FREE ANALYSIS AND DESIGN OF BIOLOGICAL MATERIALS AND STRUCTURES ADVANCED STRUCTURED MATERIALS

Analysis and Design of Biological Materials and Structures

This collection provides researchers and scientists with advanced analyses and materials design techniques in Biomaterials and presents mechanical studies of biological structures. In 16 contributions well known experts present their research on Stress and Strain Analysis, Material Properties, Fluid and Gas mechanics and they show related problems.

Design and Computation of Modern Engineering Materials

The idea of this monograph is to present the latest results related to design and computation of engineering materials and structures. The contributions cover the classical fields of mechanical, civil and materials engineering up to biomechanics and advanced materials processing and optimization. The materials and structures covered can be categorized into modern steels and titanium alloys, composite materials, biological and natural materials, material hybrids and modern joining technologies. Analytical modelling, numerical simulation, the application of state-of-the-art design tools and sophisticated experimental techniques are applied to characterize the performance of materials and to design and optimize structures in different fields of engineering applications.

Structural Biomaterials

\"This book should go a long way towards filling the communication gap between biology and physics in the area of biomaterials]. It begins with the basic theory of elasticity and viscoelasticity, describing concepts like stress, strain, compliance, and plasticity in simple mathematical terms. . . . For the non-biologist, these chapters provide a clear account of macromolecular structure and conformation. . . . Vincent's work] is a delight to read, full of interesting anecdotes and examples from unexpected sources. . . . I can strongly recommend this book, as it shows how biologists could use mechanical properties as well as conventional methods to deduce molecular structure.\"--Anna Furth, The Times Higher Education Supplement In what is now recognized as a standard introduction to biomaterials, Julian Vincent presents a biologist's analysis of the structural materials of organisms, using molecular biology as a starting point. He explores the chemical structure of both proteins and polysaccharides, illustrating how their composition and bonding determine the mechanical properties of the materials in which they occurincluding pliant composites such as skin, artery, and plant tissue; stiff composites such as insect cuticle and wood; and biological ceramics such as teeth, bone, and eggshell. Here Vincent discusses the possibilities of taking ideas from nature with biomimicry and \"intelligent\" (or self-designing and sensitive) materials.

Structural Biological Materials

The ongoing process of bio-evolution has produced materials which are perfectly adapted to fulfil a specific functional role. The natural world provides us with a multitude of examples of materials with durability,

strength, mechanisms of programmed self-assembly and biodegradability. The materials industry has sought to observe and appreciate the relationship between structure, properties and function of these biological materials. A multidisciplinary approach, building on recent advances at the forefront of physics, chemistry and molecular biology, has been successful in producing many synthetic structures with interesting and useful properties. Structural Biological Materials: Design and Structure-Property Relationships represents an invaluable reference in the field of biological materials science and provides an incisive view into this rapidly developing and increasingly important topic within materials science. This book focuses on the study of three sub-groups of structural biological materials: • Hard tissue engineering, focussing on cortical bone • Soft tissue engineering • Fibrous materials, particularly engineering with silk fibers. The fundamental relationship between structure and properties, and certain aspects of design and engineering, are explored in each of the sub-groups. The importance of these materials, both in their intrinsic properties and specific functions, are illustrated with relevant examples. These depict the successful integration of material properties, architecture and shape, providing a wide range of optimised designs, tailored to specific functions. Edited by Manuel Elices of the Universidad Politécnica de Madrid, Spain, this book is Volume 4 in the Pergamon Material Series.

Mechanical and Materials Engineering of Modern Structure and Component Design

This book presents the latest findings on mechanical and materials engineering as applied to the design of modern engineering materials and components. The contributions cover the classical fields of mechanical, civil and materials engineering, as well as bioengineering and advanced materials processing and optimization. The materials and structures discussed can be categorized into modern steels, aluminium and titanium alloys, polymers/composite materials, biological and natural materials, material hybrids and modern nano-based materials. Analytical modelling, numerical simulation, state-of-the-art design tools and advanced experimental techniques are applied to characterize the materials’ performance and to design and optimize structures in different fields of engineering applications.

