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KEY=FUNDAMENTALS - PRESTON SAIGE

FUNDAMENTALS OF CRYOGENIC ENGINEERING

PHI Learning Pvt. Ltd. Intended as a text for the undergraduate and postgraduate students of Chemical/Mechanical/Materials Engineering streams, this well-balanced book explains the fundamental principles and the applied aspects of cryogenic engineering. The author, with her vast and varied experience in teaching and allied fields, clearly enunciates the behaviour and various properties of common cryogenic fluids, methods of liquefaction, and separation and applications of cryogenics with thermodynamic analysis for process selection. This profusely illustrated study with clear-cut diagrams and process charts, should serve not only as a textbook for students but also as an excellent reference for researchers and practising engineers on design of cryogenic refrigeration, and liquefaction and separation process plants for various applications. Key Features : Discusses various application areas of cryogenics including cryogenic propellants used in space propulsion systems. Analyzes measurement techniques for temperature, pressure, flow rate, and liquid level, and describes the unique behaviour of cryogenic fluids and materials at cryo-temperatures. Gives numerous solved problems and exercises that lay emphasis on honing the concepts discussed.

Cryogenic Engineering and Technologies

Principles and Applications of Cryogen-Free Systems

CRC Press Cryogen-free cryogenics is leading a revolution in research and industry by its significant advantages over traditional liquid helium systems. This is the first overview for the field, covering the key technologies, conceptual design, fabrication, operation, performance, and applications of these systems. The contents cover important topics such as the operating principles of 4K cryocoolers, enabling technologies (including vibration reduction) for cryogen free systems, the cryogen-free superconducting magnet, and cryogen-free systems that reach mK. It highlights the wide range of applications in materials science, quantum physics, astronomy and space science, medical sciences and etc. Key features: Introduce technologies and practical know-how employed for cryogen-free systems of using 4 K cryocoolers to replace liquid helium; Address state of the arts of cryogen-free superconducting magnets, sub-kelvin refrigeration systems of He-3 sorption cooler, adiabatic demagnetization refrigerator (ADR) and dilution refrigerators (DR). Discuss applications of cryogen-free systems in modern instruments and equipment.

Cryogenic Engineering

Fifty Years of Progress

Springer Science & Business Media This is a benchmark reference work on Cryogenic Engineering which chronicles the major developments in the field. Starting with an historical background, this book reviews the development of data resources now available for cryogenic fields and properties of materials. It presents the latest changes in cryopreservation and the advances over the past 50 years. The book also highlights an exceptional reference listing to provide referral to more details.

Cryogenic Engineering Fundamentals [an Intensive Course for Engineers and Scientists,]

Cryogenic Engineering, Second Edition, Revised and Expanded

CRC Press Details the important cryogenic technology developed at the National Bureau of Standards Cryogenic Engineering Laboratory in Boulder, Colorado, over a 30 year period (1953-1983)--presenting the principles and techniques necessary to solve cryogenic engineering problems. Contains hard-to find archival information no longer readily available elsewhere. Topics include cryogenic fluids, mechanical properties of solids, transport properties of solids, refrigeration and liquefaction, insulation, instrumentation, natural gas processing and liquefied natural gas, and safety with cryogenic systems.

Cryogenic Systems

Oxford University Press on Demand This introduction to the principles of low-temperature engineering emphasizes the design and analysis of cryogenic systems. The new edition includes fresh material on superconductivity, liquid natural gas technology, rectification system design, refrigerators, and instrumentation. SI units are now used throughout the book. Unlike the previous edition, which was designed primarily as a college text, the new edition is written to serve as a professional reference as well, and is particularly useful for mechanical and chemical engineers involved in the design of cryogenic systems. Senior-level and graduate students interested in the fundamentals of cryogenic engineering will find this volume indispensable.

Physics of Cryogenics

An Ultralow Temperature Phenomenon

Elsevier Physics of Cryogenics: An Ultralow Temperature Phenomenon discusses the significant number of advances that have been made during the last few years in a variety of cryocoolers, such as Brayton, Joule-Thomson, Stirling, pulse tube, Gifford-McMahon and magnetic refrigerators. The book reviews various approaches taken to improve reliability, a major driving force for new research areas. The advantages and disadvantages of different cycles are compared, and the latest improvements in each of these cryocoolers is discussed. The book starts with the thermodynamic fundamentals, followed by the definition of cryogenic and the associated science behind low temperature phenomena and properties. This book is an ideal resource for scientists, engineers and graduate and senior undergraduate students who need a better understanding of the science of cryogenics and related thermodynamics. Defines the fundamentals of thermodynamics that are associated with cryogenic processes Provides an overview of the history of the development of cryogenic technology Includes new, low temperature tables written by the author Deals with the application of cryogenics to preserve objects at very low temperature Explains how cryogenic phenomena work for human cell and human body preservations and new medical approaches

