

Engineering Science N4 By G Oliver

This multivolume work covers all aspects of membrane science and technology - from basic phenomena to the most advanced applications and future perspectives. Modern membrane engineering is critical to the development of process-intensification strategies and to the stimulation of industrial growth. The work presents researchers and industrial managers with an indispensable tool toward achieving these aims. Covers membrane science theory and economics, as well as applications ranging from chemical purification and natural gas enrichment to potable water. Includes contributions and case studies from internationally recognized experts and from up-and-coming researchers working in this multi-billion dollar field. Takes a unique, multidisciplinary approach that stimulates research in hybrid technologies for current (and future) life-saving applications (artificial organs, drug delivery).

Surface Science of Photocatalysis, Volume 32, summarizes significant findings on the surface science behind various classic and novel photocatalysts for energy and environmental applications, with special emphasis on important surface/interface processes in photocatalysis, such as interfacial charge transfer, function of co-catalysts, and adsorption over photocatalyst surface. This book timely and systematically reviews the state-of-the-art of the surface science in semiconductor-based photocatalysis, serving as a useful reference book for both new and experienced researchers in this field. Provides timely reviews on cutting-edge research on surface science and photocatalysts. Comprehensively discusses novel photocatalysts, such as metal oxides, metal sulphides, graphitic carbon nitrides, graphene and metal-organics. Presents important surface/interface processes in photocatalysis, like Z-scheme system and surface heterojunctions. Investigates the function of co-catalysts and the adsorption on photocatalyst surfaces. Edited by world-leading researchers in interface science. Engineering Science, Second Edition provides a comprehensive discussion of the fundamental concepts in engineering. The book is comprised of 16 chapters that provide the theories and applications of different engineering concepts. The coverage of the text includes statics (equilibrium and structures), dynamics (motions and vibrations), and energy and thermal systems. The book also discusses electrical circuits, including direct and alternating current circuits, and electric and magnetic fields, including electromagnetism. The text will be useful to students of the various branches of engineering, such as mechanical, electrical, and civil.

Materials Science in Photocatalysis provides a complete overview of the different semiconductor materials, from titania to third-generation photocatalysts, examining the increasing complexity and novelty of the materials science in photocatalytic materials. The book describes the most recommended synthesis procedure for each of them and the suitable characterization techniques for determining the optical, structural, morphological, and physical-chemical

properties. The most suitable applications of the photocatalysts are described in detail, as well as their environmental applications for wastewater treatment, gaseous effluents depollution, water splitting, CO₂ fixation, selective organic synthesis, coupling reactions, and other selective transformations under both UV light and visible-light irradiation. This book offers a useful reference for a wide audience from students studying chemical engineering and materials chemistry to experienced researchers working on chemical engineering, materials science, materials engineering, environment engineering, nanotechnology, and green chemistry.

- Includes a complete overview of the different semiconductor materials used as photocatalysts
- Describes methods of preparation and characterization of photocatalysts and their applications
- Examines new possibilities to prepare effective photocatalysts

Nanostructured, Functional, and Flexible Materials for Energy Conversion and Storage Systems gathers and reviews developments within the field of nanostructured functional materials towards energy conversion and storage. Contributions from leading research groups involved in interdisciplinary research in the fields of chemistry, physics and materials science and engineering are presented. Chapters dealing with the development of nanostructured materials for energy conversion processes, including oxygen reduction, methanol oxidation, oxygen evolution, hydrogen evolution, formic acid oxidation and solar cells are discussed. The work concludes with a look at the application of nanostructured functional materials in energy storage system, such as supercapacitors and batteries. With its distinguished international team of expert contributors, this book will be an indispensable tool for anyone involved in the field of energy conversion and storage, including materials engineers, scientists and academics. Covers the importance of energy conversion and storage systems and the application of nanostructured functional materials toward energy-relevant catalytic processes. Discusses the basic principles involved in energy conversion and storage systems. Presents the role of nanostructured functional materials in the current scenario of energy-related research and development.