Structural Biomaterials

This is a thoroughly revised, updated, and expanded edition of a classic illustrated introduction to the structural materials in natural organisms and what we can learn from them to improve man-made technology--from nanotechnology to textiles to architecture. Julian Vincent's book has long been recognized as a standard work on the engineering design of biomaterials and is used by undergraduates, graduates, researchers, and professionals studying biology, zoology, engineering, and biologically inspired design. This third edition incorporates new developments in the field, the most important of which have been at the molecular level. All of the illustrations have been redrawn, the references have been updated, and a new chapter on biomimetic design has been added. Vincent emphasizes the mechanical properties of structural biomaterials, their contribution to the lives of organisms, and how these materials differ from man-made ones. He shows how the properties of biomaterials are derived from their chemistry and interactions, and how to measure them. Starting with proteins and polysaccharides, he shows how skin and hair function, how materials self-assemble, and how ceramics such as bone and mother-of-pearl can be so stiff and tough, despite being made in water in benign ambient conditions. Finally, he combines these topics with an analysis of how the design of biomaterials can be adapted in technology, and presents a series of guidelines for designers. An accessible illustrated introduction with minimal technical jargon Suitable for undergraduates and more advanced readers Integrates chemistry, mechanics, and biology Includes descriptions of all biological materials Simple exposition of mechanical analysis of materials

Mechanical Design in Organisms

This book deals with an interface between mechanical engineering and biology. Available for the first time in paperback, it reviews biological structural materials and systems and their mechanically important features and demonstrates that function at any particular level of biological integration is permitted and controlled by

structure at lower levels of integration. Five chapters discuss the properties of materials in general and those of biomaterials in particular. The authors examine the design of skeletal elements and discuss animal and plant systems in terms of mechanical design. In a concluding chapter they investigate organisms in their environments and the insights gained from study of the mechanical aspects of their lives.

Materiomics: Multiscale Mechanics of Biological Materials and Structures

Multiscale mechanics of hierarchical materials plays a crucial role in understanding and engineering biological and bioinspired materials and systems. The mechanical science of hierarchical tissues and cells in biological systems has recently emerged as an exciting area of research and provides enormous opportunities for innovative basic research and technological advancement. Such advances could enable us to provide engineered materials and structure with properties that resemble those of biological systems, in particular the ability to self-assemble, to self-repair, to adapt and evolve, and to provide multiple functions that can be controlled through external cues. This book presents material from leading researchers in the field of mechanical sciences of biological materials and structure, with the aim to introduce methods and applications to a wider range of engineers.

Visual Impairment and Blindness

Blindness and vision impairment affect at least 2.2 billion people worldwide with most individuals having a preventable vision impairment. The majority of people with vision impairment are older than 50 years, however, vision loss can affect people of all ages. Reduced eyesight can have major and long-lasting effects on all aspects of life, including daily personal activities, interacting with the community, school and work opportunities, and the ability to access public services. This book provides an overview of the effects of blindness and visual impairment in the context of the most common causes of blindness in older adults as well as children, including retinal disorders, cataracts, glaucoma, and macular or corneal degeneration.

Current Cataract Surgical Techniques

The first clinical application of the phacoemulsification cataract surgical technique (often referred to as “phaco”) was introduced in 1967 by Dr. Charles Kelman. This innovation is a big step forward for cataract surgery. With the development of intraocular lens (IOL) design, more and more premium presbyopia- and astigmatism-correction IOLs are being used in clinics. This progress has greatly improved the visual quality of cataract patients. This book discusses the basic surgical skills required to perform this procedure, premium IOL surgical design, specific surgical plans for clinically challenging cases, and more. It provides readers with a comprehensive knowledge of the current state of the art of cataract surgery and surgical design.

Bioinspired Structures and Design

Human cortical bone as a structural material : Hierarchical design and biological degradation / Robert Ritchie and Elizabeth A. Zimmermann -- Bio-inspiration from nacre / Nima Rahbar and Sina Askarinejad -- Bio-inspiration from bamboo / Ting Tan and Wole Soboyejo.

Characterization and Development of Biosystems and Biomaterials

This collection of recent activities provides researchers and scientists with the latest trends in characterization and developments of biosystems and biomaterials. Well known experts present their research in materials for drug delivery, dental implants and filling materials, biocompatible membranes, bioactive surface coatings and bio-compatible and eco-sustainable building materials. In The book covers also topics like microorganisms, the human eye, the musculoskeletal system and human body parts.

