

# Engineering Heat And Mass Transfer By Mahesh M Rathore

This textbook presents the classical treatment of the problems of heat transfer in an exhaustive manner with due emphasis on understanding of the physics of the problems. This emphasis is especially visible in the chapters on convective heat transfer. Emphasis is laid on the solution of steady and unsteady two-dimensional heat conduction problems. Another special feature of the book is a chapter on introduction to design of heat exchangers and their illustrative design problems. A simple and understandable treatment of gaseous radiation has been presented. A special chapter on flat plate solar air heater has been incorporated that covers thermo-hydraulic modeling and simulation. The chapter on mass transfer has been written looking specifically at the needs of the students of mechanical engineering. The book includes a large number and variety of solved problems with supporting line diagrams. The author has avoided duplicating similar problems, while incorporating more application-based examples. All the end-of-chapter exercise problems are supplemented with stepwise answers. Primarily designed to serve as a complete textbook for undergraduate and graduate students of mechanical engineering, the book will also be useful for students of chemical, automobile, production, and industrial engineering streams. The book fully covers the topics of heat transfer coursework and can also be used as reference for students preparing for competitive

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graduate examinations.

Heat and Mass Transfer in Drying of Porous Media offers a comprehensive review of heat and mass transfer phenomena and mechanisms in drying of porous materials. It covers pore-scale and macro-scale models, includes various drying technologies, and discusses the drying dynamics of fibrous porous material, colloidal porous media and size-distributed particle system. Providing guidelines for mathematical modeling and design as well as optimization of drying of porous material, this reference offers useful information for researchers and students as well as engineers in drying technology, food processes, applied energy, mechanical, and chemical engineering.

**Key Features:**

- Y New edition in multi-colour with improvised figures
- Y Dual objective method is adopted for both theoretical and practical purpose
- Y Qualitative and quantitative approach to identify between heat and mass transfer
- Y Properly designed experiments to reinforce the teaching of basic principles.

**About the Book:** This text is meant to fill a long felt need for a comprehensive and authoritative book on heat and mass transfer for students of Mechanical/Chemical/Aeronautical/Production/Metallurgical engineering. The dual objective of understanding the physical phenomena involved and the ability to formulate and solve typical problems by an average student has been kept in mind while writing this book. In this text, an effort has been made to identify the similarities in both qualitative and quantitative approach, between heat transfer and mass transfer. This would help in better understanding of the phenomena of mass

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transfer which is generally thought to be a bit difficult to read. The subject matter has been developed from scratch to a sufficiently advanced stage in a logical and coherent manner with neat illustrations along with an adequate number of solved examples. A fairly large number of problems (with answers) at the end of each chapter will be exciting for both the teacher and the student to have brain storming discussion in the class. The book has been appended with a set of selected MCQs along with its key. The role of experimentation in the teaching of heat and mass transfer is well established. Properly designed experiments reinforce the teaching of basic principles more thoroughly. Keeping this in mind, one full chapter comprising 12 typical experiments forms another special feature of this text.

With complete coverage of the basic principles of heat transfer and a broad range of applications in a flexible format, "Heat and Mass Transfer: A Practical Approach" provides the perfect blend of fundamentals and applications. The text provides a highly intuitive and practical understanding of the material by emphasizing the physics and the underlying physical phenomena involved. Key: Text covers the standard topics of heat transfer with an emphasis on physics and real-world every day applications, while de-emphasizing the intimidating heavy mathematical aspects. This approach is designed to take advantage of students' intuition, making the learning process easier and more engaging. Key: The new edition will add helpful web-links for students. Key: 50% of the Homework Problems including

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design, computer, essay, lab-type, and FE problems are new or revised to this edition. Using a reader-friendly approach and a conversational writing style, the book is self-instructive and entertains while it teaches. It shows that highly technical matter can be communicated effectively in a simple yet precise language.

Heat and Mass Transfer in Particulate Suspensions is a critical review of the subject of heat and mass transfer related to particulate Suspensions, which include both fluid-particles and fluid-droplet Suspensions.

Fundamentals, recent advances and industrial applications are examined. The subject of particulate heat and mass transfer is currently driven by two significant applications: energy transformations –primarily combustion – and heat transfer equipment.

The first includes particle and droplet combustion processes in engineering Suspensions as diverse as the Fluidized Bed Reactors (FBR's) and Internal Combustion Engines (ICE's). On the heat transfer side, cooling with nanofluids, which include nanoparticles, has attracted a great deal of attention in the last decade both from the fundamental and the applied side and has produced several scientific publications. A monograph that combines the fundamentals of heat transfer with particulates as well as the modern applications of the subject would be welcomed by both academia and industry.

