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KEY=GUIDED - PRANAV NATHANIEL

GUIDED WAVES IN STRUCTURES FOR SHM

THE TIME - DOMAIN SPECTRAL ELEMENT METHOD

John Wiley & Sons Understanding and analysing the complex phenomena related to elastic wave propagation has been the subject of intense research for many years and has enabled application in numerous fields of technology, including structural health monitoring (SHM). In the course of the rapid advancement of diagnostic methods utilising elastic wave propagation, it has become clear that existing methods of elastic wave modeling and analysis are not always very useful; developing numerical methods aimed at modeling and analysing these phenomena has become a necessity. Furthermore, any methods developed need to be verified experimentally, which has become achievable with the advancement of measurement methods utilising laser vibrometry. Guided Waves in Structures for SHM reports on the simulation, analysis and experimental investigation related propagation of elastic waves in isotropic or laminated structures. The full spectrum of theoretical and practical issues associated with propagation of elastic waves is presented and discussed in this one study. Key features: Covers both numerical and experimental aspects of modeling, analysis and measurement of elastic wave propagation in structural elements formed from isotropic or composite materials Comprehensively discusses the application of the Spectral Finite Element Method for modelling and analysing elastic wave propagation in diverse

structural elements Presents results of experimental measurements employing advanced laser technologies, validating the quality and correctness of the developed numerical models Accompanying website (www.wiley.com/go/ostachowicz) contains demonstration versions of commercial software developed by the authors for modelling and analyzing elastic wave propagation using the Spectral Finite Element Method Guided Waves in Structures for SHM provides a state of the art resource for researchers and graduate students in structural health monitoring, signal processing and structural dynamics. This book should also provide a useful reference for practising engineers within structural health monitoring and non-destructive testing.

MARE-WINT

NEW MATERIALS AND RELIABILITY IN OFFSHORE WIND TURBINE TECHNOLOGY

Springer This book provides a holistic, interdisciplinary overview of offshore wind energy, and is a must-read for advanced researchers. Topics, from the design and analysis of future turbines, to the decommissioning of wind farms, are covered. The scope of the work ranges from analytical, numerical and experimental advancements in structural and fluid mechanics, to novel developments in risk, safety & reliability engineering for offshore wind. The core objective of the current work is to make offshore wind energy more competitive, by improving the reliability, and operations and maintenance (O&M) strategies of wind turbines. The research was carried out under the auspices of the EU-funded project, MARE-WINT. The project provided a unique opportunity for a group of researchers to work closely together, undergo multidisciplinary doctoral training, and conduct research in the area of offshore wind energy generation. Contributions from expert, external authors are also included, and the complete work seeks to bridge the gap between research and a rapidly-evolving industry.

FIFTH EUROPEAN WORKSHOP ON STRUCTURAL HEALTH MONITORING 2010

DEStech Publications, Inc

LAMB-WAVE BASED STRUCTURAL HEALTH MONITORING IN POLYMER COMPOSITES

Springer The book focuses especially on the application of SHM technology to thin walled structural systems made from carbon fiber reinforced plastics. Here, guided elastic waves (Lamb-waves) show an excellent sensitivity to structural damages so that they are in the center of this book. It is divided into 4 sections dealing with analytical, numerical and experimental fundamentals, and subsequently with Lamb-wave propagation in fiber reinforced composites, SHM-systems and signal processing. The book is designed

for engineering students as well as for researchers in the field of structural health monitoring and for users of this technology.

IDENTIFICATION OF DAMAGE USING LAMB WAVES

FROM FUNDAMENTALS TO APPLICATIONS

Springer Science & Business Media Lamb waves are guided waves that propagate in thin plate or shell structures. There has been a clear increase of interest in using Lamb waves for identifying structural damage, entailing intensive research and development in this field over the past two decades. Now on the verge of maturity for diverse engineering applications, this emerging technique serves as an encouraging candidate for facilitating continuous and automated surveillance of the integrity of engineering structures in a cost-effective manner. In comparison with conventional nondestructive evaluation techniques such as ultrasonic scanning and radiography which have been well developed over half a century, damage identification using Lamb waves is in a stage of burgeoning development, presenting a number of technical challenges in application that need to be addressed and circumvented. It is these two aspects that have encouraged us to write this book, with the intention of consolidating the knowledge and know-how in the field of Lamb-wave-based damage identification, and of promoting widespread attention to mature application of this technique in the practical engineering sphere. This book provides a comprehensive description of key facets of damage identification technique using Lamb waves, based on the authors' knowledge, comprehension and experience, ranging from fundamental theory through case studies to engineering applications.