This book constitutes the thoroughly refereed post-conference proceedings of the 29th International Symposium on Logic-Based Program Synthesis and Transformation, LOPSTR 2019, held in Porto, Portugal, in October 2019. The 15 revised full papers were carefully reviewed and selected from 32 submissions. In addition to the 15 papers, this volume includes 2 invited papers. The symposium covers all aspects of logic-based program development, stages of the software life cycle, and issues of both programming-in-the-small and programming-in-the-large. This year LOPSTR extends its traditional topics to include also logic-based program development based on integration of sub-symbolic and symbolic models, on machine learning techniques and on differential semantics. The papers are grouped into the following topics: static analysis, program synthesis, constraints and unification, debugging and verification, and program transformation.

Systems engineering (SE) is experiencing a significant expansion that encompasses increasingly complex systems. However, a common body of knowledge on how to apply complex systems engineering (CSE) has yet to be developed. A combination of people and other autonomous agents, crossing organization boundaries and continually

changing, these hybrid systems are less predictable while being more self-organizing and adaptive than traditional systems. The growing pains of this evolution and the ever-widening reach of SE technology require an effective foundation for integrating traditional and complex engineering methods, addressing machine and human interaction, as well as scaling up and down, from nano scale to the macro system-of-systems level. Model-oriented Systems Engineering Science: A Unifying Framework for Traditional and Complex Systems addresses solutions to that expansion and integration problem. This text takes advantage of better-understood systems science (SS) to support the transition, identifying and using commonalities between complex systems and other sciences, such as biology, sociology, cognitive science, organizational theory, and computational science. The author defines Model-oriented Systems Engineering Science (MOSES), an organized system that selects appropriate information from these disciplines and unifies it into a coherent framework. The result is a seamless approach to the class of systems across the extended scope of the new SE—a foundation upon which to develop an enhanced and unified SE. Modeling orientation (MO) provides a common perspective on the entire SES/SE enterprise, including all supporting sciences, engineering for the full range of traditional, complex, and hybrid systems, and their management. This book extends existing modeling approaches into an MO that views all science artifacts and engineering artifacts as models of systems. It organizes them into a virtual structured repository called the "SE model space"—effectively a container for the accumulating body of SE and SES knowledge in the form of models and patterns. By organizing and integrating all these elements into a common framework, the author makes the material not only easily accessible but also immediately applicable, and provides a well-grounded basis for future growth and evolution of the SE discipline.

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Composite materials are formed when the combination of separate materials acquire new properties distinct from its components. They have a range of applications in fields such as mechanical and electrical engineering, food science and biomedicine and represent a fast-growing area of research. Composite Materials: Applications in Engineering, Biomedicine and Food Science provides an overview of current technologies and applications related to composite materials in these fields. Organized by discipline, the text encompasses a wide variety of composite materials, including polymer, ceramic, biomaterial, hydroxyapatite, nanofiber and green composites. Early chapters detail the enhanced mechanical, magnetic, dielectric properties of electrical and thermal conductive composite materials, which are essential in daily science. Subsequent chapters focus on filler or reinforcement materials, including carbon materials, hybrid materials and nanomaterials. Particular emphasis is placed on nanocomposite materials, as these have increasingly diverse field applications. Various manufacturing methods, such as the synthesis method and top-down/bottom-up manufacturing, are also discussed. Coverage of the recent progress, challenges and opportunities surrounding composite materials make this text a one-stop reference for engineers, scientists and researchers working in this exciting field.