This book provides a solid foundation in the principles of heat and mass transfer and shows how to solve problems by applying modern methods. The basic theory is developed systematically, exploring in detail the

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solution methods to all important problems. The revised second edition incorporates state-of-the-art findings on heat and mass transfer correlations. The book will be useful not only to upper- and graduate-level students, but also to practicing scientists and engineers. Many worked-out examples and numerous exercises with their solutions will facilitate learning and understanding, and an appendix includes data on key properties of important substances.

This title provides a complete introduction to the physical origins of heat and mass transfer while using problem solving methodology. The systematic approach aims to develop readers confidence in using this tool for thermal analysis.

THE BOOK HEAT AND MASS TRANSFER IS INTENDED FOR ENGINEERING STUDENTS FOR THEIR CURRICULUM AND FOR PRACTICING ENGINEERS

"This comprehensive text on the basics of heat and mass transfer provides a well-balanced treatment of theory and mathematical and empirical methods used for solving a variety of engineering problems. The book helps students develop an intuitive and practical understanding of the processes by emphasizing the underlying physical phenomena involved. Focusing on the requirement to clearly explain the essential fundamentals and impart the art of problem-solving, the text is written to meet the needs of undergraduate students in mechanical engineering, production engineering, industrial engineering, auto-mobile engineering, aeronautical engineering, chemical engineering, and

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biotechnology.

This text allows instructors to teach a course on heat and mass transfer that will equip students with the pragmatic, applied skills required by the modern chemical industry.

This new approach is a combined presentation of heat and mass transfer, maintaining mathematical rigor while keeping mathematical analysis to a minimum. This allows students to develop a strong conceptual understanding, and teaches them how to become proficient in engineering analysis of mass contactors and heat exchangers and the transport theory used as a basis for determining how critical coefficients depend upon physical properties and fluid motions. Students will first study the engineering analysis and design of equipment important in experiments and for the processing of material at the commercial scale. The second part of the book presents the fundamentals of transport phenomena relevant to these applications. A complete teaching package includes a comprehensive instructor's guide, exercises, case studies, and project assignments.

Mass and Heat Transfer Analysis of Mass Contactors and Heat Exchangers Cambridge University Press

The First edition of HEAT AND MASS TRANSFER has been published to serve undergraduate students concerning with this extremely important domain of engineering science. The book is written to gradually build up the concepts and inculcate mathematical abilities in students to solve real life problems in Heat and Mass Transfer analysis. Book has been designed to make it student friendly, interesting and engaging with

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special focus to provide a meaningful, correct and lucid explanation of the underlying concepts. Features:

- Building up stepwise concepts with proper interlinking and apt illustrations.
- Exhaustive and In-depth coverage of subject.
- Plethora of Solved Examples, Multiple Choice Questions and Review Questions.
- Coverage of Competitive and University Exam questions.

Table of Contents: Chapter 1) Introduction to Heat Transfer  
Chapter 2) Fundamentals of Conduction and Governing Equations  
Chapter 3) Unsteady State Conduction  
Chapter 4) Numerical Approach for Solving Heat Conduction Problems  
Chapter 5) Heat Transfer from Extended Surfaces  
Chapter 6) Fundamentals of Convection  
Chapter 7) Heat Transfer by Forced Convection  
Chapter 8) Heat Transfer by Free Convection  
Chapter 9) Boiling and Condensation  
Chapter 10) Heat Exchangers  
Chapter 11) Mass Transfer  
Chapter 12) Thermal Radiations: Process and Properties  
Chapter 13) Radiation Heat Exchange Between Surfaces

CD-ROM contains: the limited academic version of Engineering equation solver(EES) with homework problems.

With complete coverage of the basic principles of heat transfer and a broad range of applications in a flexible format, Heat and Mass Transfer: Fundamentals and Applications, by Yunus Cengel and Afshin Ghajar provides the perfect blend of fundamentals and applications. The text provides a highly intuitive and practical understanding of the material by emphasizing the physics and the underlying physical phenomena

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involved. This text covers the standard topics of heat transfer with an emphasis on physics and real-world every day applications, while de-emphasizing mathematical aspects. This approach is designed to take advantage of students' intuition, making the learning process easier and more engaging. McGraw-Hill Education's Connect, is also available as an optional, add on item. Connect is the only integrated learning system that empowers students by continuously adapting to deliver precisely what they need, when they need it, how they need it, so that class time is more effective. Connect allows the professor to assign homework, quizzes, and tests easily and automatically grades and records the scores of the student's work. Problems are randomized to prevent sharing of answers and may also have a "multi-step solution" which helps move the students' learning along if they experience difficulty.