AEROSPACE MATERIALS AND MATERIAL TECHNOLOGIES

VOLUME 2: AEROSPACE MATERIAL TECHNOLOGIES

Springer This book serves as a comprehensive resource on various traditional, advanced and futuristic material technologies for aerospace applications encompassing nearly 20 major areas. Each of the chapters addresses scientific principles behind processing and production, production details, equipment and facilities for industrial production, and finally aerospace application areas of these material technologies. The chapters are authored by pioneers of industrial aerospace material technologies. This book has a well-planned layout in 4 parts. The first part deals with primary metal and material processing, including nano manufacturing. The second part deals with materials characterization and testing methodologies and technologies. The third part addresses structural design. Finally, several advanced material technologies are covered in the fourth part. Some key advanced topics such as "Structural Design by ASIP", "Damage Mechanics-Based Life Prediction and Extension" and "Principles of Structural Health Monitoring" are dealt with at

equal length as the traditional aerospace materials technology topics. This book will be useful to students, researchers and professionals working in the domain of aerospace materials.

STRUCTURAL HEALTH MONITORING DAMAGE DETECTION SYSTEMS FOR AEROSPACE

Springer Nature This open access book presents established methods of structural health monitoring (SHM) and discusses their technological merit in the current aerospace environment. While the aerospace industry aims for weight reduction to improve fuel efficiency, reduce environmental impact, and to decrease maintenance time and operating costs, aircraft structures are often designed and built heavier than required in order to accommodate unpredictable failure. A way to overcome this approach is the use of SHM systems to detect the presence of defects. This book covers all major contemporary aerospace-relevant SHM methods, from the basics of each method to the various defect types that SHM is required to detect to discussion of signal processing developments alongside considerations of aerospace safety requirements. It will be of interest to professionals in industry and academic researchers alike, as well as engineering students.

STRUCTURAL HEALTH MONITORING FOR ADVANCED COMPOSITE STRUCTURES

World Scientific Structural health monitoring (SHM) is a relatively new and alternative way of non-destructive inspection (NDI). It is the process of implementing a damage detection and characterization strategy for composite structures. The basis of SHM is the application of permanent fixed sensors on a structure, combined with minimum manual intervention to monitor its structural integrity. These sensors detect changes to the material and/or geometric properties of a structural system, including changes to the boundary conditions and system connectivity, which adversely affect the system's performance. This book's primary focus is on the diagnostics element of SHM, namely damage detection in composite structures. The techniques covered include the use of Piezoelectric transducers for active and passive Ultrasonics guided waves and electromechanical impedance measurements, and fiber optic sensors for strain sensing. It also includes numerical modeling of wave propagation in composite structures. Contributed chapters written by leading researchers in the field describe each of these techniques, making it a key text for researchers and NDI practitioners as well as postgraduate students in a number of specialties including materials, aerospace, mechanical and computational engineering.

Contents: Damage Detection and Characterization with Piezoelectric Transducers — Active Sensing (Z Sharif Khodaei and M H Aliabadi) Modeling Guided Wave Propagation in Composite Structures Using Local Interaction Simulation Approach (Yanfeng Shen and Carlos E S Cesnik) Design and Development of a Phased Array System for Damage Detection in Structures (Bruno Rocha, Mehmet Yildiz & Afzal Suleman) Degradation Detection in Composite Structures with PZT Transducers (Wiesław M Ostachowicz, Paweł H

