

# Chemical Engineering Lecture Notes

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Co-ordinate Indexing System Used in the Chemical Engineering Group of the CSIR Eleanor Douglas 1967

Principles of Extractive Metallurgy Ahindra Ghosh 1991 The Book Attempts To Present A Comprehensive View Of Extractive Metallurgy, Especially Principles Of Extractive Metallurgy In A Concise Form. This Is The First Book In This Area Which Attempts To Do It. It Has Been Written In Textbook Style. It Presents The Various Concepts Step By Step, Shows Their Importance, Deals With Elementary Quantitative Formulations, And Illustrates Through Quantitative And Qualitative Informations. The Approach Is Such That Even Undergraduate Students Would Be Able To Follow The Topics Without Much Difficulty And Without Much Of A Background In Specialized Subjects. This Is Considered To Be A Very Useful Approach In This Area Of Technology. Moreover The Inter-Disciplinary Nature Of The Subject Has Been Duely Brought Out. While Teaching Concerned Course(S) In The Undergraduate And Postgraduate Level The Authors Felt The Need Of Such A Book. The Authors Found The Books Available On The Subject Did Not Fulfill The Requirements. No Other Book Was Concerned With All Relevant Concepts. Most Of Them Laid Emphasis Either On Thermodynamic Aspects Or On Discussing Unit Processes. Transport Phenomena Are Dealt With In Entirely Different Books. Reactor Concepts Were Again Lying In Chemical Engineering Texts. The Authors Tried To Harmonize And Synthesize The Concepts In Elementary Terms For Metallurgists. The Present Book Contains A Brief Descriptive Summary Of Some Important Metallurgical Unit Processes. Subsequently It Discusses Not Only Physical Chemistry Of Metallurgical Reactions And Processes But Also Rate Phenomena Including Heat And Mass Transfer, Fluid Flow, Mass And Energy Balance, And Elements Of Reactor Engineering. A Variety Of Scientific And Engineering Aspects Of Unit Processes Have Been Discussed With Stress On The Basic Principles All Throughout. There Is An Attempt To Introduce, As Much As Possible, Quantitative Treatments And Engineering Estimates. The Latter May Often Be Approximate From The Point Of View Of Theory But Yields Results That Are Very Valuable To Both Practicing Metallurgists As Well As Others.

Practical Aspects of Chemical Engineering Marek Ochowiak 2018-02-07 This book focuses on Chemical Engineering and Processing, covering interdisciplinary innovation technologies and sciences closely related to chemical engineering, such as computer image analysis, modelling and IT. The book presents interdisciplinary aspects of chemical and biochemical engineering interconnected with process system engineering, process safety and computer science.

Engineering of Chemical Complexity Alexander S. Mikhailov 2013 This review volume, co-edited by Nobel laureate G Ertl, provides a broad overview on current studies in the understanding of design and control of complex chemical systems of various origins, on scales ranging from single molecules and nano-phenomena to macroscopic chemical reactors. Self-organizational behavior and the emergence of coherent collective dynamics in reaction diffusion systems, reactive soft matter and chemical networks are covered. Special attention is paid to the applications in molecular cell biology and to the problems of biological evolution, synthetic biology and design of artificial living cells. Starting with a detailed introduction on the history of research on complex chemical systems, its current state of the art and perspectives, the book comprises 19 chapters that survey the current progress in particular research fields. The reviews, prepared by leading international experts, yield together a fascinating picture of a rapidly developing research discipline that brings chemical engineering to new frontiers.

Differential Evolution In Chemical Engineering: Developments And Applications Gade Pandu Rangaiah 2017-05-29 Optimization plays a key role in the design, planning and operation of chemical and related processes for several decades. Techniques for solving optimization problems are of deterministic or stochastic type. Of these, stochastic techniques can solve any type of optimization problems and can be adapted for multiple objectives. Differential evolution (DE), proposed about two decades ago, is one of the stochastic techniques. Its algorithm is simple to understand and use. DE has found many applications in chemical engineering. This unique compendium focuses on DE, its recent developments and applications in chemical engineering. It will cover both single and multi-objective optimization. The book contains a number of chapters from experienced editors, and also several chapters from active researchers in this area.