Completely updated, the seventh edition provides engineers with an in-depth look at the key concepts in the field. It incorporates new discussions on emerging areas of heat transfer, discussing technologies that are related to nanotechnology, biomedical engineering and alternative energy. The example problems are also updated to better show how to apply the material. And as engineers follow the rigorous and systematic problem-solving methodology, they'll gain an appreciation for the richness and beauty of the discipline.

This broad-based book covers the three major areas of Chemical Engineering. Most of the books in the market involve one of the individual areas, namely, Fluid



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Mechanics, Heat Transfer or Mass Transfer, rather than all the three. This book presents this material in a single source. This avoids the user having to refer to a number of books to obtain information. Most published books covering all the three areas in a single source emphasize theory rather than practical issues. This book is written with emphasis on practice with brief theoretical concepts in the form of questions and answers, not adopting stereo-typed question-answer approach practiced in certain books in the market, bridging the two areas of theory and practice with respect to the core areas of chemical engineering. Most parts of the book are easily understandable by those who are not experts in the field. Fluid Mechanics chapters include basics on non-Newtonian systems which, for instance find importance in polymer and food processing, flow through piping, flow measurement, pumps, mixing technology and fluidization and two phase flow. For example it covers types of pumps and valves, membranes and areas of their use, different equipment commonly used in chemical industry and their merits and drawbacks. Heat Transfer chapters cover the basics involved in conduction, convection and radiation, with emphasis on insulation, heat exchangers, evaporators, condensers, reboilers and fired heaters. Design methods, performance, operational issues and maintenance problems are highlighted. Topics such as heat pipes, heat pumps, heat tracing, steam traps, refrigeration, cooling of electronic devices, NO<sub>x</sub> control find place in the book. Mass transfer chapters cover basics such as diffusion, theories, analogies, mass transfer coefficients and mass transfer with chemical

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reaction, equipment such as tray and packed columns, column internals including structural packings, design, operational and installation issues, drums and separators are discussed in good detail. Absorption, distillation, extraction and leaching with applications and design methods, including emerging practices involving Divided Wall and Petluk column arrangements, multicomponent separations, supercritical solvent extraction find place in the book.

Heat and mass transfer is the core science for many industrial processes as well as technical and scientific devices. Automotive, aerospace, power generation (both by conventional and renewable energies), industrial equipment and rotating machinery, materials and chemical processing, and many other industries are requiring heat and mass transfer processes. Since the early studies in the seventeenth and eighteenth centuries, there has been tremendous technical progress and scientific advances in the knowledge of heat and mass transfer, where modeling and simulation developments are increasingly contributing to the current state of the art. Heat and Mass Transfer - Advances in Science and Technology Applications aims at providing researchers and practitioners with a valuable compendium of significant advances in the field.

The rapid growth of literature on convective heat and mass transfer through porous media has brought both engineering and fundamental knowledge to a new state of completeness and depth. Additionally, several new questions of fundamental merit have arisen in several areas which bear direct relation to further advancement

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of basic knowledge and applications in this field. For example, the growth of fundamental heat transfer data and correlations for engineering use for saturated media has now reached the point where the relations for heat transfer coefficients and flow parameters are known well enough for design purposes. Multiple flow field regimes in natural convection have been identified in several important enclosure geometries. New questions have arisen on the nature of equations being used in theoretical studies, i. e. , the Validity of Darcy assumption is being brought into question; Wall effects in high and low velocity flow fields have been found to play a role in predicting transport coefficients; The formulation of transport problems in fractured media are being investigated as both an extension of those in a homogeneous medium and for application in engineering systems in geologic media and problems on saturated media are being addressed to determine their proper formulation and solution. The long standing problem of how to adequately formulate and solve problems of multi-phase heat and mass transfer in heterogeneous media is important in the technologies of chemical reactor engineering and enhanced oil recovery.