Malinowski & Tomasz Wandowski) Numerical Modelling of Wave Propagation in Composite Structures (Sourav Banerjee) SHM of Composite Structures by Fibre Optic Sensors (Alfredo Guemes) Impact Detection and Identification with Piezoceramic Sensors — Passive Sensing (Z Sharif Khodaei and M H Aliabadi) Readership: Researchers and NDI practitioners as well as postgraduate students in a number of specialties including materials, aerospace, mechanical and computational engineering. Keywords: Structural Health Modelling; Non-Destructive Inspection; Diagnostic SHM; Aerospace Engineering; Microelectromechanical Systems; Acoustic Emission Monitoring; Accelerometers Review: 0

STRESS, VIBRATION, AND WAVE ANALYSIS IN AEROSPACE COMPOSITES

SHM AND NDE APPLICATIONS

Academic Press Stress, Vibration, and Wave Analysis in Aerospace Composites: SHM and NDE Applications presents a unified approach to studying and understanding stress, vibrations and waves in composite materials used in aerospace applications. Combining topics that are typically found across an array of various sources, the book starts by looking at the properties of various composite materials, progresses to coverage of an analysis of stress, vibration and waves and then concludes with a discussion of various structural health monitoring (SHM) and nondestructive evaluation (NDE) techniques and applications based on the analysis developed earlier in the book. Every chapter of the book contains a variety of worked-out examples to illustrate and tie together underlying theory and specific applications. The MATLAB code used to generate these examples is available on the book's companion website, as are solution documents and additional MATLAB code for problems and exercises featured in each chapter. Presents a comprehensive treatment of aerospace composites, starting with composite material properties and then covering an analysis of stress, vibration and waves, and culminating with SHM and NDE applications Provides an understanding of the use and application of stress, vibration and waves to detect composite damage and monitor growth Features an array of worked-out examples, problems and exercises Includes access to a companion website that features MATLAB codes for worked-out examples, along with problems, exercises and their solutions

STRUCTURAL HEALTH MONITORING OF LARGE STRUCTURES USING ACOUSTIC EMISSION-CASE HISTORIES

MDPI Acoustic emission (AE) techniques have successfully been used for assuring the structural integrity of large rocket motorcases since 1963, and their uses have expanded to ever larger structures, especially as structural health monitoring (SHM) of large structures has become the most urgent task for engineering communities around the world. The needs for advanced AE monitoring methods are felt keenly by those dealing with aging infrastructures. Many publications have appeared covering various aspects of AE

techniques, but documentation of actual applications of AE techniques has been mostly limited to reports of successful results without technical details that allow objective evaluation of the results. There are some exceptions in the literature. In this Special Issue of the Acoustics section of Applied Sciences, we seek contributions covering these exceptions cited here. Here, we seek contributions describing case histories of AE applications to large structures that have achieved the goals of SHM by providing adequate technical information supporting the success stories. Types of structures can include aerospace and geological structures, bridges, buildings, factories, maritime facilities, off-shore structures, etc. Experiences with AE monitoring methods designed and proven for large structures.

ROTATING MACHINERY, OPTICAL METHODS & SCANNING LDV METHODS, VOLUME 6

PROCEEDINGS OF THE 39TH IMAC, A CONFERENCE AND EXPOSITION ON STRUCTURAL DYNAMICS 2021

Springer Nature Rotating Machinery, Optical Methods & Scanning LDV Methods, Volume 6: Proceedings of the 39th IMAC, A Conference and Exposition on Structural Dynamics, 2021, the sixth volume of nine from the Conference brings together contributions to this important area of research and engineering. The collection presents early findings and case studies on fundamental and applied aspects of Structural Health Monitoring, including papers on: Novel Techniques Optical Methods, Scanning LDV Methods Photogrammetry & DIC Rotating Machinery

