This textbook deals with the fundamental principles of fluid dynamics, heat and mass transfer. The basic equations governing the convective transfer by fluid motion of matter, energy and momentum, and the transfer of the same properties by diffusion of molecular motion, are presented at the outset. These concepts are then applied systematically to the study of fluid dynamics in an engineering context and to the parallel investigation of heat and mass transfer processes. The influence of viscosity and the dominant role of turbulence in fluid motion are emphasised. Individual chapters are concerned with the important subjects of boundary layers, flow in pipes and ducts, gas dynamics, and flow in turbo-machinery and of a liquid with a free surface. Later chapters cover some of the special types of flow and transfer process encountered in chemical engineering applications, including two-phase flow, condensation, evaporation, flow in packed beds and fluidized solids.

An Introduction to Heat Transfer Principles and Calculations is an introductory text to the principles and calculations of heat transfer. The theory underlying heat transfer is described, and the principal results and formulae are presented. Available techniques for obtaining rapid, approximate solutions to complicated problems are also considered. This book is comprised of 12 chapters and begins with a brief account of some of the concepts, methods, nomenclature, and other relevant information about heat transfer. The reader is then introduced to radiation, conduction, convection, and boiling and condensation. Problems involving more than one mode of heat transfer are presented. Some of the factors influencing the selection of heat exchangers are also discussed. The remaining chapters focus on mass transfer and its simultaneous occurrence with heat transfer; the air-water vapor system, with emphasis on humidity and enthalpy as well as wet-bulb temperature, adiabatic saturation temperature, cooling by evaporation, drying, and condensation; and physical properties and other information that must be taken into account before any generalized formula for heat or mass transfer can be applied to a specific problem. This monograph will be of value to mechanical engineers, physicists, and mathematicians.

This book is a comprehensive collection of chemical engineering terms in a single volume. It covers generally all the chemical engineering literature and has distinguished features. The book is a useful reference material for the people both at the schools and the industry. The author's experience of teaching and research over the years has realized a must book of this kind. The terms are written in alphabetical order. Where a term deserves more elaboration, a rather detailed description is provided. The book also contains a number of labeled diagrams which may be helpful in understanding some critical terms.

Process Heat Transfer is a reference on the design and implementation of industrial heat exchangers. It provides the background needed to understand and master the commercial software packages used by professional engineers in the design and analysis of heat exchangers. This book focuses on types of heat exchangers most widely used by industry: shell-and-tube exchangers (including condensers, reboilers and vaporizers), air-cooled heat exchangers and double-pipe (hairpin) exchangers. It provides a substantial introduction to the design of heat exchanger networks using
pinch technology, the most efficient strategy used to achieve optimal recovery of heat in industrial processes. Utilizes leading commercial software. Get expert HTRI Xchanger Suite guidance, tips and tricks previously available via high cost professional training sessions. Details the development of initial configuration for a heat exchanger and how to systematically modify it to obtain an efficient final design. Abundant case studies and rules of thumb, along with copious software examples, provide a complete library of reference designs and heuristics for readers to base their own designs on.

Process Equipment and Plant Design: Principles and Practices takes a holistic approach towards process design in the chemical engineering industry, dealing with the design of individual process equipment and its configuration as a complete functional system. Chapters cover typical heat and mass transfer systems and equipment included in a chemical engineering curriculum, such as heat exchangers, heat exchanger networks, evaporators, distillation, absorption, adsorption, reactors and more. The authors expand on additional topics such as industrial cooling systems, extraction, and topics on process utilities, piping and hydraulics, including instrumentation and safety basics that supplement the equipment design procedure and help to arrive at a complete plant design. The chapters are arranged in sections pertaining to heat and mass transfer processes, reacting systems, plant hydraulics and process vessels, plant auxiliaries, and engineered safety as well as a separate chapter showcasing examples of process design in complete plants. This comprehensive reference bridges the gap between industry and academia, while exploring best practices in design, including relevant theories in process design making this a valuable primer for fresh graduates and professionals working on design projects in the industry.