Thoroughly up-to-date and packed with real world examples that apply concepts to engineering practice, HEAT AND MASS TRANSFER, 2e, presents the fundamental concepts of heat and mass transfer, demonstrating their complementary nature in engineering applications. Comprehensive, yet more concise than other books for the course, the Second Edition provides a solid introduction to the scientific,

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mathematical, and empirical methods for treating heat and mass transfer phenomena, along with the tools needed to assess and solve a variety of contemporary engineering problems. Practical guidance throughout helps students learn to anticipate the reasonable answers for a particular system or process and understand that there is often more than one way to solve a particular problem. Especially strong coverage of radiation view factors sets the book apart from other texts available for the course, while a new emphasis on renewable energy and energy efficiency prepares students for engineering practice in the 21st century. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

Heat Transfer has been written for undergraduate students in mechanical, nuclear, and chemical engineering programs. The success of Anthony Mill's Basic Heat and Mass Transfer and Heat Transfer continues with two new editions for 1999. The careful ordering of topics in each chapter leads students gradually from introductory concepts to advanced material, eliminating road blocks to developing solid engineering problem-solving skills. Mathematical concepts, from earlier courses, are reviewed on as needed basis refreshing students' memories, and the computational software integrated with the text allows them to obtain reliable numerical results. The integrated coverage of design principles and the wide variety of exercises based on current heat and mass transfer technologies encourages students to think like

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engineers, better preparing them for the engineering workplace.

Heat Transfer XIII: Simulation and Experiments in Heat and Mass Transfer contains the proceedings of the thirteenth conference in the well established series on Simulation and Experiments in Heat Transfer and its applications. Advances in computational methods for solving and understanding heat transfer problems continue to be important because heat transfer topics and related phenomena are commonly of a complex nature and different mechanisms like heat conduction, convection, turbulence, thermal radiation and phase change as well as chemical reactions may occur simultaneously. Typically, applications are found in heat exchangers, gas turbine cooling, turbulent combustion and fires, fuel cells, batteries, micro- and mini- channels, electronics cooling, melting and solidification, chemical processing etc. Heat Transfer might be regarded as an established and mature scientific discipline, but it has played a major role in new emerging areas such as sustainable development and reduction of greenhouse gases as well as for micro- and nano- scale structures and bioengineering. Non-linear phenomena other than momentum transfer may occur due to temperature-dependent thermophysical properties. In engineering design and development, reliable and accurate computational methods are requested to replace or complement expensive and time consuming experimental trial an error work. Tremendous advancements have been achieved during recent years due to improved numerical solution methods for non-

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linear partial differential equations, turbulence modelling advancements and developments of computers and computing algorithms to achieve efficient and rapid simulations. Nevertheless, to further progress in computational methods requires developments in theoretical and predictive procedures – both basic and innovative – and in applied research. Accurate experimental investigations are needed to validate the numerical calculations. Topics covered include: Heat transfer in energy producing devices; Heat transfer enhancements; Heat exchangers; Natural and forced convection and radiation; Multiphase flow heat transfer; Modelling and experiments; Heat recovery; Heat and mass transfer problems; Environmental heat transfer; Experimental and measuring technologies; Thermal convert studies.

Intended as a textbook for undergraduate courses in heat transfer for students of mechanical, chemical, aeronautical, and metallurgical engineering, or as a reference for professionals in industry, this book emphasizes the clear understanding of theoretical concepts followed by practical applications. Treating each subject analytically and then numerically, it provides step-by-step solutions of numerical problems through the use of systematic procedures by a prescribed format. With more than a million users in industry, MATLAB is the most popular computing programming language among engineers. This Second Edition has been updated to include discussions on how to develop programs that solve heat transfer problems using MATLAB, which allows the student to rapidly develop programs that involve complex numerical and engineering heat transfer computations.

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The Third Edition of Basic Heat and Mass Transfer offers complete coverage for introductory engineering courses on heat and mass transfer. Carefully ordered material renders this textbook reader-friendly and accessible to engineering students and instructors. The book includes an extensive introduction to heat exchanger design. Includes over 1,000 exercises and examples plus companion software.

The advent of high-speed computers has encouraged a growing demand for newly graduated engineers to possess the basic skills of computational methods for heat and mass transfer and fluid dynamics. Computational fluid dynamics and heat transfer, as well as finite element codes, are standard tools in the computer-aided design and analysis of processes

Fundamentals of Heat and Mass Transfer is written as a textbook for senior undergraduates in engineering colleges of Indian universities, in the departments of Mechanical, Automobile, Production, Chemical, Nuclear and Aerospace Engineering. The book should also be useful as a reference book for practising engineers for whom thermal calculations and understanding of heat transfer are necessary, for example, in the areas of Thermal Engineering, Metallurgy, Refrigeration and Airconditioning, Insulation etc.