Summer School on Modelling of Dynamical Systems Based on Experimental Data with Chemical Engineering Applications A. Pethö 1980

Advances in Chemical Engineering Guy B. Marin 2005-10-24 The theme of the present volume "Multiscale Analysis" has been introduced about a decade ago and is now reaching a stage where a first balance can be made and further research directions should be decided. Contributions have been carefully selected to ensure the reader will not be confronted with quantum mechanics at one side of the spectrum nor with chemical plants or even the environment on the other side. Maintaining a strong connection with reality i.e. experimental data was another selection criterion. Experimental validation remains the corner stone of any theoretical development and very powerful experimental techniques are emerging. Areas covered include discussing in depth an important example of experimental techniques. Coming from the medical world, Magnetic Resonance techniques can now provide even quantitative answers to problems our community is faced with. The modeling issue is discussed further. Finally, the limitations of the classic reactor engineering models are outlined. \* Original reviews \* Leading chemical engineers as authors \* Update on biomaterials use \* Novel subject on use of biomaterials in drug delivery and gene therapy \* Mathematical modeling

30th European Symposium on Computer Aided Chemical Engineering Sauro Pierucci 2020-10-23 30th European Symposium on Computer Aided Chemical Engineering, Volume 47 contains the papers presented at the 30th European Symposium of Computer Aided Process Engineering (ESCAPE) event held in Milan, Italy, May 24-27, 2020. It is a valuable resource for chemical engineers, chemical process engineers, researchers in industry and academia, students, and consultants for chemical industries. Presents findings and discussions from the 30th European Symposium of Computer Aided Process Engineering (ESCAPE) event Offers a valuable resource for chemical engineers, chemical process engineers, researchers in industry and academia, students, and consultants for chemical industries

Industrial Chemistry Henry K. Benson 2015-06-26 Excerpt from Industrial Chemistry: For Engineering Students The purpose of this text is to describe from the standpoint of chemistry, the more common

materials used in the various branches of engineering. Emphasis is accordingly laid upon the occurrence, the mode of manufacture, the properties, and, to a limited extent, the uses of the various materials. The text is an elaboration of the author's lecture notes used during the last eight years in the courses of industrial chemistry for second year engineering students. The compilations of data have been taken from various sources, many of which are indicated in the footnotes. The work presupposes a knowledge of elementary physics and general chemistry. By a selection of suitable subject matter, it is hoped to give the prospective engineer a working knowledge of the chemistry of the materials and processes with which he will deal and the ability necessary to interpret chemical analyses and apply them in the preparation of specifications and in the pursuit of experimental research which now so frequently accompanies the solution of engineering problems. The topics of greatest interest and importance to engineers, such as fuels and combustion, clay products and cement, are treated quite fully; other topics are necessarily dealt with more briefly than in the larger text-books but in all cases the bibliographies at the ends of the chapters will guide the reader who desires to go farther. These bibliographies have been compiled with care and brought closely down to date; it is believed that they will be useful to practicing chemists and engineers as well as to students. About the Publisher Forgotten Books publishes hundreds of thousands of rare and classic books. Find more at [www.forgottenbooks.com](http://www.forgottenbooks.com) This book is a reproduction of an important historical work. Forgotten Books uses state-of-the-art technology to digitally reconstruct the work, preserving the original format whilst repairing imperfections present in the aged copy. In rare cases, an imperfection in the original, such as a blemish or missing page, may be replicated in our edition. We do, however, repair the vast majority of imperfections successfully; any imperfections that remain are intentionally left to preserve the state of such historical works.