Serves as a consolidated resource for process and plant design, including process utilities and engineered safety. Bridges the gap between industry and academia by including practices in design and summarizing relevant theories. Presents design solutions as a complete functional system and not merely the design of major equipment. Provides design procedures as pseudo-code/flow-chart, along with practical considerations.

Cutting-edge heat transfer principles and design applications. Apply advanced heat transfer concepts to your chemical, petrochemical, and refining equipment designs using the detailed information contained in this comprehensive volume. Filled with valuable graphs, tables, and charts, Heat Transfer in Process Engineering covers the latest analytical and empirical methods for use with current industry software. Select heat transfer equipment, make better use of design software, calculate heat transfer coefficients, troubleshoot your heat transfer process, and comply with design and construction standards. Heat Transfer in Process Engineering allows you to: Review heat transfer principles with a direct focus on process equipment design. Design, rate, and specify shell and tube, plate, and hairpin heat exchangers. Design, rate, and specify different types of condensers with tube or shellside condensation for pure fluids or multicomponent mixtures. Understand the principles and correlations of boiling heat transfer, with their limits on and applications to different types of reboiler design. Apply correlations for fired heater ratings, for radiant and convective zones, and calculate fuel efficiency. Obtain a set of useful Excel worksheets for process heat transfer calculations.

Master the fundamentals of thermodynamics and learn how to apply these skills in
engineering practice today with Reisel's PRINCIPLES OF ENGINEERING THERMODYNAMICS, 2nd Edition. This edition's informal writing style helps make abstract concepts easier to understand. In addition to mastering fundamental principles and applications, you explore the impact of different system parameters on the performance of devices and processes. For example, you study how changing outlet pressure in a turbine changes the power produced or how the power requirement of a compressor varies with inlet temperature. This unique approach strengthens your understanding of how different components of thermodynamics interrelate, while demonstrating how you will use thermodynamics in your engineering career. You also learn to develop computer-based models of devices, processes and cycles as well as practice using internet-based programs and computer apps to find thermodynamic data, exactly like today's practicing engineers. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

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

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.

This book comprises select papers presented at the International Conference on
Mechanical Engineering Design (ICMechD) 2019. The volume focuses on the
recent trends in design research and their applications across the mechanical
and biomedical domain. The book covers topics like tribology design, mechanism
and machine design, wear and surface engineering, vibration and noise
engineering, biomechanics and biomedical engineering, industrial
thermodynamics, and thermal engineering. Case studies citing practical
challenges and their solutions using appropriate techniques and modern
engineering tools are also discussed. Given its contents, this book will prove
useful to students, researchers as well as practitioners.

Presents comprehensive coverage of both classical and new topics on the
subject. Classical aspects discussed include shell and tube heat exchangers and
condensers. New topics covered include process intergration, heat exchanger
selection and ohmic heating.

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 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.

The fourth edition of Ludwig’s Applied Process Design for Chemical and
Petrochemical Plants, Volume Three is a core reference for chemical, plant, and
process engineers and provides an unrivalled reference on methods, process
fundamentals, and supporting design data. New to this edition are expanded
chapters on heat transfer plus additional chapters focused on the design of shell
and tube heat exchangers, double pipe heat exchangers and air coolers. Heat
tracer requirements for pipelines and heat loss from insulated pipelines are
covered in this new edition, along with batch heating and cooling of process
fluids, process integration, and industrial reactors. The book also looks at the
troubleshooting of process equipment and corrosion and metallurgy. Assists
engineers in rapidly analyzing problems and finding effective design methods and mechanical specifications. Definitive guide to the selection and design of various equipment types, including heat exchanger sizing and compressor sizing, with established design codes. Batch heating and cooling of process fluids supported by Excel programs.