Helium Cryogenics

Springer Science & Business Media Twenty five years have elapsed since the original publication of Helium Cryogenics. During this time, a considerable amount of research and development involving helium fluids has been carried out culminating in several large-scale projects. Furthermore, the field has matured through these efforts so that there is now a broad engineering base to assist the development of future projects. Helium Cryogenics, 2nd edition brings these advances in helium cryogenics together in an updated form. As in the original edition, the author's approach is to survey the field of cryogenics with emphasis on helium fluids. This approach is more specialized and fundamental than that contained in other cryogenics books, which treat the associated range of cryogenic fluids. As a result, the level of treatment is more advanced and assumes a certain knowledge of fundamental engineering and physics principles, including some quantum mechanics. The goal throughout the work is to bridge the gap between the physics and engineering aspects of helium fluids to provide a source for engineers and scientists to enhance their usefulness in low-temperature systems. Dr. Van Sciver is a Distinguished Research Professor and John H. Gorrie Professor of Mechanical Engineering at Florida State University. He is also a Program Director at the National High Magnetic Field Laboratory (NHMFL). Dr. Van Sciver joined the FAMU-FSU College of Engineering and the NHMFL in 1991, initiating and teaching a graduate program in magnet and materials engineering and in cryogenic thermal sciences and heat transfer. He also led the NHMFL development efforts of the cryogenic systems for the NHMFL Hybrid and 900 MHz NMR superconducting magnets. Between 1997 and 2003, he served as Director of Magnet Science and Technology at the NHMFL. Dr. Van Sciver is a Fellow of the ASME and the Cryogenic Society of America and American Editor for the journal Cryogenics. He is the 2010 recipient of the Kurt Mendelssohn Award. Prior to joining Florida State University, Dr. Van Sciver was Research Scientist and then Professor of Nuclear Engineering, Engineering Physics and Mechanical Engineering at the University of Wisconsin-Madison from 1976 to 1991. During that time he also served as the Associate Director of the Applied Superconductivity Center. Dr. Van Sciver received his PhD in Low Temperature Physics from the University of Washington-Seattle in 1976. He received his BS degree in Engineering Physics from Lehigh University in 1970. Dr. Van Sciver is author of over 200 publications and patents in low temperature physics, liquid helium technology, cryogenic engineering and magnet technology. The first edition of Helium Cryogenics was

published by Plenum Press (1986). The present work is an update and expansion of that original project.

Fundamental Elements of Applied Superconductivity in Electrical Engineering

John Wiley & Sons Superconducting technology is potentially important as one of the future smart grid technologies. It is a combination of superconductor materials, electrical engineering, cryogenic insulation, cryogenics and cryostats. There has been no specific book fully describing this branch of science and technology in electrical engineering. However, this book includes these areas, and is essential for those majoring in applied superconductivity in electrical engineering. Recently, superconducting technology has made great progress. Many universities and companies are involved in applied superconductivity with the support of government. Over the next five years, departments of electrical engineering in universities and companies will become more involved in this area. This book: • will enable people to directly carry out research on applied superconductivity in electrical engineering • is more comprehensive and practical when compared to other advances • presents a clear introduction to the application of superconductor in electrical engineering and related fundamental technologies • arms readers with the technological aspects of superconductivity required to produce a machine • covers power supplying technologies in superconducting electric apparatus • is well organized and adaptable for students, lecturers, researchers and engineers • lecture slides suitable for lecturers available on the Wiley Companion Website Fundamental Elements of Applied Superconductivity in Electrical Engineering is ideal for academic researchers, graduates and undergraduate students in electrical engineering. It is also an excellent reference work for superconducting device researchers and engineers.

Fundamentals of Natural Gas Processing

CRC Press Fundamentals of Natural Gas Processing explores the natural gas industry from the wellhead to the marketplace. It compiles information from the open literature, meeting proceedings, and experts to accurately depict the state of gas processing technology today and highlight technologies that could become important in the future. This book cov

Cryogenic Fundamentals

Introduction to Spacecraft Thermal Design

Cambridge University Press Develop a fundamental understanding of heat transfer analysis techniques as applied to earth based spacecraft with this practical guide. Written in a tutorial style, this essential text provides a how-to manual tailored for those who wish to understand and develop spacecraft thermal analyses. Providing an overview of basic heat transfer analysis fundamentals such as thermal circuits, limiting resistance, MLI, environmental thermal sources and sinks, as well as contemporary space based thermal technologies, and the distinctions between design considerations inherent to room temperature and cryogenic temperature applications, this is the perfect tool for graduate students, professionals and academic researchers.