Advanced Structural Materials

A snapshot of the central ideas used to control fracture properties of engineered structural metallic materials, Advanced Structural Materials: Properties, Design Optimization, and Applications illustrates the critical role that advanced structural metallic materials play in aerospace, biomedical, automotive, sporting goods, and other industries in the twenty-first century. The book presents an overview of the structure, properties, and applications of these materials, including the basic ideas behind their design. It contains examples and accessible language, elucidating the basic concepts that guide the development of new alloys and composite materials. With in-depth reviews from leading contributors, the text develops an understanding of the breadth and depth of advances in the field. It begins with a broad introduction to advanced structural materials, then examines materials at the frontiers of emerging applications such as biomaterials, MEMS, amorphous materials, and nanotechnology. The chapter authors are experts in their own right and they assume no prior knowledge of a given material system, delineating the fundamental concepts and applications of advanced structural materials. The rich array of carefully selected topics provides useful insights into the structure, properties, and applications of advanced structural materials.

Shell and Membrane Theories in Mechanics and Biology

This book presents the latest results related to shells characterize and design shells, plates, membranes and other thin-walled structures, a multidisciplinary approach from macro- to nanoscale is required which involves the classical disciplines of mechanical/civil/materials engineering (design, analysis, and properties) and physics/biology/medicine among others. The book contains contributions of a meeting of specialists (mechanical engineers, mathematicians, physicists and others) in such areas as classical and non-classical shell theories. New trends with respect to applications in mechanical, civil and aero-space engineering, as well as in new branches like medicine and biology are presented which demand improvements of the theoretical foundations of these theories and a deeper understanding of the material behavior used in such structures.

Biological Materials Science

Taking a unique materials science approach, this text introduces students to the basic concepts and applications of materials and biomedical engineering and prepares them for the challenges of the new interdisciplinary field of biomaterials science. Split into three sections - Basic Biology Principles, Biological Materials, and Bioinspired Materials and Biomimetics - it presents biological materials along with the structural and functional classification of biopolymers, bioelastomers, foams, and ceramic composites. More traditional biomimetic designs such as Velcro are then discussed in conjunction with new developments that mimic the structure of biological materials at the molecular level, mixing nanoscale with biomolecular designs. Bioinspired design of materials and structures is also covered. Focused presentations of biomaterials are presented throughout the text in succinct boxes, emphasising biomedical applications, whilst the basic principles of biology are explained, so no prior knowledge is required. The topics are supported by approximately 500 illustrations, solved problems, and end-of-chapter exercises.

Biomimetic Principles and Design of Advanced Engineering Materials

This book explores the structure-property-process relationship of biomaterials from engineering and biomedical perspectives, and the potential of bio-inspired materials and their applications. A large variety of natural materials with outstanding physical and mechanical properties have appeared in the course of evolution. From a bio-inspired viewpoint, materials design requires a novel and highly cross disciplinary approach. Considerable benefits can be gained by providing an integrated approach using bio-inspiration with materials science and engineering. The book is divided into three parts; Part One focuses on mechanical aspects, dealing with conventional material properties: strength, toughness, hardness, wear resistance, impact resistance, self-healing, adhesion, and adaptation and morphing. Part Two focuses on functional materials

with unique capabilities, such as self-cleaning, stimuli-response, structural color, anti-reflective materials, catalytic materials for clean energy conversion and storage, and other related topics. Part Three describes how to mimic natural materials processes to synthesize materials with low cost, efficient and environmentally friendly approaches. For each chapter, the approach is to describe situations in nature first and then biomimetic materials, fulfilling the need for an interdisciplinary approach which overlaps both engineering and materials science.

Experimental Stress Analysis for Materials and Structures

This book summarizes the main methods of experimental stress analysis and examines their application to various states of stress of major technical interest, highlighting aspects not always covered in the classic literature. It is explained how experimental stress analysis assists in the verification and completion of analytical and numerical models, the development of phenomenological theories, the measurement and control of system parameters under operating conditions, and identification of causes of failure or malfunction. Cases addressed include measurement of the state of stress in models, measurement of actual loads on structures, verification of stress states in circumstances of complex numerical modeling, assessment of stress-related material damage, and reliability analysis of artifacts (e.g. prostheses) that interact with biological systems. The book will serve graduate students and professionals as a valuable tool for finding solutions when analytical solutions do not exist.