Proceedings of the 2nd Energy Security and Chemical Engineering Congress Nasrul Hadi Johari 2022-09-21 This book presents selected articles presented at the 2nd Energy Security and Chemical Engineering Congress (ESChE 2021). This collection of proceedings presents the key challenges and trends related to mechanical as well as materials engineering and technology in setting the stage for promoting the sustainable technological solution for the better world. The book discusses recent explorations and findings with regard to mechanical and materials, specifically the thermal engineering and renewable energy areas that are very relevant toward the establishment of sustainable technological solutions. This book benefits academic researchers and industrial practitioners in the field of renewable energy and material engineering for energy applications.

Physical Chemistry for Chemists and Chemical Engineers Alexander V. Vakhrushev 2018-09-03 This volume is based on different aspects of chemical technology that are associated with research and the development of theories for chemical engineers, helping to bridge the gap between classical analysis and modern, real-life applications. Taking an interdisciplinary approach, the authors present the current state-of-the-art technology in key materials with an emphasis on the rapidly growing technologies.

Energy and Chemical Engineering - Outcomes from the EFCE Energy Section in the 12th European Congress on Chemical Engineering (ECCE12) Francois M. A. Marechal 2021-07-21

Advances in Design, Simulation and Manufacturing III Vitalii Ivanov 2020-06-05 This book explores topics at the interface between mechanical and chemical engineering, with a focus on design, simulation, and manufacturing. Covering recent developments in the mechanics of solids and structures; numerical simulation of coupled problems, including wearing, compression, detonation and collision; and chemical process technologies, including ultrasonic technology, capillary rising process, pneumatic classification, membrane electrolysis and absorption processes, it reports on developments in the field of heat and mass transfer, energy-efficient technologies, and industrial ecology. Part of a two-volume set based on the 3rd International Conference on Design, Simulation, Manufacturing: The Innovation Exchange (DSMIE-2020), held on June 9-12, 2020, in Kharkiv, Ukraine, this book provides academics and professionals with extensive information on the latest trends, technologies and challenges in the field as well as practical lessons learned.

Moving Finite Element Method Maria do Carmo Coimbra 2016-11-30 This book focuses on process simulation in chemical engineering with a numerical algorithm based on the moving finite element method (MFEM). It offers new tools and approaches for modeling and simulating time-dependent problems with moving fronts and with moving boundaries described by time-dependent convection-reaction-diffusion partial differential equations in one or two-dimensional space domains. It provides a comprehensive account of the development of the moving finite element method, describing and analyzing the theoretical and practical aspects of the MFEM for models in 1D, 1D+1d, and 2D space domains. Mathematical models are universal, and the book reviews successful applications of MFEM to solve engineering problems. It covers a broad range of application algorithm to engineering problems, namely on separation and reaction processes presenting and discussing relevant numerical applications of the moving finite element method derived from real-world process simulations.

Lecture Notes on Principles of Plasma Processing Francis F. Chen 2003-01-31 Plasma processing of semiconductors is an interdisciplinary field requiring knowledge of both plasma physics and chemical engineering. The two authors are experts in each of these fields, and their collaboration results in the merging of these fields with a common terminology. Basic plasma concepts are introduced painlessly to those who have studied undergraduate electromagnetics but have had no previous exposure to plasmas. Unnecessarily detailed derivations are omitted; yet the reader is led to understand in some depth those concepts, such as the structure of sheaths, that are important in the design and operation of plasma processing reactors. Physicists not accustomed to low-temperature plasmas are introduced to chemical kinetics, surface science, and molecular spectroscopy. The material has been condensed to suit a nine-week graduate course, but it is sufficient to bring the reader up to date on current problems such as copper interconnects, low-k and high-k dielectrics, and oxide damage. Students will appreciate the web-style layout with ample color illustrations opposite the text, with ample room for notes. This short book is ideal for new workers in the semiconductor industry who want to be brought up to speed with minimum effort. It is also suitable for Chemical Engineering students studying plasma processing of materials; Engineers, physicists, and technicians entering the semiconductor industry who want a quick overview of the use of plasmas in the industry.