Cryogenic Mixed Refrigerant Processes

Springer Science & Business Media Most conventional cryogenic refrigerators and liquefiers operate with pure fluids, the major exception being natural gas liquefiers that use mixed refrigerant processes. The fundamental aspects of mixed refrigerant processes, though very innovative, have not received the due attention in open literature in view of commercial interests. Hundreds of patents exist on different aspects of mixed refrigerant processes. However, it is difficult to piece together the existing information to choose an appropriate process and an optimum composition or a given application. The aim of the book is to teach (a.) the need for refrigerant mixtures, (b.) the type of mixtures that can be used for different refrigeration and liquefaction applications, (c.) the different processes that can be used and (d.) the methods to be adopted for choosing the components of a mixture and their concentration for different applications.

Chemical Engineering Design

Principles, Practice and Economics of Plant and Process Design

Elsevier Chemical Engineering Design, Second Edition, deals with the application of chemical engineering principles to the design of chemical processes and equipment. Revised throughout, this edition has been specifically developed for the U.S. market. It provides the latest US codes and standards, including API, ASME and ISA design codes and ANSI standards. It contains new discussions of conceptual plant design, flowsheet development, and revamp design; extended coverage of capital cost estimation, process costing, and economics; and new chapters on equipment

selection, reactor design, and solids handling processes. A rigorous pedagogy assists learning, with detailed worked examples, end of chapter exercises, plus supporting data, and Excel spreadsheet calculations, plus over 150 Patent References for downloading from the companion website. Extensive instructor resources, including 1170 lecture slides and a fully worked solutions manual are available to adopting instructors. This text is designed for chemical and biochemical engineering students (senior undergraduate year, plus appropriate for capstone design courses where taken, plus graduates) and lecturers/tutors, and professionals in industry (chemical process, biochemical, pharmaceutical, petrochemical sectors). New to this edition: Revised organization into Part I: Process Design, and Part II: Plant Design. The broad themes of Part I are flowsheet development, economic analysis, safety and environmental impact and optimization. Part II contains chapters on equipment design and selection that can be used as supplements to a lecture course or as essential references for students or practicing engineers working on design projects. New discussion of conceptual plant design, flowsheet development and revamp design Significantly increased coverage of capital cost estimation, process costing and economics New chapters on equipment selection, reactor design and solids handling processes New sections on fermentation, adsorption, membrane separations, ion exchange and chromatography Increased coverage of batch processing, food, pharmaceutical and biological processes All equipment chapters in Part II revised and updated with current information Updated throughout for latest US codes and standards, including API, ASME and ISA design codes and ANSI standards Additional worked examples and homework problems The most complete and up to date coverage of equipment selection 108 realistic commercial design projects from diverse industries A rigorous pedagogy assists learning, with detailed worked examples, end of chapter exercises, plus supporting data and Excel spreadsheet calculations plus over 150 Patent References, for downloading from the companion website Extensive instructor resources: 1170 lecture slides plus fully worked solutions manual available to adopting instructors

Low Temperature Electronics

Physics, Devices, Circuits, and Applications

Academic Press Low Temperature Electronics: Physics, Devices, Circuits, and Applications summarizes the recent advances in cryoelectronics starting from the fundamentals in physics and semiconductor devices to electronic systems, hybrid superconductor-semiconductor technologies, photonic devices, cryocoolers and thermal management. Furthermore, this book provides an exploration of the currently available theory, research, and technologies related to cryoelectronics, including treatment of the solid state physical properties of the materials used in these systems. Current applications are found in infrared systems, satellite communications and medical equipment. There are opportunities to expand in newer fields such as wireless and mobile communications, computers, and measurement and scientific equipment. Low temperature operations can offer certain advantages such as higher operational speeds, lower power dissipation, shorter signal transmission times, higher semiconductor and metal thermal conductivities, and improved digital and analog circuit performance. The computer, telecommunication, and cellular phone market is pushing the semiconductor industry towards the development of very aggressive device and integrated circuit fabrication technologies. This is taking these technologies towards the physical miniaturization limit, where quantum effects and fabrication costs are becoming a technological and economical barrier for further development. In view of these limitations, operation of semiconductor devices and circuits at low temperature (cryogenic temperature) is studied in this book. * It is a book intended for a wide audience: students, scientists, technology development engineers, private companies, universities, etc. * It contains information which is for the first time available as an all-in-one source; Interdisciplinary material is arranged and made compatible in this book * It is a must as reference source