Hierarchical Structures in Biology as a Guide for New Materials Technology

Hierarchical structures are those assemblages of molecular units or their aggregates embedded within other particles or aggregates that may, in turn, be part of even larger units of increasing levels of organization. This volume reviews the state of the art of synthetic techniques and processing procedures for assembling these structures. Typical natural-occurring systems used as models for synthetic efforts and insight on properties, unusual characteristics, and potential end-use applications are identified. Suggestions are made for research and development efforts to mimic such structures for broader applications.

Advanced Structural and Functional Materials Design

Volume is indexed by Thomson Reuters CPCI-S (WoS). The Industrial Revolution showed that the development and improvement of new materials and functions could bring about social change, and benefit human society. However, one can be forgiven for feeling that more recent materials research, particularly in the domain of metals, has focused only upon individual elemental characteristics and narrow specialty fields, and that the original vision of materials research has thus been lost.

Bio-Inspired Engineering

More and more, the patterns and scientific principles of natural living systems are being mimicked and exploited in man-made engineered systems and products. That trend is now starting to appear in the curricula design of engineering schools. This will be the first broad-based introduction to the influence of nature and biological systems in how things are designed and made, from new design paradigms and structural systems to \"self-healing materials\" and \"smart\" systems and robotics. Presented as a traditional textbook, with accompanying Solutions and Instructor's Manuals, it will offer both students and professionals new to the subject a window into the new world of engineering. The reader will find: * A general overview of the relationship between living systems and engineering and how biosystems can and do affect engineering design, from structural materials to thermal-fluid behavior to systems engineering * Applications of bio-systems to robotics and biomedical engineering. * End of chapter problems and exercises to reinforce design concepts and expand understanding.

Indentation Testing of Biological Materials

This book presents a comprehensive and unifying approach to analytical identification of material properties of biological materials. Focusing on depth-sensing indentation testing, pipette aspiration testing, and torsion of soft tissues, it discusses the following important aspects in detail: damping, adhesion, thickness effect, substrate effect, elastic inhomogeneity effect, and biphasic effect. This book is intended for advanced undergraduate and graduate students, researchers in the area of biomechanics as well as for biomedical engineers interested in contact problems and involved in inverse materials parameters prediction analysis.

Materials Design and Applications III

This book offers selected contributions to fundamental research and application in designing and engineering materials. It focuses on mechanical engineering applications such as automobile, railway, marine, aerospace, biomedical, pressure vessel technology, and turbine technology. This includes a wide range of material classes, like lightweight metallic materials, polymers, composites, and ceramics. Advanced applications include manufacturing using the new or newer materials, testing methods, and multi-scale experimental and computational aspects.

Biomimetics -- Materials, Structures and Processes

The book presents an outline of current activities in the field of biomimetics and integrates a variety of applications comprising biophysics, surface sciences, architecture and medicine. Biomimetics as innovation method is characterised by interdisciplinary information transfer from the life sciences to technical application fields aiming at increased performance, functionality and energy efficiency. The contributions of the book relate to the research areas: - Materials and structures in nanotechnology and biomaterials - Biomimetic approaches to develop new forms, construction principles and design methods in architecture - Information and dynamics in automation, neuroinformatics and biomechanics Readers will be informed about the latest research approaches and results in biomimetics with examples ranging from bionic nano-membranes to function-targeted design of tribological surfaces and the translation of natural auditory coding strategies.

Combinatorial Materials Science

Combinatorial Materials Science describes new developments and research results in catalysts, biomaterials, and nanomaterials, together with informatics approaches to the analysis of Combinatorial Science (CombiSci) data. CombiSci has been used extensively in the pharmaceutical industry, but there is enormous potential in its application to materials design and characterization. Addressing advances and applications in both fields, Combinatorial Materials Science: Integrates the scientific fundamentals and interdisciplinary underpinnings required to develop and apply CombiSci concepts Discusses the development and use of CombiSci for the systematic and accelerated investigation of new phenomena and of the complex structure-function interplay in materials Covers the development of new library design strategies for materials processing and for high-throughput tools for rapid sampling Uses a unique, unified approach of applying combinatorial methods to unravel the non-linear structure-function relationships in diverse materials (both hard and soft), together with advances in informatics With chapters written by leading researchers in their specialty areas, this authoritative guide is a must-have resource for scientists and engineers in materials science research, biochemists, chemists, immunologists, cell biologists, polymer scientists, chemical and mechanical engineers, statisticians, and computer scientists. It is also a great text for graduate-level courses in materials science/engineering, polymer science, chemical engineering, and chemistry.