The CRC Handbook of Thermal Engineering, Second Edition, is a fully updated version of this respected reference work, with chapters written by leading experts. Its first part covers basic concepts, equations and principles of thermodynamics, heat transfer, and fluid dynamics. Following that is detailed coverage of major application areas, such as bioengineering, energy-efficient building systems, traditional and renewable energy sources, food processing, and aerospace heat transfer topics. The latest numerical and computational tools, microscale and nanoscale engineering, and new complex-structured materials are also presented. Designed for easy reference, this new edition is a must-have volume for engineers and researchers around the globe.

Convective heat transfer is the result of fluid flowing between objects of different temperatures. Thus it may be the objective of a process (as in refrigeration) or it may be an incidental aspect of other processes. This monograph reviews in a concise and unified manner recent contributions to the principles of convective heat transfer for single- and multi-phase systems: It summarizes the role of the fundamental mechanism, discusses the governing differential equations, describes approximation schemes and phenomenological models, and examines their solutions and applications. After a review of the basic physics and thermodynamics, the book divides the subject into three parts. Part 1 deals with single-medium transfer, specifically with intraphase transfers in single-phase flows and with intramedium transfers in two-phase flows. Part 2 deals with fluid-solid transfer processes, both in cases where the interface is small and in cases where it is large, as well as liquid-liquid transfer processes. Part 3 considers three media, addressing both liquid-solid-solid and gas-liquid-solid systems.

This highly recommended book on transport phenomena shows readers how to develop mathematical representations (models) of physical phenomena. The key elements in model development involve assumptions about the physics, the application of basic physical principles, the exploration of the implications of the resulting model, and the evaluation of the degree to which the model mimics reality. This book also expose readers to the wide range of technologies where their skills may be applied.
System unterworfen ist. Diese Prinzipien ermöglichen es ihm, das Verhalten eines S.

This book covers different aspects of gas injection, from the classic pressure maintenance operation to enhanced oil recovery (EOR), underground gas storage (UGS), and carbon capture and storage (CCS). The authors detail the unique characteristics and specific criteria of each application, including: material balance equations phase behaviour reservoir engineering well design operating aspects surface facilities environmental issues Examples, data, and simulation codes are provided to enable the reader to gain an in-depth understanding of these applications. Fundamentals and Practical Aspects of Gas Injection will be of use to practising engineers in the fields of reservoir engineering, and enhanced oil recovery. It will also be of interest to researchers, academics, and graduate students working in the field of petroleum engineering.

- Describes the fundamentals of heat transfer and its applications in process engineering.
- Includes approximately 600 figures and 50 tables. Provides both worked examples and problems at the end of each chapter.
- Presented in modern nomenclature and units, with extensive references and tabulated data. Process Heat Transfer presents comprehensive coverage of both classical and new topics on the subject. Classical aspects discussed include shell-and-tube heat exchangers, double pipe exchangers, reboilers, and condensers. New topics covered include process integration, heat exchanger selection, heat transfer associated with thermodynamic cycles, and ohmic heating. The book includes both worked examples and problems at the end of each chapter.

Extensive sections on the fundamental principles of heat transfer and fluid flow, in addition to a wealth of material on applied techniques and problems, make Process Heat Transfer an invaluable text and reference for students and professionals in mechanical engineering, chemical engineering, and applied heat transfer.