Chemical Engineering Education 2002

Advances in Chemical Engineering 1956-01-01 Advances in Chemical Engineering

16th European Symposium on Computer Aided Process Engineering and 9th International Symposium on Process Systems Engineering Wolfgang Marquardt 2006-08-02 This proceedings book contains the papers presented at the joint conference event of the 9th Symposium on Process Systems Engineering (PSE'2006) and the 16th European Symposium on Computer Aided Process Engineering (ESCAPE-16), held in Garmisch-Partenkirchen, Germany, from July 9 – July 13, 2006. The symposium follows the first joint event PSE'97 / ESCAPE-7 in Trondheim, Norway (1997). The last two venues of the ESCAPE symposia were Barcelona, Spain (2005) and Lisbon, Portugal (2004) and the most recent PSE symposia were held in Kunming, China (2003) and Keystone, Colorado, USA (2000). The purpose of both series is to bring together the international community of researchers engineers who are interested in computing-based methods in process engineering. The main objective of the symposium is to review and present the latest developments and current state in Process Systems Engineering and Computer Aided Process Engineering. The focus of PSE'2006 / ESCAPE-16 has been on Modelling and Numerical Methods, Product and Process Design, Operations and Control, Biological Systems, Infrastructure Systems, and Business decision support. \* reviews and presents the latest developments and current state of Process Systems Engineering and Computer Aided Process Engineering \* contains papers presented at a joint conference event \* bringing together an international community of researchers and engineers interested in

computing-based methods in Process Engineering

Stochastic Global Optimization

Elements of Chemical Reaction Engineering H. Scott Fogler 1999 "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.

Chemical Literature and Its Use Marion Emeline Sparks 1921

Coulson and Richardson's Chemical Engineering Sohrab Rohani 2017-08-23 Coulson and Richardson's Chemical Engineering: Volume 3B: Process Control, Fourth Edition, covers reactor design, flow modeling, and gas-liquid and gas-solid reactions and reactors. Converted from textbooks into fully revised reference material Content ranges from foundational through to technical Added emerging applications, numerical methods and computational tools

A Guide to Archives and Manuscript Collections in the History of Chemistry and Chemical Technology George Tselos 1987 A thorough inventory of research resources in American repositories, the Guide lists collections in the history of chemistry and chemical engineering, the chemical and pharmaceutical industries, and a number of related chemical process industries and businesses, from personal and professional papers of chemical scientists and engineers to business records of the chemical process industries.

Lectures in Classical Thermodynamics with an Introduction to Statistical Mechanics Daniel Blankschtein 2021-03-15 This textbook facilitates students' ability to apply fundamental principles and concepts in classical thermodynamics to solve challenging problems relevant to industry and everyday life. It also introduces the reader to the fundamentals of statistical mechanics, including understanding how the microscopic properties of atoms and molecules, and their associated intermolecular interactions, can be accounted for to calculate various average properties of macroscopic systems. The author emphasizes application of the fundamental principles outlined above to the calculation of a variety of thermodynamic properties, to the estimation of conversion efficiencies for work production by heat interactions, and to the solution of practical thermodynamic problems related to the behavior of non-ideal pure fluids and fluid mixtures, including phase equilibria and chemical reaction equilibria. The book contains detailed solutions to many challenging sample problems in classical thermodynamics and statistical mechanics that will help the reader crystallize the material taught. Class-tested and perfected over 30 years of use by nine-time Best Teaching Award recipient Professor Daniel Blankschtein of the Department of Chemical Engineering at MIT, the book is ideal for students of Chemical and Mechanical Engineering, Chemistry, and Materials Science, who will benefit greatly from in-depth discussions and pedagogical explanations of key concepts. Distills critical concepts, methods, and applications from leading full-length textbooks, along with the author's own deep understanding of the material taught, into a concise yet rigorous graduate and advanced undergraduate text; Enriches the standard curriculum with succinct, problem-based learning strategies derived from the content of 50 lectures given over the years in the Department of Chemical Engineering at MIT; Reinforces concepts covered with detailed solutions to illuminating and challenging homework problems.