Ten week journey to Engineering ScienceA Ten Week Course in Engineering Sciencebasic engineering science n4Pearson South AfricaA Ten Week Course in Engineering Science N4New SyllabusEngineering Science N4Pearson South AfricaN4 Engineering ScienceEngineering ScienceSolutions for Mathematics N4 and Engineering Science N4Engineering ScienceEngineering Science N4New SyllabusA Ten Week Course in Engineering ScienceEngineering ScienceEngineering ScienceN4, Student's BookSANBSouth African National BibliographyN4 Engineering ScienceSouth African national bibliography Offers an Interdisciplinary approach to the engineering of functional materials for efficient solar cell technology Written by a collection of experts in the field of solar cell technology, this book focuses on the engineering of a variety of functional materials for improving photoanode efficiency of dye-sensitized solar cells (DSSC). The first two chapters describe operation principles of DSSC, charge transfer dynamics, as well as challenges and solutions for improving DSSCs. The remaining chapters focus on interfacial engineering of functional materials at the photoanode surface to create greater output efficiency. Interfacial Engineering in Functional Materials for Dye-Sensitized Solar Cells begins by introducing readers to the history, configuration, components, and working principles of DSSC It then goes on to cover both nanoarchitectures and light scattering materials as photoanode. Function of compact (blocking) layer in the photoanode and of $TiCl_4$ post-treatment in the photoanode are examined at next. Next two chapters look at photoanode function of doped semiconductors and binary semiconductor metal oxides. Other chapters consider nanocomposites, namely, plasmonic nanocomposites, carbon nanotube based nanocomposites, graphene based nanocomposites, and graphite carbon nitride based nanocompositesas photoanodes. The book: Provides comprehensive coverage of the fundamentals through the applications of DSSC Encompasses topics on various functional materials for DSSC technology Focuses on the novel design and application of materials in DSSC, to develop more efficient renewable energy sources Is useful for material scientists, engineers, physicists, and chemists interested in functional materials for the design of efficient solar cells Interfacial Engineering in Functional Materials for Dye-Sensitized Solar Cells will be of great benefit to graduate students, researchers and engineers, who work in the multi-disciplinary areas of material science, engineering, physics, and chemistry.

Fatigue failures occur in aerospace,marine,nuclear structures and automobile components from initiation and propagation of cracks from holes,scratches or defects in the material. To design against these failures, crack propagation life and fracture strength need to be accurately predicted. It is reported in the literature, that these failures often initiate as surface cracks, corner cracks and cracks emanating from fastner holes. Such cracks are with elliptic or nearly elliptic in shapes. The deviation from elliptic shape is due to varying constraint effect along the crack front. Even in situations, when the cracks are through the thickness of the material, there would be thicknesswise variation of constraint

effects leading to three dimensional nature of crack growth. Accurate predictions of the crack growth in these cases by numerical methods can be made only by solving three-dimensional boundary value problems. Empirical relationships have been developed [1] based on Linear Elastic Fracture Mechanics over years describing fatigue crack growth response. Some of these empirical relationships required modifications in the later stages, to meet the design applications. The Crack closure phenomenon discovered by Elber[2, 3] during the crack growth phase is mainly attributed to the local material yielding near the crack tip and the consequent residual plastic wake behind the crack tip. It helped considerably in understanding several aspects of fatigue crack growth and rewrite these relations.

New tables in this edition cover lasers, radiation, cryogenics, ultra-sonics, semi-conductors, high-vacuum techniques, eutectic alloys, and organic and inorganic surface coating. Another major addition is expansion of the sections on engineering materials and compos-ites, with detailed indexing by name, class and usage. The special Index of Properties allows ready comparisons with respect to single property, whether physical, chemical, electrical, radiant, mechani-cal, or thermal. The user of this book is assisted by a comprehensive index, by cross references and by numerically keyed subject headings at the top of each page. Each table is self-explanatory, with units, abbreviations, and symbols clearly defined and tabular material subdivided for easy reading.

Offering coverage of all features of compoiste materials and concepts of compoiste technology, this book elucidates the subject well.

In this book, the authors discuss some of the main challenges and new opportunities in science and engineering research, which involve combining computational and experimental approaches as a promising strategy for arriving at new insights into composition–structure–property relations, even at the nanoscale. From a practical standpoint, the authors show that significant improvements in the material/biomolecular foresight by design, including a fundamental understanding of their physical and chemical properties, are vital and will undoubtedly help us to reach a new technological level in the future.