ADVANCED STRUCTURAL DAMAGE DETECTION

FROM THEORY TO ENGINEERING APPLICATIONS

John Wiley & Sons Structural Health Monitoring (SHM) is the interdisciplinary engineering field devoted to the monitoring and assessment of structural health and integrity. SHM technology integrates non-destructive evaluation techniques using remote sensing and smart materials to create smart self-monitoring structures characterized by increased reliability and long life. Its applications are primarily systems with critical demands concerning performance where classical onsite assessment is both difficult and expensive. *Advanced Structural Damage Detection: From Theory to Engineering Applications* is written by academic experts in the field and provides students, engineers and other technical specialists with a comprehensive review of recent developments in various monitoring techniques and their applications to SHM. Contributing to an area which is the subject of intensive research and development, this book offers both theoretical principles and feasibility studies for a number of SHM techniques. Key features: Takes a multidisciplinary approach and provides a comprehensive review of main SHM techniques Presents real case studies and practical application of techniques for damage detection in different types of structures Presents a number of new/novel data processing algorithms

Demonstrates real operating prototypes Advanced Structural Damage Detection: From Theory to Engineering Applications is a comprehensive reference for researchers and engineers and is a useful source of information for graduate students in mechanical and civil engineering

ULTRASONIC GUIDED WAVES IN SOLID MEDIA

Cambridge University Press Ultrasonic guided waves in solid media have become a critically important subject in nondestructive testing and structural health monitoring, as new faster, more sensitive, and more economical ways of looking at materials and structures have become possible. This book will lead to fresh creative ideas for use in new inspection procedures. Although the mathematics is sometimes sophisticated, the book can also be read by managers without detailed understanding of the concepts as it can be read from a 'black box' point of view. Overall, the material presented on wave mechanics - in particular, guided wave mechanics - establishes a framework for the creative data collection and signal processing needed to solve many problems using ultrasonic nondestructive evaluation and structural health monitoring. The book can be used as a reference in ultrasonic nondestructive evaluation by professionals and as a textbook for seniors and graduate students. This work extends the coverage of Rose's earlier book Ultrasonic Waves in Solid Media.

STRUCTURAL HEALTH MONITORING OF AEROSPACE COMPOSITES

Academic Press Structural Health Monitoring of Aerospace Composite Structures offers a comprehensive review of established and promising technologies under development in the emerging area of structural health monitoring (SHM) of aerospace composite structures. Beginning with a description of the different types of composite damage, which differ fundamentally from the damage states encountered in metallic airframes, the book moves on to describe the SHM methods and sensors currently under consideration before considering application examples related to specific composites, SHM sensors, and detection methods. Expert author Victor Giurgiutiu closes with a valuable discussion of the advantages and limitations of various sensors and methods, helping you to make informed choices in your structure research and development. The first comprehensive review of one of the most ardent research areas in aerospace structures, providing breadth and detail to bring engineers and researchers up to speed on this rapidly developing field. Covers the main classes of SHM sensors, including fiber optic sensors, piezoelectric wafer active sensors, electrical properties sensors and conventional resistance strain gauges, and considers their applications and limitation. Includes details of active approaches, including acousto-ultrasonics, vibration, frequency transfer function, guided-wave tomography, phased arrays, and electrochemical impedance spectroscopy (ECIS), among other emerging methods

DELAMINATION IN WOOD, WOOD PRODUCTS AND WOOD-BASED COMPOSITES

Springer Science & Business Media In the last quarter century, delamination has come to mean more than just a failure in adhesion between layers of bonded composite plies that might affect their load-bearing capacity. Ever-increasing computer power has meant that we can now detect and analyze delamination between, for example, cell walls in solid wood. This fast-moving and critically important field of study is covered in a book that provides everyone from manufacturers to research scientists the state of the art in wood delamination studies. Divided into three sections, the book first details the general aspects of the subject, from basic information including terminology, to the theoretical basis for the evaluation of delamination. A settled terminology in this subject area is a first key goal of the book, as the terms which describe delamination in wood and wood-based composites are numerous and often confusing. The second section examines different and highly specialized methods for delamination detection such as confocal laser scanning microscopy, light microscopy, scanning electron microscopy and ultrasonics. Ways in which NDE (non-destructive evaluation) can be employed to detect and locate defects are also covered. The book's final section focuses on the practical aspects of this defect in a wide range of wood products covering the spectrum from trees, logs, laminated panels and glued laminated timbers to parquet floors. Intended as a primary reference, this book covers everything from the microscopic, anatomical level of delamination within solid wood sections to an examination of the interface of wood and its surface coatings. It provides readers with the perspective of industry as well as laboratory and is thus a highly practical sourcebook for wood engineers working in manufacturing as well as a comprehensively referenced text for materials scientists wrestling with the theory underlying the subject.