Structural Biomaterials

\"This book should go a long way towards filling the communication gap between biology and physics in [the

area of biomaterials]. It begins with the basic theory of elasticity and viscoelasticity, describing concepts like stress, strain, compliance, and plasticity in simple mathematical terms. . . . For the non-biologist, these chapters provide a clear account of macromolecular structure and conformation. . . . [Vincent's work] is a delight to read, full of interesting anecdotes and examples from unexpected sources. . . . I can strongly recommend this book, as it shows how biologists could use mechanical properties as well as conventional methods to deduce molecular structure\".--Anna Furth, The Times Higher Education SupplementIn what is now recognized as a standard introduction to biomaterials, Julian Vincent presents a biologist's analysis of the structural materials of organisms, using molecular biology as a starting point. He explores the chemical structure of both proteins and polysaccharides, illustrating how their composition and bonding determine the mechanical properties of the materials in which they occurincluding pliant composites such as skin, artery, and plant tissue; stiff composites such as insect cuticle and wood; and biological ceramics such as teeth, bone, and eggshell. Here Vincent discusses the possibilities of taking ideas from nature with biomimicry and \"intelligent\" (or self-designing and sensitive) materials.

Adaptive Structures

Adaptive structures have the ability to adapt, evolve or change their properties or behaviour in response to the environment around them. The analysis and design of adaptive structures requires a highly multi-disciplinary approach which includes elements of structures, materials, dynamics, control, design and inspiration taken from biological systems. Development of adaptive structures has been taking place in a wide range of industrial applications, but is particularly advanced in the aerospace and space technology sector with morphing wings, deployable space structures; piezoelectric devices and vibration control of tall buildings. Bringing together some of the foremost world experts in adaptive structures, this unique text: includes discussions of the application of adaptive structures in the aerospace, military, civil engineering structures, automotive and MEMS. presents the impact of biological inspiration in designing adaptive structures, particularly the use of hierarchy in nature, which typically induces multi-functional behavior. sets the agenda for future research in adaptive structures in one distinctive single volume. Adaptive Structures: Engineering Applications is essential reading for engineers and scientists working in the fields of intelligent materials, structural vibration, control and related smart technologies. It will also be of interest to senior undergraduate and postgraduate research students as well as design engineers working in the aerospace, mechanical, electrical and civil engineering sectors.

The National Academy of Sciences' Decadal Plan for Aeronautics

This volume presents recent research work focused in the development of adequate theoretical and numerical formulations to describe the behavior of advanced engineering materials. Particular emphasis is devoted to applications in the fields of biological tissues, phase changing and porous materials, polymers and to micro/nano scale modeling. Sensitivity analysis, gradient and non-gradient based optimization procedures are involved in many of the chapters, aiming at the solution of constitutive inverse problems and parameter identification. All these relevant topics are exposed by experienced international and inter institutional research teams resulting in a high level compilation. The book is a valuable research reference for scientists, senior undergraduate and graduate students, as well as for engineers acting in the area of computational material modeling.

Computational Modeling, Optimization and Manufacturing Simulation of Advanced Engineering Materials

There were eleven symposia conducted with a focus on biomaterials under the sub-class of \"Biomaterials and Soft Matter\" at the MRS 2013 fall meeting. Symposia H, C, D and J have been combined into this proceedings volume. The aim of this volume is to provide state-of-the-art research in biomaterials and bio-inspired materials - their structures, properties, and applications.

Advances in Structures, Properties and Applications of Biological and Bioinspired Materials: Volume 1621

Volume is indexed by Thomson Reuters CPCI-S (WoS). The 108 papers which make up these proceedings contain many original ideas and new angles on the subjects of Advanced Structures, Materials and Engineering, and wherein researchers exchange their innovative ideas from new perspectives. The papers are grouped under the chapter-headings: advanced structures, construction materials and dynamic engineering, design of machines, mechanics and dynamic systems, energy application, materials engineering and the environment. The proceedings will provide guidance to scientists, physicists, chemists, lecturers and others all over the world.