The First Law of Thermodynamics states that energy can neither be created nor destroyed. Heat exchangers are devices built for efficient heat transfer from one fluid to another. They are widely used in engineering processes and include examples such as intercoolers, preheaters, boilers and condensers in power plants. Heat exchangers are becoming more and more important to manufacturers striving to control energy costs. Process Heat Transfer Rules of Thumb investigates the design and implementation of industrial heat exchangers. It provides the background needed to understand and master the commercial software packages used by professional engineers for design and analysis of heat exchangers. This book focuses on the types of heat exchangers most widely used by industry, namely shell-and-tube exchangers (including condensers, reboilers and vaporizers), air-cooled heat exchangers and double-pipe (hairpin) exchangers. It provides a substantial introduction to the design of heat exchanger networks using pinch technology, the most efficient strategy used to achieve optimal recovery of heat in industrial processes. Utilizes leading commercial
software important to professional engineers designing heat exchangers
Illustrates design procedures using complete step-by-step worked examples
Provides details on how to develop an initial configuration for a heat exchanger
and how to systematically modify it to obtain a final design Abundant example
problems solved manually and with the integration of computer software
This third edition of Applied Process Design for Chemical and Petrochemical
Plants, Volume 3, is completely revised and updated throughout to make this
standard reference more valuable than ever. It has been expanded by more than
200 pages to include the latest technological and process developments in heat
transfer, refrigeration, compression and compression surge drums, and
mechanical drivers. Like other volumes in this classic series, this one
emphasizes how to apply techniques of process design and how to interpret
results into mechanical equipment details. It focuses on the applied aspects of
chemical engineering design to aid the design and/or project engineers in rating
process requirements, specifying for purchasing purposes, and interpreting and
selecting the mechanical equipment needed to satisfy the process functions.
Process chemical engineering and mechanical hydraulics are included in the
design procedures. Includes updated information that allows for efficiency and
accuracy in daily tasks and operations Part of a classic series in the industry
This book presents the basic principles and engineering data governing the process design of
indirect heat transfer fluids and systems. It focuses on the selection of systems based on
common engineering criteria such as reliability and cost, and particularly on energy
conservation and safety.
This book insures the legacy of the original 1950 classic, Process Heat Transfer, by Donald Q.
Kern. This second edition book is divided into three parts: Fundamental Principles; Heat
Exchangers; and Other Heat Transfer Equipment/ Considerations. - Part I provides a series of
chapters concerned with introductory topics that are required when solving heat transfer
problems. This part of the book deals with topics such as steady-state heat conduction,
unsteady-state conduction, forced convection, free convection, and radiation. - Part II is
considered by the authors to be the “meat” of the book – addressing heat transfer equipment
design procedures and applications. In addition to providing a more meaningful treatment of
the various types of heat exchangers, this part also examines the impact of entropy
calculations on exchanger design. - Part III of the book examines other related topics of
interest, including boiling and condensation, refrigeration and cryogenics, boilers, cooling
towers and quenchers, batch and unsteady-state processes, health & safety and the
accompanying topic of risk. An Appendix is also included. What is new in the 2nd edition
Changes that are addressed in the 2nd edition so that Kern’s original work continues to
remain relevant in 21st century process engineering include: - Updated Heat Exchanger
Design - Increased Number of Illustrative Examples - Energy Conservation/ Entropy
Considerations - Environmental Considerations - Health & Safety - Risk Assessment
- Refrigeration and Cryogenics - Inclusion of SI Units
CD-ROM contains: Equations and relations (models) for thermal circuit modeling.
The proposed book will be divided into three parts. The chapters in Part I provide an overview
of certain aspect of process retrofitting. The focus of Part II is on computational techniques for
solving process retrofit problems. Finally, Part III addresses retrofit applications from diverse
process industries. Some chapters in the book are contributed by practitioners whereas others
are from academia. Hence, the book includes both new developments from research and also
practical considerations. Many chapters include examples with realistic data. All these feature make the book useful to industrial engineers, researchers and students.

Heat Transfer Principles and Applications is a welcome change from more encyclopedic volumes exploring heat transfer. This shorter text fully explains the fundamentals of heat transfer, including heat conduction, convection, radiation and heat exchangers. The fundamentals are then applied to a variety of engineering examples, including topics of special and current interest like solar collectors, cooling of electronic equipment, and energy conservation in buildings. The text covers both analytical and numerical solutions to heat transfer problems and makes considerable use of Excel and MATLAB® in the solutions. Each chapter has several example problems and a large, but not overwhelming, number of end-of-chapter problems. A medium-sized text providing a thorough treatment of heat transfer fundamentals Includes both analytical and numerical solutions of heat transfer problems