Compressors and Modern Process Applications

John Wiley & Sons A modern reference to the principles, operation, and applications of the most important compressor types Thoroughly addressing process-related information and a wider variety of the major compressor types of interest to process plants, Compressors and Modern Process Applications uniquely covers the systematic linkage of fluid processing machinery to the processes they serve. This book is a highly practical resource for professionals responsible for purchasing, servicing, or operating compressors. It describes the main features of over 300 petrochemical and refining schematics and associated process descriptions involving compressors and expanders in modern industry. The organized presentation of this reference covers first the basics of compressors and what they are, and then progresses to important operational and process issues. It then explains the underlying principles, operating modes, selection issues, and major hardware elements for compressors. Topics include double-acting positive displacement compressors, rotary positive displacement compressors, understanding centrifugal process gas compressors, power transmission and advanced bearing technology, centrifugal compressor performance, gas processing and turbo-expander applications, and compressors typically found in petroleum refining and other petrochemical processes. Suitable for plant operation personnel, machinery engineering specialists, process engineers, as well as undergraduate students of this subject, this book's special features include: * Flow schematics of modern process units and processes used in gas transport, gas conditioning, petrochemical manufacture, and petroleum refining * Listings of licensors for each process on the flow schematics * Identification of each process flow schematic of compressors, cryogenic, and hot gas expanders at their respective locations * Important overview of

surge control, estimating compressor performance, applications for air separation and gas processing plants, petroleum refinery issues, and important criteria that govern compressor selection and application. Placing hundreds of associated process flow schematics at the fingertips of professionals and students, author and industry expert Heinz Bloch facilitates comprehension of the workings of various petrochemical, oil refining, and product upgrading processes that are served by compressors.

Handbook of Liquefied Natural Gas

Gulf Professional Publishing Liquefied natural gas (LNG) is a commercially attractive phase of the commodity that facilitates the efficient handling and transportation of natural gas around the world. The LNG industry, using technologies proven over decades of development, continues to expand its markets, diversify its supply chains and increase its share of the global natural gas trade. The Handbook of Liquefied Natural Gas is a timely book as the industry is currently developing new large sources of supply and the technologies have evolved in recent years to enable offshore infrastructure to develop and handle resources in more remote and harsher environments. It is the only book of its kind, covering the many aspects of the LNG supply chain from liquefaction to regasification by addressing the LNG industries' fundamentals and markets, as well as detailed engineering and design principles. A unique, well-documented, and forward-thinking work, this reference book provides an ideal platform for scientists, engineers, and other professionals involved in the LNG industry to gain a better understanding of the key basic and advanced topics relevant to LNG projects in operation and/or in planning and development. Highlights the developments in the natural gas liquefaction industries and the challenges in meeting environmental regulations Provides guidelines in utilizing the full potential of LNG assets Offers advices on LNG plant design and operation based on proven practices and design experience Emphasizes technology selection and innovation with focus on a "fit-for-purpose design Updates code and regulation, safety, and security requirements for LNG applications

Cryogenic Engineering

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The Art of Cryogenics

Low-Temperature Experimental Techniques

Elsevier Cryogenics is the study of low temperature interactions - temperatures well below those existing in the natural universe. The book covers a large spectrum of experimental cases, including basic vacuum techniques, indispensable in cryogenics. Guidance in solving experimental problems and numerous numerical examples are given, as are examples of the applications of cryogenics in such areas as underground detectors and space applications. Updated tables of low-temperature data on materials are also presented, and the book is supplemented with a rich bibliography. Researchers (graduate and above) in the fields of physics, engineering and chemistry with an interest in the technology and applications of low-temperature measurements, will find this book invaluable. Experiments described in technical detail Description of newest cryogenic apparatus Applications in multidisciplinary areas Data on cryogenic properties of new materials Current reference review