Advanced Research on Advanced Structure, Materials and Engineering

An authoritative introduction to the science and engineering of bioinspired materials Bioinspired Materials Science and Engineering offers a comprehensive view of the science and engineering of bioinspired materials and includes a discussion of biofabrication approaches and applications of bioinspired materials as they are fed back to nature in the guise of biomaterials. The authors also review some biological compounds and shows how they can be useful in the engineering of bioinspired materials. With contributions from noted experts in the field, this comprehensive resource considers biofabrication, biomacromolecules, and biomaterials. The authors illustrate the bioinspiration process from materials design and conception to application of bioinspired materials. In addition, the text presents the multidisciplinary aspect of the concept, and contains a typical example of how knowledge is acquired from nature, and how in turn this information contributes to biological sciences, with an accent on biomedical applications. This important resource: Offers an introduction to the science and engineering principles for the development of bioinspired materials Includes a summary of recent developments on biotemplated formation of inorganic materials using natural templates Illustrates the fabrication of 3D-tumor invasion models and their potential application in drug assessments Explores electroactive hydrogels based on natural polymers Contains information on turning mechanical properties of protein hydrogels for biomedical applications Written for chemists, biologists, physicists, and engineers, Bioinspired Materials Science and Engineering contains an indispensible resource for an understanding of bioinspired materials science and engineering.

Bioinspired Materials Science and Engineering

Scientists have long desired to create synthetic systems that function with the precision and efficiency of biological systems. Using new techniques, researchers are now uncovering principles that could allow the creation of synthetic materials that can perform tasks as precise as biological systems. To assess the current work and future promise of the biology-materials science intersection, the Department of Energy and the National Science Foundation asked the NRC to identify the most compelling questions and opportunities at this interface, suggest strategies to address them, and consider connections with national priorities such as healthcare and economic growth. This book presents a discussion of principles governing biomaterial design, a description of advanced materials for selected functions such as energy and national security, an assessment of biomolecular materials research tools, and an examination of infrastructure and resources for bridging biological and materials science.

Inspired by Biology

The book presents a series of concise papers by researchers specialized in various fields of continuum and computational mechanics and of material science. The focus is on principles and strategies for multiscale modeling and simulation of complex heterogeneous materials, with periodic or random microstructure, subjected to various types of mechanical, thermal, chemical loadings and environmental effects. A wide overview of complex behavior of materials (plasticity, damage, fracture, growth, etc.) is provided. Among various approaches, attention is given to advanced non-classical continua modeling which, provided by

constitutive characterization for the internal and external actions (in particular boundary conditions), is a very powerful frame for the gross mechanical description of complex material behaviors, able to circumvent the restrictions of classical coarse–graining multiscale approaches.

Materials with Internal Structure

This book discusses analytical tools for designing energy efficient and lightweight structures that embody the concept of tensegrity. The book provides both static and dynamic analysis of special tensegrity structural concepts, which are motivated by biological material architecture. This is the first book written to attempt to integrate structure and control design.

Tensegrity Systems

This book focuses on the use of bio-inspired and biomimetic methods for the fabrication and activation of nanomaterials. This includes studies concerning the binding of the biomolecules to the surface of inorganic structures, structure/function relationships of the final materials and extensive discussions on the final applications of such biomimetic materials in unique applications including energy harvesting/storage, biomedical diagnostics and materials assembly.

Bio-Inspired Nanotechnology

Introductory text on the analysis and design of smart devices and structures.