This textbook presents the classical treatment of the problems of heat transfer in an exhaustive manner with due emphasis on understanding of the physics of the problems. This emphasis will be especially visible in the chapters on convective heat transfer. Emphasis is also laid on the solution of steady and unsteady two-dimensional heat conduction problems. Another special feature of the book is a chapter on introduction to design of heat exchangers and their illustrative design problems. A simple and understandable treatment of gaseous radiation has been presented. A special chapter on flat plate solar air heater has been incorporated that covers

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mathematical modeling of the air heater. The chapter on mass transfer has been written looking specifically at the needs of the students of mechanical engineering. The book includes a large number and variety of solved problems with supporting line diagrams. A number of application-based examples have been incorporated where applicable. The end-of-chapter exercise problems are supplemented with stepwise answers. Though the book has been primarily designed to serve as a complete textbook for undergraduate and graduate students of mechanical engineering, it will also be useful for students of chemical, aerospace, automobile, production, and industrial engineering streams. The book fully covers the topics of heat transfer coursework and can also be used as an excellent reference for students preparing for competitive graduate examinations.

With complete coverage of the basic principles of heat transfer and a broad range of applications in a flexible format, *Heat and Mass Transfer: Fundamentals and Applications*, by Yunus Cengel and Afshin Ghajar provides the perfect blend of fundamentals and applications. The text provides a highly intuitive and practical understanding of the material by emphasizing the physics and the underlying physical phenomena involved. This text covers the standard topics of heat transfer with an emphasis on physics and real-world every day applications, while de-emphasizing mathematical aspects. This approach is designed to take advantage of students' intuition, making the learning process easier and more engaging. McGraw-Hill is also proud to offer Connect with the fifth edition of Cengel's *Heat and Mass Transfer: Fundamentals and Applications*. This innovative and powerful new system helps your students learn more efficiently and gives you the ability to assign homework problems simply and easily. Problems are graded automatically, and the results are recorded immediately. Track individual student performance -



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by question, assignment, or in relation to the class overall with detailed grade reports. ConnectPlus provides students with all the advantages of Connect, plus 24/7 access to an eBook. Cengel's Heat and Mass Transfer includes the power of McGraw-Hill's LearnSmart--a proven adaptive learning system that helps students learn faster, study more efficiently, and retain more knowledge through a series of adaptive questions. This innovative study tool pinpoints concepts the student does not understand and maps out a personalized plan for success.

Hydrodynamics, Mass and Heat Transfer in Chemical Engineering contains a concise and systematic exposition of fundamental problems of hydrodynamics, heat and mass transfer, and physicochemical hydrodynamics, which constitute the theoretical basis of chemical engineering in science. Areas covered include: fluid flows; processes of chemical engineering; mass and heat transfer in plane channels, tubes and fluid films; problems of mass and heat transfer; the motion and mass exchange of power-law and viscoplastic fluids through tubes, channels, and films; and the basic concepts and properties of very specific technological media, namely foam systems. Topics are arranged in increasing order of difficulty, with each section beginning with a brief physical and mathematical statement of the problem considered, followed by final results, usually given for the desired variables in the form of final relationships and tables. Building design is increasingly geared towards low energy consumption. Understanding the fundamentals of heat transfer and the behaviour of air and water movements is more important than ever before. Heat and Mass Transfer in Building Services Design provides an essential underpinning knowledge for the technology subjects of space heating, water services, ventilation and air conditioning. This new text:

\*provides core understanding of heat transfer and fluid flow

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from a building services perspective \*complements a range of courses in building services engineering \*underpins and extends the themes of the author's previous books: Heating and Water Services Design in Buildings; Energy Management and Operational Costs in Buildings Heat and Mass Transfer in Building Services Design combines theory with practical application for building services professional and students. It will also be beneficial to technicians and undergraduate students on courses in construction and mechanical engineering.