Heat Transfer in Aerospace Applications

Academic Press Heat Transfer in Aerospace Applications is the first book to provide an overall description of various heat transfer issues of relevance for aerospace applications. The book contains chapters relating to convection cooling, heat pipes, ablation, heat transfer at high velocity, low pressure and microgravity, aircraft heat exchangers, fuel cells, and cryogenic cooling systems. Chapters specific to low density heat transfer (4) and microgravity heat transfer (9) are newer subjects which have not been previously covered. The book takes a basic engineering approach by including correlations and examples that an engineer needs during the initial phases of vehicle design or to quickly analyze and solve a specific problem. Designed for mechanical, chemical, and aerospace engineers in research institutes, companies, and consulting firms, this book is an invaluable resource for the latest on aerospace heat transfer engineering and research. Provides an overall description of heat transfer issues of relevance for aerospace applications Discusses why thermal problems arise and introduces the various heat transfer modes Helps solve the problem of selecting and calculating the cooling system, the heat exchanger, and heat protection Features a collection of problems in which the methods presented in the book can be used to solve these problems

Cryogenic Heat Transfer

Taylor & Francis Presents applied heat transfer principles in the range of extremely low temperatures. The specific features of heat transfer at cryogenic temperatures, such as variable properties, near critical convection, and Kapitza resistance, are described. This book includes many example problems, in each section, that help to illustrate the applications of the principles presented.

Machining Technology for Composite Materials Principles and Practice

Elsevier Machining processes play an important role in the manufacture of a wide variety of components. While the processes required for metal components are well-established, they cannot always be applied to composite materials, which instead require new and innovative techniques. Machining technology for composite materials provides an extensive overview and analysis of both traditional and non-traditional methods of machining for different composite materials. The traditional methods of turning, drilling and grinding are discussed in part one, which also contains chapters analysing cutting forces, tool wear and surface quality. Part two covers non-traditional methods for machining composite materials, including electrical discharge and laser machining, among others. Finally, part three contains chapters that deal with special topics in machining processes for composite materials, such as cryogenic machining and processes for wood-based composites. With its renowned editor and distinguished team of international contributors, Machining technology for composite materials is an essential reference particularly for process designers and tool and production engineers in the field of composite manufacturing, but also for all those involved in the fabrication and assembly of composite structures, including the aerospace, marine, civil and leisure industry sectors. Provides an extensive overview of machining methods for composite materials Chapters analyse cutting forces, tool wear and surface quality Cryogenic machining and processes for wood based composites are discussed

Fundamentals of Creep in Metals and Alloys

Elsevier * Numerous line drawings with consistent format and units allow easy comparison of the behavior of a very wide range of materials * Transmission electron micrographs provide a direct insight in the basic microstructure of metals deforming at high temperatures * Extensive literature review of over 1000 references provide an excellent reference document, and a very balanced discussion Understanding the strength of materials at a range of temperatures is critically important to a huge number of researchers and practitioners from a wide range of fields and industry sectors including metallurgists, industrial designers, aerospace R&D personnel, and structural engineers. The most up-to date and comprehensive book in the field, Fundamentals of Creep in Metals and Alloys discusses the fundamentals of time-dependent plasticity or creep plasticity in metals, alloys and metallic compounds. This is the first book of its kind that provides broad coverage of a range of materials not just a sub-group such as metallic compounds, superalloys or crystals. As such it presents the most balanced view of creep for all materials scientists. The theory of all of these phenomena are extensively reviewed and analysed in view of an extensive bibliography that includes the most recent publications in the field. All sections of the book have undergone extensive peer review and therefore the reader can be sure they have access to the most up-to-date research, fully interrogated, from the world's leading investigators. · Numerous line drawings with consistent format and units allow easy comparison of the behavior of a very wide range of materials · Transmission electron micrographs provide a direct insight in the basic microstructure of metals deforming at high temperatures · Extensive literature review of over 1000 references provide an excellent reference document, and a very balanced discussion

Cryostat Design

Case Studies, Principles and Engineering

Springer This book enables the reader to learn the fundamental and applied aspects of practical cryostat design by examining previous design choices and resulting cryostat performance. Through a series of extended case studies the book presents an overview of existing cryostat design covering a wide range of cryostat types and applications, including the magnet cryostats that comprise the majority of the Large Hadron Collider at CERN, space-borne cryostats containing sensors operating below 1 K, and large cryogenic liquid storage vessels. It starts with an introductory section on the principles of cryostat design including practical data and equations. This section is followed by a series of case studies on existing cryostats, describing the specific requirements of the cryostat, the challenges involved and the design choices made along with the resulting performance of the cryostat. The cryostat examples used in the studies are chosen to cover a broad range of cryostat applications and the authors of each case are leading experts in the field, most of whom participated in the design of the cryostats being described. The concluding chapter offers an overview of lessons learned and summarises some key hints and tips for practical cryostat design. The book will help the reader to expand their knowledge of many disciplines required for good cryostat design, including the cryogenic properties of materials, heat transfer and thermal insulation, instrumentation, safety, structures and seals.