ULTRASONIC GUIDED WAVES

MDPI The propagation of ultrasonic guided waves in solids is an important area of scientific inquiry, primarily due to their practical applications for nondestructive characterization of materials, such as nondestructive inspection, quality assurance testing, structural health monitoring, and providing a material state awareness. This Special Issue of Applied Sciences covers all aspects of ultrasonic guided waves (e.g., phased array transducers, meta-materials to control wave propagation characteristics, scattering, attenuation, and signal processing techniques) from the perspective of modeling, simulation, laboratory experiments, or field testing. In order to fully utilize ultrasonic guided waves for these applications, it is necessary to have a firm grasp of their requisite characteristics, which include that they are multimodal, dispersive, and are comprised of unique displacement profiles through the thickness of the waveguide.

ADVANCED ULTRASONIC METHODS FOR MATERIAL AND STRUCTURE INSPECTION

John Wiley & Sons Ultrasonic signals are increasingly being used for predicting material behavior, both in an engineering context (detecting anomalies in a variety of structures) and a biological context (examining human bones, body parts and unborn fetuses). Featuring contributions from authors who are specialists in their subject area, this book presents new developments in ultrasonic research in both these areas, including ultrasonic NDE and other areas which go beyond traditional imaging techniques of internal defects. As such, both those in the biological and physical science communities will find this an informative and stimulating read.

STRUCTURAL HEALTH MONITORING WITH PIEZOELECTRIC WAFER ACTIVE SENSORS

Academic Press Structural Health Monitoring with Piezoelectric Wafer Active Sensors, Second Edition provides an authoritative theoretical and experimental guide to this fast-paced, interdisciplinary area with exciting applications across a range of industries. The book begins with a detailed yet digestible consolidation of the fundamental theory relating to structural health monitoring (SHM). Coverage of fracture and failure basics, relevant piezoelectric material properties, vibration modes in different structures, and different wave types provide all the background needed to understand SHM and apply it to real-world structural challenges. Moving from theory to experimental practice, the book then provides the most comprehensive coverage available on using piezoelectric wafer active sensors (PWAS) to detect and quantify damage in structures. Updates to this edition include circular and straight-crested Lamb waves from first principle, and the interaction between PWAS and Lamb waves in 1-D and 2-D geometries. Effective shear stress is described, and tuning expressions between PWAS and Lamb waves has been extended to cover axisymmetric geometries with a complete Hankel-transform-based derivation. New chapters have been added including hands-on SHM case studies of PWAS stress, strain, vibration, and wave sensing applications, along with new sections covering essential aspects of vibration and wave propagation in axisymmetric geometries. Comprehensive coverage of underlying theory such as piezoelectricity, vibration, and wave propagation alongside experimental techniques Includes step-by-step guidance on the use of piezoelectric wafer active sensors (PWAS) to detect and quantify damage in structures, including clear information on how to interpret sensor signal patterns Updates to this edition include a new chapter on composites and new sections on advances in vibration and wave theory, bringing this established reference in line with the cutting edge in this emerging area

THE HANDBOOK OF SANDWICH CONSTRUCTION

EUROPEAN WORKSHOP ON STRUCTURAL HEALTH MONITORING

SPECIAL COLLECTION OF 2020 PAPERS - VOLUME 1

Springer Nature This volume gathers the latest advances, innovations, and applications in the field of structural health monitoring (SHM) and more broadly in the fields of smart materials and intelligent systems. The volume covers highly diverse topics, including signal processing, smart sensors, autonomous systems, remote sensing and support, UAV platforms for SHM, Internet of Things, Industry 4.0, and SHM for civil structures and infrastructures. The contributions, which are published after a rigorous international peer-review process, highlight numerous exciting ideas that will spur novel research directions and foster multidisciplinary collaboration among different specialists. The contents of this volume reflect the outcomes of the activities of EWSHM (European Workshop on Structural Health Monitoring) in 2020.