Chemical Engineering Progress 2005

Introduction to Fusion Power Robert G. Mills 1977

Inleiding chemie en chemische technologie J.A.M. Kuipers 2016

Multi-Objective Optimization

Register Tulane University 1891

Numerical Methods and Modeling for Chemical Engineers Mark E. Davis 2013 "Geared toward advanced undergraduates or graduate students of chemical engineering studying applied mathematics, this text introduces the quantitative treatment of differential equations arising from modeling physical phenomena in chemical engineering. Coverage includes topics such as ODE-IVPs, placing emphasis on numerical methods and modeling implemented in commercial mathematical software available in 1985"--

Multi-objective Optimization: Techniques And Applications In Chemical Engineering (Second Edition) Rangaiah Gade Pandu 2016-12-22 Optimization is now essential in the design, planning and operation of chemical and related processes. Although process optimization for multiple objectives was studied in the 1970s and 1980s, it has attracted active research in the last 15 years, spurred by the new and effective techniques for multi-objective optimization (MOO). To capture this renewed interest, this monograph presents recent research in MOO techniques and applications in chemical engineering. Following a brief introduction and review of MOO applications in chemical engineering since 2000, the book presents selected MOO techniques and many chemical engineering applications in detail. In this second edition, several chapters from the first edition have been updated, one chapter is completely revised and three new chapters have been added. One of the new chapters describes three MS Excel programs useful for MOO of application problems. All the chapters will be of interest to researchers in MOO and/or chemical engineering. Several exercises are included at the end of many chapters, for use by both practicing engineers and students.

Chemical Engineering in the Pharmaceutical Industry, Active Pharmaceutical Ingredients David J. am Ende 2019-04-23 A guide to the development and manufacturing of pharmaceutical products written for professionals in the industry, revised second edition The revised and updated second edition of Chemical Engineering in the Pharmaceutical Industry is a practical book that highlights chemistry and chemical engineering. The book's regulatory quality strategies target the development and manufacturing of pharmaceutically active ingredients of pharmaceutical products. The expanded second edition contains revised content with many new case studies and additional example calculations that are of interest to chemical engineers. The 2nd Edition is divided into two separate books: 1) Active Pharmaceutical Ingredients (API's) and 2) Drug Product Design, Development and Modeling. The active pharmaceutical ingredients book puts the focus on the chemistry, chemical engineering, and unit operations specific to development and manufacturing of the active ingredients of the pharmaceutical product. The drug substance operations section includes information on chemical reactions, mixing, distillations, extractions, crystallizations, filtration, drying, and wet and dry milling. In addition, the book includes many applications of process modeling and modern software tools that are geared toward batch-scale and continuous drug substance pharmaceutical operations. This updated second edition: • Contains 30new chapters or revised chapters specific to API, covering topics including: manufacturing quality by design, computational approaches, continuous manufacturing, crystallization and final form, process safety • Expanded topics of scale-up, continuous processing, applications of thermodynamics and thermodynamic modeling, filtration and drying • Presents updated and expanded example calculations • Includes contributions from noted experts in the field Written for pharmaceutical engineers, chemical engineers, undergraduate and graduate students, and professionals in the field of pharmaceutical sciences and manufacturing, the second edition of Chemical Engineering in the Pharmaceutical Industry focuses on the development and chemical engineering as well as operations specific to the design, formulation, and manufacture of drug substance and products.

