide more than 75 interactive simulations, allowing students to explore the examples and ask “what-if ” questions Professional Reference Shelf, containing advanced content on reactors, weighted least squares, experimental planning, laboratory reactors, pharmacokinetics, wire gauze reactors, trickle bed reactors, fluidized bed reactors, CVD boat reactors, detailed explanations of key derivations, and more Problem-solving strategies and insights on creative and critical thinking Register your product at [informit.com/register](http://informit.com/register) for convenient access to downloads, updates, and/or corrections as they become available.

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## **MASS TRANSFER**

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### **FUNDAMENTALS AND APPLICATIONS**

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*Prentice Hall* A thorough introduction to the fundamentals and applications of microscopic and macroscopic mass transfer.

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### **CHEMICAL KINETICS**

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#### **THE STUDY OF REACTION RATES IN SOLUTION**

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*Wiley-VCH Verlag GmbH* Chemical Kinetics The Study of Reaction Rates in Solution Kenneth A. Connors This chemical kinetics book blends physical theory, phenomenology and empiricism to provide a guide to the experimental practice and interpretation of reaction kinetics in solution. It is suitable for courses in chemical kinetics at the graduate and advanced undergraduate levels. This book will appeal to students in physical organic chemistry, physical inorganic chemistry, biophysical chemistry, biochemistry, pharmaceutical chemistry and water chemistry all fields concerned with the rates of chemical reactions in the solution phase.

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### **CHEMICAL REACTOR ANALYSIS AND DESIGN FUNDAMENTALS**

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*Nob Hill Pub, Llc*

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### **FIELD AND WAVE ELECTROMAGNETICS**

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*Pearson Education India*

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### **OPEN-CHANNEL FLOW**

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*Springer Science & Business Media* Open Channel Flow, 2nd edition is written for senior-level undergraduate and graduate courses on steady and unsteady open-channel flow. The book is comprised of two parts: Part I covers steady flow and Part II describes unsteady flow. The second edition features considerable emphasis on the presentation of modern methods for computer analyses; full coverage of unsteady flow; inclusion of typical computer programs; new problem sets and a complete solution manual for instructors.

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### **WATER CHEMISTRY**

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#### **AN INTRODUCTION TO THE CHEMISTRY OF NATURAL AND ENGINEERED AQUATIC SYSTEMS**

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*OUP USA* Secondary audience: the book will serve as a reference source for researchers and other professionals in environmental engineering and all areas of aquatic chemistry.

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## MACHINES AND MECHANISMS

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### APPLIED KINEMATIC ANALYSIS

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*Prentice Hall* This up-to-date introduction to kinematic analysis ensures relevance by using actual machines and mechanisms throughout. **MACHINES & MECHANISMS, 4/e** provides the techniques necessary to study the motion of machines while emphasizing the application of kinematic theories to real-world problems. State-of-the-art techniques and tools are utilized, and analytical techniques are presented without complex mathematics. Reflecting instructor and student feedback, this Fourth Edition's extensive improvements include: a new section introducing special-purpose mechanisms; expanded descriptions of kinematic properties; clearer identification of vector quantities through standard boldface notation; new timing charts; analytical synthesis methods; and more. All end-of-chapter problems have been reviewed, and many new problems have been added.

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### SEPARATION PROCESS ENGINEERING

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#### INCLUDES MASS TRANSFER ANALYSIS

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*Prentice Hall* The Definitive, Fully Updated Guide to Separation Process Engineering-Now with a Thorough Introduction to Mass Transfer Analysis Separation Process Engineering, Third Edition, is the most comprehensive, accessible guide available on modern separation processes and the fundamentals of mass transfer. Phillip C. Wankat teaches each key concept through detailed, realistic examples using real data-including up-to-date simulation practice and new spreadsheet-based exercises. Wankat thoroughly covers each of today's leading approaches, including flash, column, and batch distillation; exact calculations and shortcut methods for multicomponent distillation; staged and packed column design; absorption; stripping; and more. In this edition, he also presents the latest design methods for liquid-liquid extraction. This edition contains the most detailed coverage available of membrane separations and of sorption separations (adsorption, chromatography, and ion exchange). Updated with new techniques and references throughout, Separation Process Engineering, Third Edition, also contains more than 300 new homework problems, each tested in the author's Purdue University classes. Coverage includes Modular, up-to-date process simulation examples and homework problems, based on Aspen Plus and easily adaptable to any simulator Extensive new coverage of mass transfer and diffusion, including both Fickian and Maxwell-Stefan approaches Detailed discussions of liquid-liquid extraction, including McCabe-Thiele, triangle and computer simulation analyses; mixer-settler design; Karr columns; and related mass transfer analyses Thorough introductions to adsorption, chromatography, and ion exchange-designed to prepare students for advanced work in these areas Complete coverage of membrane separations, including gas permeation, reverse osmosis, ultrafiltration, pervaporation, and key applications A full chapter on economics and energy conservation in distillation Excel spreadsheets offering additional practice with problems in distillation, diffusion, mass transfer, and membrane separation