ULTRASONIC GUIDED WAVES IN SOLID MEDIA

Cambridge University Press Ultrasonic guided waves in solid media are important in nondestructive testing and structural health monitoring, as new faster, more sensitive, and economical ways of looking at materials and structures have become possible. This book can be read by managers from a "black box" point of view, or used as a professional reference or textbook.

WAVE PROPAGATION IN STRUCTURES

SPECTRAL ANALYSIS USING FAST DISCRETE FOURIER TRANSFORMS

Springer Science & Business Media This book introduces spectral analysis as a means of investigating wave propagation and transient oscillations in structures. After developing the foundations of spectral analysis and the fast Fourier transform algorithm, the book provides a thorough treatment of waves in rods, beams, and plates, and introduces a novel matrix method for analysing complex structures as a collection of waveguides. The presentation includes an introduction to higher-order structural theories, the results of many experimental studies, practical applications, and source-code listings for many programs. An extensive bibliography provides an entry to the research literature. Intended as a textbook for graduate students of aerospace or mechanical engineering, the book will also be of interest to practising engineers in these and related disciplines.

FOUNDATIONS FOR GUIDED-WAVE OPTICS

John Wiley & Sons A classroom-tested introduction to integrated and fiber optics This text offers an in-depth treatment of integrated and fiber optics, providing graduate students, engineers, and scientists with a solid foundation of the principles, capabilities, uses, and limitations of guided-wave optic devices and systems. In addition to the transmission properties of dielectric waveguides and optical fibers, this book covers the principles of directional couplers, guided-wave gratings, arrayed-waveguide gratings, and fiber optic polarization components. The material is fully classroom-tested and carefully structured to help readers grasp concepts quickly and apply their knowledge to solving problems. Following an overview, including important nomenclature and notations, the text investigates three major topics: Integrated optics Fiber optics Pulse evolution and broadening in optical waveguides Each chapter starts with basic principles and gradually builds to more advanced concepts and applications. Compelling reasons for including each topic are given, detailed explanations of each concept are provided, and steps for each derivation are carefully set forth. Readers learn how to solve complex problems using physical concepts and simplified mathematics. Illustrations throughout the text aid in understanding key concepts, while problems at the end of each chapter test the readers' grasp of the material. The author has designed the text for upper-level undergraduates, graduate students in physics and electrical and computer engineering, and scientists. Each chapter is self-contained, enabling instructors to choose a subset of topics to match their particular course needs. Researchers and practitioners can also use the text as a self-study guide to gain a better understanding of photonic and fiber optic devices and systems.

SURFACE IMPEDANCE BOUNDARY CONDITIONS

A COMPREHENSIVE APPROACH

CRC Press Surface Impedance Boundary Conditions is perhaps the first effort to formalize the concept of SIBC or to extend it to higher orders by providing a comprehensive, consistent, and thorough approach to the subject. The product of nearly 12 years of research on surface impedance, this book takes the mystery out of the largely overlooked SIBC. It provides an understanding that will help practitioners select, use, and develop these efficient modeling tools for their own applications. Use of SIBC has often been viewed as an esoteric issue, and they have been applied in a very limited way, incorporated in computation as an ad hoc means of simplifying the treatment for specific problems. Apply a Surface Impedance "Toolbox" to Develop SIBCs for Any Application The book not only outlines the need for SIBC but also offers a simple, systematic method for constructing SIBC of any order based on a perturbation approach. The formulation of the SIBC within common numerical techniques—such as the boundary integral equations method, the

finite element method, and the finite difference method—is discussed in detail and elucidated with specific examples. Since SIBC are often shunned because their implementation usually requires extensive modification of existing software, the authors have mitigated this problem by developing SIBCs, which can be incorporated within existing software without system modification. The authors also present: Conditions of applicability, and errors to be expected from SIBC inclusion Analysis of theoretical arguments and mathematical relationships Well-known numerical techniques and formulations of SIBC A practical set of guidelines for evaluating SIBC feasibility and maximum errors their use will produce A careful mix of theory and practical aspects, this is an excellent tool to help anyone acquire a solid grasp of SIBC and maximize their implementation potential.