MATLAB Applications in Chemical Engineering Chyi-Tsong Chen 2022-05-20 This book addresses the applications of MATLAB® and Simulink in the solution of chemical engineering problems. By classifying the

problems into seven different categories, the author organizes this book as follows: Chapter One - Solution of a System of Linear Equations Chapter Two - Solution of Nonlinear Equations Chapter Three - Interpolation, Differentiation and Integration Chapter Four- Numerical Solution of Ordinary Differential Equations Chapter Five - Numerical solution of Partial Differential Equations Chapter Six - Process Optimization Chapter Seven - Parameter Estimation Each chapter is arranged in four major parts. In the first part, the basic problem patterns that can be solved with MATLAB® are presented. The second part describes how to apply MAT-LAB® commands to solve the formulated problems in the field of chemical engineering. In the third and the fourth parts, exercises and summary of MATLAB® instructions are provided, respectively. The description of the chemical engineering example follows the sequence of problem formulation, model analysis, MATLAB® program design, execution results, and discussion. In this way, learners are first aware of the basic problem patterns and the underlying chemical engineering principles, followed by further familiarizing themselves with the relevant MATLAB® instructions and programming skills. Readers are encouraged to do exercises to practice their problem-solving skills and deepen the fundamental knowledge of chemical engineering and relevant application problems. The table of contents is listed below: Chapter 1: Solution of a System of Linear Equations 1 1.1 Properties of linear equation systems and the relevant MATLAB commands 1 1.2 Chemical engineering examples 10 1.3 Exercises 43 1.4 Summary of the MATLAB commands related to this chapter 48 Chapter 2: Solution of Nonlinear Equations 51 2.1 Relevant MATLAB commands and the Simulink solution interface 51 2.2 Chemical engineering examples 70 2.3 Exercises 103 2.4 Summary of MATLAB commands related to this chapter 122 Chapter 3: Interpolation, Differentiation, and Integration 125 3.1 Interpolation commands in MATLAB 125 3.2 Numerical differentiation 131 3.3 Numerical integration 153 3.4 Chemical engineering examples 157 3.5 Exercises 183 3.6 Summary of the MATLAB commands related to this chapter 195 Chapter 4: Numerical Solution of Ordinary Differential Equations 197 4.1 Initial value problems for ordinary differential equations 197 4.2 Higher-order ordinary differential equations 222 4.3 Stiff differential equations 227 4.4 Differential-algebraic equation system 232 4.5 Boundary-valued ordinary differential equations 236 4.6 Chemical engineering examples 254 4.7 Exercises 285 4.8 Summary of the MATLAB commands related to this chapter 308 Chapter 5: Numerical Solution of Partial Differential Equations 311 5.1 Classifications of PDEs 311 5.2 The MATLAB PDE toolbox 316 5.3 Chemical engineering examples 341 5.4 Exercises 388 5.5 Summary of the MATLAB commands related to this chapter 397 Chapter 6: Process Optimization 399 6.1 The optimization problem and the relevant MATLAB commands 399 6.2 Chemical engineering examples 448 6.3 Exercises 481 6.4 Summary of the MATLAB commands related to this chapter 501 Chapter 7: Parameter Estimation 503 7.1 Parameter estimation using the least-squares method 503 7.2 Chemical engineering examples 517 7.3 Exercises 549 7.4 Summary of the MATLAB commands related to this chapter 560 References 563 Index 569

Drying of Granular Materials Zdzisław Pakowski 1981

Softwarewartung und Reengineering 2013-07-02 In diesem Tagungsband werden Erfahrungen, Lösungen, Konzepte sowie Werkzeuge präsentiert, die den aktuellen Stand auf dem Gebiet der Softwarewartung und des Reengineering in Theorie und Praxis dokumentieren.