Industrial Gas Handbook

Gas Separation and Purification

CRC Press Drawing on Frank G. Kerry's more than 60 years of experience as a practicing engineer, the *Industrial Gas Handbook: Gas Separation and Purification* provides from-the-trenches advice that helps practicing engineers master and advance in the field. It offers detailed discussions and up-to-date approaches to process cycles for cryogenic separation of air, adsorption processes for front-end air purification, and related process control and instrumentation. The book uses SI units in accordance with international industry and covers topics such as chronological development, industrial applications, air separation technologies, noble gases, front end purification systems, insulation, non-cryogenic separation, safety, cleaning for oxygen systems, economics, and product liquefaction, storage, and transportation. No other book currently available takes the practical approach of this book – they are either outdated, too theoretical, or narrow in focus. In a clear and effective presentation, *Industrial Gas Handbook: Gas Separation and Purification* covers the principles and applications of industrial gas separation and purification.

Exergy

Energy, Environment and Sustainable Development

Newnes This book deals with exergy and its applications to various energy systems and applications as a potential tool for design, analysis and optimization, and its role in minimizing and/or eliminating environmental impacts and providing sustainable development. In this regard, several key topics ranging from the basics of the thermodynamic concepts to advanced exergy analysis techniques in a wide range of applications are covered as outlined in the contents. Offers comprehensive coverage of exergy and its applications, along with the most up-to-date information in the area with recent developments Connects exergy with three essential areas in terms of energy, environment and sustainable development Provides a number of illustrative examples, practical applications, and case studies Written in an easy-to-follow style, starting from the basics to advanced systems

Mechanics of Microsystems

John Wiley & Sons *Mechanics of Microsystems* Alberto Corigliano, Raffaele Ardito, Claudia Comi, Attilio Frangi, Aldo Ghisi and Stefano Mariani, Politecnico di Milano, Italy A mechanical approach to microsystems, covering fundamental concepts including MEMS design, modelling and reliability *Mechanics of Microsystems* takes a mechanical approach to microsystems and covers fundamental concepts including MEMS design, modelling and reliability. The book examines the mechanical behaviour of microsystems from a 'design for reliability' point of view and includes examples of applications in industry. *Mechanics of Microsystems* is divided into two main parts. The first part recalls basic knowledge related to the microsystems behaviour and offers an overview on microsystems and fundamental design and modelling tools from a mechanical point of view, together with many practical examples of real microsystems. The second part covers the mechanical characterization of materials at the micro-scale and considers the most important reliability issues (fracture, fatigue, stiction, damping phenomena, etc) which are fundamental to fabricate a real working device. Key features: Provides an overview of MEMS, with special focus on mechanical-based Microsystems and reliability issues. Includes examples of applications in industry. Accompanied by a website hosting supplementary material. The book provides essential reading for researchers and practitioners working with MEMS, as well as graduate students in mechanical, materials and electrical engineering.

Carbon Capture

Springer Science & Business Media This book approaches the energy science sub-field carbon capture with an interdisciplinary discussion based upon fundamental chemical concepts ranging from thermodynamics, combustion, kinetics, mass transfer, material properties, and the relationship between the chemistry and process of carbon capture technologies. Energy science itself is a broad field that spans many disciplines -- policy, mathematics, physical chemistry, chemical engineering, geology, materials science and mineralogy -- and the author has selected the material, as well as end-of-chapter problems and policy discussions, that provide the necessary tools to interested students.

Carbon Capture and Storage

Butterworth-Heinemann *Carbon Capture and Storage, Second Edition*, provides a thorough, non-specialist introduction to technologies aimed at reducing greenhouse gas emissions from burning fossil fuels during power generation and other energy-intensive industrial processes, such as steelmaking. Extensively revised and updated, this second edition provides detailed coverage of key carbon dioxide capture methods along with an examination of the most promising techniques for carbon storage. The book opens with an introductory section that provides background regarding the need to reduce greenhouse gas emissions, an overview of carbon capture and storage (CCS) technologies, and a primer