This book provides a systematic approach to realizing NiTi shape memory alloy actuation, and is aimed at science and engineering students who would like to develop a better understanding of the behaviors of SMAs, and learn to design, simulate, control, and fabricate these actuators in a systematic approach. Several innovative biomedical applications of SMAs are discussed. These include orthopedic, rehabilitation, assistive, cardiovascular, and surgery devices and tools. To this end unique actuation mechanisms are discussed. These include antagonistic bi-stable shape memory-superelastic actuation, shape memory spring actuation, and multi axial tension-torsion actuation. These actuation mechanisms open new possibilities for creating adaptive structures and biomedical devices by using SMAs.

Uniquely comprehensive and up to date, this book covers terrestrial as well as extraterrestrial drilling and excavation, combining the technology of drilling with the state of the art in robotics. The authors come from industry and top ranking public and corporate research institutions and provide here real-life examples, problems, solutions

and case studies, backed by color photographs throughout. The result is a must-have for oil companies and all scientists involved in planetary research with robotic probes. With a foreword by Harrison "Jack" Schmitt -- the first geologist to drill on the moon. This updated and revised first-course textbook in applied probability provides a contemporary and lively post-calculus introduction to the subject of probability. The exposition reflects a desirable balance between fundamental theory and many applications involving a broad range of real problem scenarios. It is intended to appeal to a wide audience, including mathematics and statistics majors, prospective engineers and scientists, and those business and social science majors interested in the quantitative aspects of their disciplines. The textbook contains enough material for a year-long course, though many instructors will use it for a single term (one semester or one quarter). As such, three course syllabi with expanded course outlines are now available for download on the book's page on the Springer website. A one-term course would cover material in the core chapters (1-4), supplemented by selections from one or more of the remaining chapters on statistical inference (Ch. 5), Markov chains (Ch. 6), stochastic processes (Ch. 7), and signal processing (Ch. 8—available exclusively online and specifically designed for electrical and computer engineers, making the book suitable for a one-term class on random signals and noise). For a year-long course, core chapters (1-4) are accessible to those who have taken a year of univariate differential and integral calculus; matrix algebra, multivariate calculus, and engineering mathematics are needed for the latter, more advanced chapters. At the heart of the textbook's pedagogy are 1,100 applied exercises, ranging from straightforward to reasonably challenging, roughly 700 exercises in the first four "core" chapters alone—a self-contained textbook of problems introducing basic theoretical knowledge necessary for solving problems and illustrating how to solve the problems at hand – in R and MATLAB, including code so that students can create simulations. New to this edition • Updated and re-worked Recommended Coverage for instructors, detailing which courses should use the textbook and how to utilize different sections for various objectives and time constraints • Extended and revised instructions and solutions to problem sets • Overhaul of Section 7.7 on continuous-time Markov chains • Supplementary materials include three sample syllabi and updated solutions manuals for both instructors and students

Composed of selected research papers, this book brings together new developments and processes for managing complexity. The included works originate from renowned complexity thinkers, well established practitioners and new researchers in the area of complexity and detail issues of common interest.

Metal-free carbons have recently shown great efficiency in several catalytic processes, including oxidative dehydrogenation (ODH) of ethylbenzene and alkenes, hydrogen evolution, liquid Brønsted and Lewis acid catalysis and electrochemical reactions. The catalytic activities of carbon materials are intimately related to their defects, structures, and surface chemistry. In particular, nitrogen functionalized carbons present different surface functional groups, and they can be used as multifunctional catalysts, either through their electronic or nucleophilic properties, or their ability to form additional H bonds with substrates. This book provides an overview of the preparation, characterization and application of metal-free functionalized carbons, including carbon nanotubes, graphene, carbon nitride and covalent organic frameworks (COFs). It is

ideal for researchers and industrialists working in catalysis, gas sensing and carbon dioxide storage.

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