WAVES IN LAYERED MEDIA

Elsevier *Waves in Layered Media* focuses on the theory of the propagation of elastic and electromagnetic waves in layered media. This book presents a complete report of Soviet researches on wave propagation through layered media. Organized into six chapters, this book starts with an overview of the theory of wave reflection from layers and interfaces. This text then examines the some of the representations and methods, which are common to different branches of physics. Other chapters define the reflection reduction of optical waves as the lowering of the reflection coefficient at the air-glass boundaries by depositing thin layers of several materials on the glass. This book discusses as well the field of a concentrated source situated in a layered-inhomogeneous medium, which is one of the main problems in modern radiophysics, acoustics, and the physics of the Earth's crust. The final chapter deals with wave propagation in layered-inhomogeneous media. This book is a valuable resource for engineers, scientists, and physicists.

PHOTONIC CRYSTALS

MOLDING THE FLOW OF LIGHT - SECOND EDITION

Princeton University Press Since it was first published in 1995, *Photonic Crystals* has remained the definitive text for both undergraduates and researchers on photonic band-gap materials and their use in controlling the propagation of light. This newly expanded and revised edition covers the latest developments in the field, providing the most up-to-date, concise, and comprehensive book available on these novel materials and their applications. Starting from Maxwell's equations and Fourier analysis, the authors develop the theoretical tools of photonics using principles of linear algebra and symmetry, emphasizing analogies with traditional solid-state physics and quantum theory. They then investigate the unique phenomena that take place within photonic crystals at defect sites and surfaces, from one to three dimensions. This new edition includes entirely new chapters describing important hybrid structures that use band gaps or periodicity only in some directions: periodic waveguides, photonic-crystal slabs, and photonic-crystal

fibers. The authors demonstrate how the capabilities of photonic crystals to localize light can be put to work in devices such as filters and splitters. A new appendix provides an overview of computational methods for electromagnetism. Existing chapters have been considerably updated and expanded to include many new three-dimensional photonic crystals, an extensive tutorial on device design using temporal coupled-mode theory, discussions of diffraction and refraction at crystal interfaces, and more. Richly illustrated and accessibly written, Photonic Crystals is an indispensable resource for students and researchers. Extensively revised and expanded Features improved graphics throughout Includes new chapters on photonic-crystal fibers and combined index-and band-gap-guiding Provides an introduction to coupled-mode theory as a powerful tool for device design Covers many new topics, including omnidirectional reflection, anomalous refraction and diffraction, computational photonics, and much more.

THE FINITE ELEMENT METHOD FOR SOLID AND STRUCTURAL MECHANICS

Elsevier This is the key text and reference for engineers, researchers and senior students dealing with the analysis and modelling of structures - from large civil engineering projects such as dams, to aircraft structures, through to small engineered components. Covering small and large deformation behaviour of solids and structures, it is an essential book for engineers and mathematicians. The new edition is a complete solids and structures text and reference in its own right and forms part of the world-renowned Finite Element Method series by Zienkiewicz and Taylor. New material in this edition includes separate coverage of solid continua and structural theories of rods, plates and shells; extended coverage of plasticity (isotropic and anisotropic); node-to-surface and 'mortar' method treatments; problems involving solids and rigid and pseudo-rigid bodies; and multi-scale modelling. Dedicated coverage of solid and structural mechanics by world-renowned authors, Zienkiewicz and Taylor New material including separate coverage of solid continua and structural theories of rods, plates and shells; extended coverage for small and finite deformation; elastic and inelastic material constitution; contact modelling; problems involving solids, rigid and discrete elements; and multi-scale modelling