in the fundamentals of power generation. The next chapters focus on key carbon capture technologies, including absorption, adsorption, and membrane-based systems, addressing their applications in both the power and non-power sectors. New for the second edition, a dedicated section on geological storage of carbon dioxide follows, with chapters addressing the relevant features, events, and processes (FEP) associated with this scenario. Non-geological storage methods such as ocean storage and storage in terrestrial ecosystems are the subject of the final group of chapters. A chapter on carbon dioxide transportation is also included. This extensively revised and expanded second edition will be a valuable resource for power plant engineers, chemical engineers, geological engineers, environmental engineers, and industrial engineers seeking a concise, yet authoritative one-volume overview of this field. Researchers, consultants, and policy makers entering this discipline also will benefit from this reference. Provides all-inclusive and authoritative coverage of the major technologies under consideration for carbon capture and storage Presents information in an approachable format, for those with a scientific or engineering background, as well as non-specialists Includes a new Part III dedicated to geological storage of carbon dioxide, covering this topic in much more depth (9 chapters compared to 1 in the first edition) Features revisions and updates to all chapters Includes new sections or expanded content on: chemical looping/calcium looping; life-cycle GHG assessment of CCS technologies; non-power industries (e.g. including pulp/paper alongside ones already covered); carbon negative technologies (e.g. BECCS); gas-fired power plants; biomass and waste co-firing; and hydrate-based capture

Beyond the Blast Furnace

CRC Press This unique book presents an in-depth analysis of all the emerging ironmaking processes, supplementing the conventional blast furnace method. Various processes for producing solid and liquid iron are discussed, including important features such as process outline, techno-economics, and process fundamentals. The present global status of each process is examined, projections for the future are made, and processes are compared. Beyond the Blast Furnace is valuable reading for process developers, because it gives them a complete picture of various process options. Conventional iron- and steelmakers as well as researchers and practitioners working in the area of alternative processes of ironmaking will also benefit from this ready reference. The book is an ideal text for undergraduate and postgraduate students in metallurgy.

Experimental Techniques for Low-Temperature Measurements

Cryostat Design, Material Properties and Superconductor Critical-Current Testing

Oxford University Press Publisher description

Infrared Technology Fundamentals

Routledge This work provides a basic understanding of the physical background and engineering considerations required for the design of IR systems, examining all components and combining them into examples of current surveillance systems. This second edition presents: new coverage of state-of-the-art optical systems, including lightweight mirrors and adaptiv

Matter and Methods at Low Temperatures

Springer Science & Business Media The aim of this book is to provide information about performing experiments at low temperatures, as well as basic facts concerning the low temperature properties of liquid and solid matter. To orient the reader, I begin with chapters on these low temperature properties. The major part of the book is then devoted to refrigeration techniques and to the physics on which they are based. Of equal importance, of course, are the definition and measurement of temperature; hence low temperature thermometry is extensively discussed in subsequent chapters. Finally, I describe a variety of design and construction techniques which have turned out to be useful over the years. The content of the book is based on the three-hour-per-week lecture course which I have given several times at the University of Bayreuth between 1983 and 1991. It should be particularly suited for advanced students whose intended masters (diploma) or Ph.D. subject is experimental condensed matter physics at low temperatures. However, I believe that the book will also be of value to experienced scientists, since it describes several very recent advances in experimental low temperature physics and technology, for example, new developments in nuclear refrigeration and thermometry.