Smart Structures

Mechanics of Functionally Graded Material Structures is an authoritative and fresh look at various functionally graded materials, customizing them with various structures. The book is devoted to tailoring material properties to the needed structural performance. The authors pair materials with the appropriate structures based upon their purpose and use. Material grading of structures depending upon thickness, axial and polar directions are discussed. Three dimensional analysis of rectangular plates made of functional graded materials and vibrational tailoring of inhomogeneous beams and circular plates are both covered in great detail. The authors derive novel closed form solutions that can serve as benchmarks that numerical solutions can be compared to. These are published for the first time in the literature. This is a unique book that gives the first exposition of the effects of various grading mechanisms on the structural behavior as well as taking into account vibrations and buckling. Contents:Three-Dimensional Analysis of Rectangular Plates Made of Functionally Graded Materials:Elastic PlatesIntroduction to Functionally Graded MaterialsDynamic Analysis of Plates Made of Functionally Graded MaterialsStatic Analysis of Plates Made of Functionally Graded MaterialsVibration Tailoring of Inhomogenous Beams and Circular Plates:Beams Made of Functionally Graded MaterialVibration Tailoring of Inhomogeneous Elastically Restrained Vibrating BeamsSome Intriguing Results Pertaining to Functionally Graded ColumnsDesign of Heterogeneous Polar–Orthotropic Clamped Circular Plates with Specified Fundamental Natural FrequencyVibration Tailoring of Simply-Supported Polar Orthotropic Inhomogeneous Circular PlatesVibration Tailoring of Clamped–Clamped Polar Orthotropic Inhomogeneous Circular PlatesVibration Tailoring of a Polar Orthotropic Circular Plate with Translational SpringConclusionAppendices:A Novel Formulation Leading to Closed-Form Solutions for Buckling of Circular PlatesInverse Vibration Problem for Inhomogeneous Circular Plate with Translational SpringApparently First Closed-Form Solutions for Non-Symmetric Vibrations of Inhomogeneous Circular PlatesClosed-Form Solution for Axisymmetric Vibration of Inhomogeneous Simply-Supported Circular Plates Readership: Graduate students, academics, professional and researchers interested in the effects of various grading mechanisms on structural behavior as well as vibration and buckling.Key Features:This book deals with material grading of structures in (a) thickness, (b) axial and (c) polar directionsIt derives novel closed-form solutions that can serve as benchmarks with which numerical solutions can be compared withIt contains extensive bibliography in this fascinating

topicKeywords:Materials;Structures;Vibrations;Three-Dimensional Analysis

Mechanics of Functionally Graded Material Structures

One of the key challenges current biomaterials researchers face is identifying which of the dizzying number of highly specialized characterization tools can be gainfully applied to different materials and biomedical devices. Since this diverse marketplace of tools and techniques can be used for numerous applications, choosing the proper characterization tool is highly important, saving both time and resources. Characterization of Biomaterials is a detailed and multidisciplinary discussion of the physical, chemical, mechanical, surface, in vitro and in vivo characterization tools and techniques of increasing importance to fundamental biomaterials research. Characterization of Biomaterials will serve as a comprehensive resource for biomaterials researchers requiring detailed information on physical, chemical, mechanical, surface, and in vitro or in vivo characterization. The book is designed for materials scientists, bioengineers, biologists, clinicians and biomedical device researchers seeking input on planning on how to test their novel materials, structures or biomedical devices to a specific application. Chapters are developed considering the need for industrial researchers as well as academics. Biomaterials researchers come from a wide variety of disciplines: this book will help them to analyze their materials and devices taking advantage of the multiple experiences on offer. Coverage encompasses a cross-section of the physical sciences, biological sciences, engineering and applied sciences characterization community, providing gainful and cross-cutting insight into this highly multi-disciplinary field. Detailed coverage of important test protocols presents specific examples and standards for applied characterization

Characterization of Biomaterials

Structural Biomaterials: Third Edition Julian Vincent This is a thoroughly revised, updated, and expanded edition of a classic illustrated introduction to the structural materials in natural organisms and what we can learn from them to improve man-made technology--from nanotechnology to textiles to architecture. Julian Vincent's book has long been recognized as a standard work on the engineering design of biomaterials and is used by undergraduates, graduates, researchers, and professionals studying biology, zoology, engineering, and biologically inspired design. This third edition incorpo.

Structural Biomaterials

Enables readers to take full advantage of the latest advances in biomaterials and their applications. Advanced Biomaterials: Fundamentals, Processing, and Applications reviews the latest biomaterials discoveries, enabling readers to take full advantage of the most recent findings in order to advance the biomaterials research and development. Reflecting the nature of biomaterials research, the book covers a broad range of disciplines, including such emerging topics as nanobiomaterials, interface tissue engineering, the latest manufacturing techniques, and new polymeric materials. The book, a contributed work, features a team of renowned scientists, engineers, and clinicians from around the world whose expertise spans the many disciplines needed for successful biomaterials development. All readers will gain an improved understanding of the full range of disciplines and design methodologies that are used to develop biomaterials with the physical and biological properties needed for specific clinical applications.

Advanced Biomaterials

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