Most conventional dryers use random heating to dry diverse materials without considering their thermal sensitivity and energy requirements for drying. Eventually, excess energy consumption is necessary to attain a low-quality dried product. Proper heat and mass transfer modelling prior to designing a drying system for selected food materials can overcome these problems. Heat and Mass Transfer Modelling During Drying: Empirical to Multiscale Approaches extensively discusses the issue of predicting energy consumption in terms of heat and mass transfer simulation. A comprehensive mathematical model can help provide proper insight into the underlying transport phenomena within the materials during drying. However, drying of porous materials such as food is one of the most complex problems in the engineering field that is also multiscale in nature. From the modelling perspective, heat and mass transfer phenomena can be predicted using empirical to multiscale modelling. However, multiscale simulation methods can provide a comprehensive understanding of the physics of drying food materials. **KEY FEATURES** Includes a detailed discussion on material properties that are relevant for drying phenomena Presents an in-depth discussion on the underlying physics of drying using conceptual visual content Provides appropriate formulation of mathematical modelling from empirical to

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multiscale approaches Offers numerical solution approaches to mathematical models Presents possible challenges of different modelling strategies and potential solutions The objective of this book is to discuss the implementation of different modelling techniques ranging from empirical to multiscale in order to understand heat and mass transfer phenomena that take place during drying of porous materials including foods, pharmaceutical products, paper, leather materials, and more.

This text provides a complete coverage of the basic principles of heat transfer and a broad range of applications. Heat and Mass Transfer: Fundamentals and Applications by Yunus Çengel and Afshin Ghajar provide the perfect blend of fundamentals and applications. The text provides a highly intuitive and practical understanding of the material by emphasizing the physics and the underlying physical phenomena involved. This text covers the standard topics of heat transfer with an emphasis on physics and real-world every day applications, while de-emphasizing the intimidating mathematical aspects. This approach is designed to take advantage of students' intuition, making the learning process easier and more engaging. This text includes: \* More than 1,000 illustrations with a sensational visual appeal that highlight its key learning features. \* Approximately 2,000 homework problems in design, computer, essay, and laboratory-type problems.

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

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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 Nanofluids for Heat and Mass Transfer: Fundamentals, Sustainable Manufacturing and Applications presents the latest on the performance of nanofluids in heat transfer systems. Dr. Bharat Bhanvase investigates characterization techniques and the various properties of nanofluids to analyze their efficiency and abilities in a variety of settings. The book moves through a presentation of the fundamentals of synthesis and nanofluid characterization to various properties and applications. Aimed at academics and researchers focused on heat transfer in energy and engineering disciplines, this book considers sustainable manufacturing processes within newer energy harvesting technologies to serve as an authoritative and well-rounded reference. Highlights the major elements of nanofluids as an energy harvesting fluid, including their preparation methods, characterization techniques, properties and applications Includes valuable findings and insights from numerical and computational studies Provides nanofluid researchers with

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research inspiration to discover new applications and further develop technologies

Conjugate Heat and Mass Transfer in Heat Mass Exchanger Ducts bridges the gap between fundamentals and recent discoveries, making it a valuable tool for anyone looking to expand their knowledge of heat exchangers. The first book on the market to cover conjugate heat and mass transfer in heat exchangers, author Li-Zhi Zhang goes beyond the basics to cover recent advancements in equipment for energy use and environmental control (such as heat and moisture recovery ventilators, hollow fiber membrane modules for humidification/dehumidification, membrane modules for air purification, desiccant wheels for air dehumidification and energy recovery, and honeycomb desiccant beds for heat and moisture control). Explaining the data behind and the applications of conjugated heat and mass transfer allows for the design, analysis, and optimization of heat and mass exchangers. Combining this recently discovered data into one source makes it an invaluable reference for professionals, academics, and other interested parties. A research-based approach emphasizing numerical methods in heat mass transfer Introduces basic data for exchangers' design (such as friction factors and the Nusselt/Sherwood numbers), methods to solve conjugated problems, the modeling of various heat and mass exchangers, and more The first book to include recently discovered advancements of mass transfer and fluid flow in channels comprised of new materials Includes illustrations to visually depict the book's key concepts

Heat Transfer Engineering: Fundamentals and Techniques reviews the core mechanisms of heat transfer and provides modern methods to solve practical problems encountered by working practitioners, with a particular focus on developing engagement and motivation. The book reviews fundamental

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concepts in conduction, forced convection, free convection, boiling, condensation, heat exchangers and mass transfer succinctly and without unnecessary exposition. Throughout, copious examples drawn from current industrial practice are examined with an emphasis on problem-solving for interest and insight rather than the procedural approaches often adopted in courses. The book contains numerous important solved and unsolved problems, utilizing modern tools and computational sources wherever relevant. A subsection on common issues and recent advances is presented in each chapter, encouraging the reader to explore a greater diversity of problems. Reveals physical solutions alongside their application in practical problems, with an aim of generating interest from reality rather than dry exposition Reviews pertinent, contemporary computational tools, including emerging topics such as machine learning Describes the complexity of modern heat transfer in an engaging and conversational style, greatly adding to the uniqueness and accessibility of the book

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