Coping with Complexity: Model Reduction and Data Analysis Alexander N. Gorban 2010-10-21 This volume contains the extended version of selected talks given at the international research workshop "Coping with Complexity: Model Reduction and Data Analysis", Ambleside, UK, August 31 – September 4, 2009. The book is deliberately broad in scope and aims at promoting new ideas and methodological perspectives. The topics of the chapters range from theoretical analysis of complex and multiscale mathematical models to applications in e.g., fluid dynamics and chemical kinetics.

End-User Training for Sci-Tech Databases Ellis Mount 2019-12-20 This book, first published in 1990, analyses how to train end-users to search with both natural language and controlled vocabularies in the sciences, describes a planning assessment for implementing end-user searching in a sci-tech organization, examines how the scientists at a major industrial research organization have begun to do more online searching with the encouragement of the information center, and explores the proactive role that medical libraries have taken in training health care professionals to search MEDLINE.

Nuclear Science Abstracts 1958

Project Engineering Primer for Chemical Engineers Sampa Chakrabarti 2022-03-21 This book discusses financial, managerial and engineering aspects associated with project engineering. The book is a text/reference book on courses related to project engineering for undergraduate students of Chemical Engineering programmes. The author has utilized her decade-long professional experience with reputed project consultancy organizations and her academic experience in writing this book. The background of project engineering is described with special emphasis on its interdisciplinary nature. Project management techniques are discussed with the help of worked-out examples. It includes multiple choice questions and information regarding relevant courses in different institutes. The book is useful for undergraduate degree and diploma students as well as for fresh graduate engineering trainees in various process consulting organizations.

Essentials of Chemical Reaction Engineering H. Scott Fogler 2010-11-26 Learn Chemical Reaction Engineering through Reasoning, Not Memorization Essentials of Chemical Reaction Engineering is the complete, modern introduction to chemical reaction engineering for today's undergraduate students. Starting from the strengths of his classic Elements of Chemical Reaction Engineering, Fourth Edition, in this volume H. Scott Fogler added new material and distilled the essentials for undergraduate students. Fogler's unique way of presenting the material helps students gain a deep, intuitive understanding of the field's essentials through reasoning, using a CRE algorithm, not memorization. He especially focuses on important new energy and safety issues, ranging from solar and biomass applications to the avoidance of runaway reactions. Thoroughly classroom tested, this text reflects feedback from hundreds of students at the University of Michigan and other leading universities. It also provides new resources to help students discover how reactors behave in diverse situations--including many realistic, interactive simulations on DVD-ROM. New Coverage Includes \* Greater emphasis on safety: following the recommendations of the\* Chemical Safety Board (CSB), discussion of crucial safety topics, including ammonium nitrate CSTR explosions, case studies of the nitroaniline explosion, and the T2 Laboratories batch reactor runaway\* Solar energy conversions: chemical, thermal, and catalytic water spilling\* Algae production for biomass\* Steady-state nonisothermal reactor design: flow reactors with heat exchange\* Unsteady-state nonisothermal reactor design with case studies of reactor explosions About the DVD-ROM The DVD contains six additional, graduate-level chapters covering catalyst decay, external diffusion effects on heterogeneous reactions, diffusion and reaction, distribution of residence times for reactors, models for non-ideal reactors, and radial and axial temperature variations in tubular reactions. Extensive additional DVD resources include \* Summary notes, Web modules, additional examples, derivations, audio commentary, and self-tests\* Interactive computer games that review and apply important chapter concepts\* Innovative Living Example Problems with Polymath code that can be loaded directly from the DVD so students can play with the solution to get an innate feeling of how reactors operate\* A 15-day trial of Polymath is included, along with a link to the Fogler Polymath site\* A complete, new AspenTech tutorial, and four complete example problems\* Visual Encyclopedia of Equipment, Reactor Lab, and other intuitive tools\* More than 500 PowerPoint slides of lecture notes Additional updates, applications, and information are available at [www.umich.edu/essen](http://www.umich.edu/essen) and [www.essentialsofcre.com](http://www.essentialsofcre.com).