Extensive use of Excel and Matlab Includes a chapter on mass transfer Includes a unique chapter of multimode problems to enhance the students problem-solving skills. Minimal information is given in the problem statements. Students must determine the relevant modes of heat transfer (conduction, convection, radiation) and, using the earlier chapters, must determine the appropriate solution technique. For example, they must decide whether the problem is steady-state or transient. They must determine the applicable convection coefficients and material properties. They must decide which solution approach (e. g., analytical or numerical) is appropriate

Learn and apply heat and mass transfer principles to real-world chemical engineering problems This hands-on textbook provides a concept-based introduction to heat and mass transfer procedures and lays out the foundation to practical applications in a broad range of fields relevant to chemical and biochemical processing. Written by a recognized academic and experienced author, Heat and Mass Transfer for Chemical Engineers: Principles and Applications contains comprehensive discussions on conductive and diffusive processes and the engineering correlations between momentum, heat, and mass transfer. Readers will get Mathematica workbooks that facilitate calculations and explore trends. The book refers extensively to Perry's Chemical Engineers' Handbook, Ninth Edition for data and correlations. Coverage includes: Introduction to heat and mass transfer Thermal conductivity Steady-state, one-dimensional heat conduction Combined conductive and convective heat transfer Multidimensional and transient heat conduction Convective heat transfer Thermal design of heat exchangers Fick's law and diffusivity One-dimensional, multi-dimensional, and transient diffusion Convective mass transfer Design of packed gas absorption and stripping columns Multicomponent diffusion and coupled mass transfer processes Mass transfer with chemical reaction

Engineering Principles of Unit Operations in Food Processing, volume 1 in the Woodhead Publishing Series, In Unit Operations and Processing Equipment in the Food Industry series, presents basic principles of food engineering with an emphasis on unit operations, such as heat transfer, mass transfer and fluid mechanics. Brings new opportunities in the optimization of food processing operations Thoroughly explores applications of food engineering to food processes Focuses on unit operations from an engineering viewpoint Process Heat TransferPrinciples, Applications and Rules of ThumbAcademic Press

This 1975 book presents the fundamental ideas of fluid flow, viscosity, heat conduction, diffusion, the energy and momentum principles, and the method of dimensional analysis.

This long-awaited second edition of the successful introduction to the fundamentals of heterogeneous catalysis is now completely revised and updated. Written by internationally acclaimed experts, this textbook includes fundamentals of adsorption,
characterizing catalysts and their surfaces, the significance of pore structure and surface area, solid-state and surface chemistry, poisoning, promotion, deactivation and selectivity of catalysts, as well as catalytic process engineering. A final section provides a number of examples and case histories. With its color and numerous graphics plus references to help readers to easily find further reading, this is a pivotal work for an understanding of the principles involved.

Heat exchangers with minichannel and microchannel flow passages are becoming increasingly popular due to their ability to remove large heat fluxes under single-phase and two-phase applications. Heat Transfer and Fluid Flow in Minichannels and Microchannels methodically covers gas, liquid, and electrokinetic flows, as well as flow boiling and condensation, in minichannel and microchannel applications. Examining biomedical applications as well, the book is an ideal reference for anyone involved in the design processes of microchannel flow passages in a heat exchanger. Each chapter is accompanied by a real-life case study New edition of the first book that solely deals with heat and fluid flow in minichannels and microchannels Presents findings that are directly useful to designers; researchers can use the information in developing new models or identifying research needs

This textbook is intended for courses in heat transfer for undergraduates, not only in chemical engineering and related disciplines of biochemical engineering and chemical technology, but also in mechanical engineering and production engineering. The author provides the reader with a very thorough account of the fundamental principles and their applications to engineering practice, including a survey of the recent developments in heat transfer equipment. The three basic modes of heat transfer - conduction, convection and radiation - have been comprehensively analyzed and elucidated by solving a wide range of practical and design-oriented problems. A whole chapter has been devoted to explain the concept of the heat transfer coefficient to give a feel of its importance in tackling problems of convective heat transfer. The use of the important heat transfer correlations has been illustrated with carefully selected examples.

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