Modern Engineering for Design of Liquid-Propellant

Rocket Engines

AIAA

Thermal Design and Optimization

John Wiley & Sons A comprehensive and rigorous introduction to thermal system design from a contemporary perspective **Thermal Design and Optimization** offers readers a lucid introduction to the latest methodologies for the design of thermal systems and emphasizes engineering economics, system simulation, and optimization methods. The methods of exergy analysis, entropy generation minimization, and thermoeconomics are incorporated in an evolutionary manner. This book is one of the few sources available that addresses the recommendations of the Accreditation Board for Engineering and Technology for new courses in design engineering. Intended for classroom use as well as self-study, the text provides a review of fundamental concepts, extensive reference lists, end-of-chapter problem sets, helpful appendices, and a comprehensive case study that is followed throughout the text. Contents include: * Introduction to Thermal System Design * Thermodynamics, Modeling, and Design Analysis * Exergy Analysis * Heat Transfer, Modeling, and Design Analysis * Applications with Heat and Fluid Flow * Applications with Thermodynamics and Heat and Fluid Flow * Economic Analysis * Thermoeconomic Analysis and Evaluation * Thermoeconomic Optimization **Thermal Design and Optimization** offers engineering students, practicing engineers, and technical managers a comprehensive and rigorous introduction to thermal system design and optimization from a distinctly contemporary perspective. Unlike traditional books that are largely oriented toward design analysis and components, this forward-thinking book aligns itself with an increasing number of active designers who believe that more effective, system-oriented design methods are needed. **Thermal Design and Optimization** offers a lucid presentation of thermodynamics, heat transfer, and fluid mechanics as they are applied to the design of thermal systems. This book broadens the scope of engineering design by placing a strong emphasis on engineering economics, system simulation, and optimization techniques. Opening with a concise review of fundamentals, it develops design methods within a framework of industrial applications that gradually increase in complexity. These applications include, among others, power generation by large and small systems, and cryogenic systems for the manufacturing, chemical, and food processing industries. This unique book draws on the best contemporary thinking about design and design methodology, including discussions of concurrent design and quality function deployment. Recent developments based on the second law of thermodynamics are also included, especially the use of exergy analysis, entropy generation minimization, and thermoeconomics. To demonstrate the application of important design principles introduced, a single case study involving the design of a cogeneration system is followed throughout the book. In addition, **Thermal Design and Optimization** is one of the best new sources available for meeting the recommendations of the Accreditation Board for Engineering and Technology for more design emphasis in engineering curricula. Supported by extensive reference lists, end-of-chapter problem sets, and helpful appendices, this is a superb text for both the classroom and self-study, and for use in industrial design, development, and research. A detailed solutions manual is available from the publisher.

Tribology of Ceramics and Composites

A Materials Science Perspective

John Wiley & Sons This book helps students and practicing scientists alike understand that a comprehensive knowledge about the friction and wear properties of advanced materials is essential to further design and development of new materials. With important introductory chapters on the fundamentals, processing, and applications of tribology, the book then examines in detail the nature and properties of materials, the friction and wear of structural ceramics, bioceramics, biocomposites, and nanoceramics, as well as lightweight composites and the friction and wear of ceramics in a cryogenic environment.

Fundamentals of Renewable Energy Processes

Academic Press We are hearing a LOT about renewable energy these days! But unlike most available resources on alternative energy that focus on politics and economic impacts, da Rosa's practical guide, **Fundamentals of Renewable Energy Processes**, is dedicated to explaining the scientific and technological principles and processes that enable energy production from safe, renewable, clean sources. Advances in the renewable energy sphere are proceeding with an unprecedented speed, and in order for the world's alarming energy challenges to be solved, solid, up-to-date resources addressing the technical aspects of renewables are essential. This new, updated 2e of da Rosa's successful book continues to give readers all the background they need to gain a thorough understanding of the most popular types of renewable energy—hydrogen, solar power, biomass, wind power, and hydropower—from the ground up. The latest advances in all these technologies are given particular attention, and are carefully contextualized to help professionals and students grasp the "whys and hows" behind these breakthroughs. Discusses how and why the most popular renewable energy sources work, including wind, solar, bio and hydrogen Provides a thorough technical grounding for all professionals and students investigating renewable energy The new 2e of a highly regarded guide written by an internationally renowned pioneer

Fundamentals of Chemical Reaction Engineering

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

Solutions Manual to Accompany Fundamentals of Engineering Thermodynamics

The Engineer's Guide to Plant Layout and Piping Design for the Oil and Gas Industries

Gulf Professional Publishing The Engineer's Guide to Plant Layout and Piping Design for the Oil and Gas Industries gives pipeline engineers and plant managers a critical real-world reference to design, manage, and implement safe and effective plants and piping systems for today's operations. This book fills a training void with complete and practical understanding of the requirements and procedures for producing a safe, economical, operable and maintainable process facility. Easy to understand for the novice, this guide includes critical standards, newer designs, practical checklists and rules of thumb. Due to a lack of structured training in academic and technical institutions, engineers and pipe designers today may understand various computer software programs but lack the fundamental understanding and implementation of how to lay out process plants and run piping correctly in the oil and gas industry. Starting with basic terms, codes and basis for selection, the book focuses on each piece of equipment, such as pumps, towers, underground piping, pipe sizes and supports, then goes on to cover piping stress analysis and the daily needed calculations to use on the job. Delivers a practical guide to pipe supports, structures and hangers available in one go-to source Includes information on stress analysis basics, quick checks, pipe sizing and pressure drop Ensures compliance with the latest piping and plant layout codes and complies with worldwide risk management legislation and HSE Focuses on each piece of equipment, such as pumps, towers, underground piping, pipe sizes and supports Covers piping stress analysis and the daily needed calculations to use on the job