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### HEAT CONDUCTION

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*John Wiley & Sons* The long-awaited revision of the bestseller on heat conduction Heat Conduction, Third Edition is an update of the classic text on heat conduction, replacing some of the coverage of numerical methods with content on micro- and nanoscale heat transfer. With an emphasis on the mathematics and underlying physics, this new edition has considerable depth and analytical rigor, providing a systematic framework for each solution scheme with attention to boundary conditions and energy conservation. Chapter coverage includes: Heat conduction fundamentals Orthogonal functions, boundary value problems, and the Fourier Series The separation of variables in the rectangular coordinate system The separation of variables in the cylindrical coordinate system The separation of variables in the spherical coordinate system Solution of the heat equation for semi-infinite and infinite domains The use of Duhamel's theorem The use of Green's function for solution of heat conduction The use of the Laplace transform One-dimensional composite medium Moving heat source problems Phase-change problems Approximate analytic methods Integral-transform technique Heat conduction in anisotropic solids Introduction to microscale heat conduction In addition, new capstone examples are included in this edition and extensive problems, cases, and examples have been thoroughly updated. A solutions manual is also available. Heat Conduction is appropriate reading for students in mainstream courses of conduction heat transfer, students in mechanical engineering, and engineers in research and design functions throughout industry.

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### TRANSPORT PHENOMENA (2ND ED.)

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*John Wiley & Sons* Market\_Desc: · Chemical, Mechanical, Nuclear, Industrial Engineers Special Features: · Careful attention is paid to the presentation of the basic theory· Enhanced

sections throughout text provide much firmer foundation than the first edition. Literature citations are given throughout for reference to additional material. **About The Book: The long-awaited revision of a classic! This new edition presents a balanced introduction to transport phenomena, which is the foundation of its long-standing success. Topics include mass transport, momentum transport and energy transport, which are presented at three different scales: molecular, microscopic and macroscopic.**

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### **INTRODUCTORY CHEMICAL ENGINEERING THERMODYNAMICS**

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*Prentice Hall* **A Practical, Up-to-Date Introduction to Applied Thermodynamics, Including Coverage of Process Simulation Models and an Introduction to Biological Systems** **Introductory Chemical Engineering Thermodynamics, Second Edition**, helps readers master the fundamentals of applied thermodynamics as practiced today: with extensive development of molecular perspectives that enables adaptation to fields including biological systems, environmental applications, and nanotechnology. This text is distinctive in making molecular perspectives accessible at the introductory level and connecting properties with practical implications. Features of the second edition include Hierarchical instruction with increasing levels of detail: Content requiring deeper levels of theory is clearly delineated in separate sections and chapters Early introduction to the overall perspective of composite systems like distillation columns, reactive processes, and biological systems Learning objectives, problem-solving strategies for energy balances and phase equilibria, chapter summaries, and “important equations” for every chapter Extensive practical examples, especially coverage of non-ideal mixtures, which include water contamination via hydrocarbons, polymer blending/recycling, oxygenated fuels, hydrogen bonding, osmotic pressure, electrolyte solutions, zwitterions and biological molecules, and other contemporary issues Supporting software in formats for both MATLAB® and spreadsheets Online supplemental sections and resources including instructor slides, ConcepTests, coursecast videos, and other useful resources

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### **CHEMICAL AND BIO-PROCESS CONTROL**

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*Addison-Wesley* **Key features: Industrially relevant approach to chemical and bio-process control Fully revised edition with substantial enhancements to the theoretical coverage of the subject Increased number and variety of examples Extensively revised homework problems with degree-of-difficulty rating added Expanded and enhanced chapter on model predictive control Self-assessment questions and problems at the end of most sections with answers listed in the appendix Bio-process control coverage: Background and history of bio-processing and bio-process control added to the introductory chapter Discussion and analysis of the primary bio-sensors used in bio-tech industries added to the chapter on control loop hardware Significant proportion of examples and homework problems in the text deal with bio-processes Section on troubleshooting bio-process control systems included Bio-related process models added to the modeling chapter Supplemental material: Visual basic simulator of process models developed in text Solutions manual Set of PowerPoint lecture slides Collection of process control exams All supplemental material can be found at [www.che.ttu.edu/pcoc/software](http://www.che.ttu.edu/pcoc/software)**