SEISMIC WAVE PROPAGATION IN STRATIFIED MEDIA

ANU E Press Seismic Wave Propagation in Stratified Media presents a systematic treatment of the interaction of seismic waves with Earth structure. The theoretical development is physically based and is closely tied to the nature of the seismograms observed across a wide range of distance scales - from a few kilometres as in shallow reflection work for geophysical prospecting, to many thousands of kilometres for major earthquakes. A unified framework is presented for all classes of seismic phenomena, for both body waves and surface waves. Since its first publication in 1983 this book has been an important resource for understanding the way in which seismic waves can be understood in terms of reflection and transmission properties of Earth models, and how complete theoretical

seismograms can be calculated. The methods allow the development of specific approximations that allow concentration on different seismic arrivals and hence provide a direct tie to seismic observations.

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

STRUCTURAL COMPOSITE MATERIALS

ASM International This book deals with all aspects of advanced composite materials; what they are, where they are used, how they are made, their properties, how they are designed and analyzed, and how they perform in-service. It covers both continuous and discontinuous fiber composites fabricated from polymer, metal, and ceramic matrices, with an emphasis on continuous fiber polymer matrix composites.

WAVEGUIDE HANDBOOK

IET Presents the equivalent-circuit parameters for a large number of microwave structures.

COPLANAR WAVEGUIDE CIRCUITS, COMPONENTS, AND SYSTEMS

John Wiley & Sons Up-to-date coverage of the analysis and applications of coplanar waveguides to microwave circuits and antennas. The unique feature of coplanar waveguides, as opposed to more conventional waveguides, is their uniplanar construction, in which all of the conductors are aligned on the same side of the substrate. This feature simplifies manufacturing and allows faster and less expensive characterization using on-wafer techniques. *Coplanar Waveguide Circuits, Components, and Systems* is an engineer's complete resource, collecting all of the available data on the subject. Rainee Simons thoroughly discusses propagation parameters for conventional coplanar waveguides and includes valuable details such as the derivation of the fundamental equations, physical explanations, and numerical examples. Coverage also includes: Discontinuities and circuit elements Transitions to other transmission media Directional couplers, hybrids, and magic T Microelectromechanical systems based switches and phase shifters Tunable devices using ferroelectric materials Photonic bandgap structures Printed circuit antennas

COMPUTATIONAL MECHANICS

PROCEEDINGS OF THE 2007 INTERNATIONAL SYMPOSIUM ON COMPUTATIONAL MECHANICS IN BEIJING

Springer Science & Business Media Computational Mechanics is the proceedings of the International Symposium on Computational Mechanics, ISCM 2007. This conference is the first of a series created by a group of prominent scholars from the Mainland of China, Hong Kong, Taiwan, and overseas Chinese, who are very active in the field. The book includes 22 full papers of plenary and semi-plenary lectures and approximately 150 one-page summaries.

COMPUTATIONAL NONDESTRUCTIVE EVALUATION HANDBOOK

ULTRASOUND MODELING TECHNIQUES

CRC Press Introducing computational wave propagation methods developed over 40 years of research, this comprehensive book offers a computational approach to NDE of isotropic, anisotropic, and functionally graded materials. It discusses recent methods to enable enhanced computational efficiency for anisotropic materials. It offers an overview of the need for and uses of NDE simulation. The content provides a basic understanding of ultrasonic wave propagation through continuum mechanics and detailed discussions on the mathematical techniques of six computational methods to simulate NDE experiments. In this book, the pros and cons of each individual method are discussed and guidelines for selecting specific simulation methods for specific NDE scenarios are offered. Covers ultrasonic CNDE fundamentals to provide understanding of NDE simulation methods Offers a catalog of effective CNDE methods to evaluate and compare Provides exercises on real-life NDE problems with mathematical steps Discusses CNDE for common material types, including isotropic, anisotropic, and functionally graded materials Presents readers with practical knowledge on ultrasonic CNDE methods This work is an invaluable resource for researchers, advanced students, and industry professionals across materials, mechanical, civil, and aerospace engineering, and anyone seeking to enhance their understanding of computational approaches for advanced material evaluation methods.

MECHANICAL TESTING OF ADVANCED FIBRE COMPOSITES

Elsevier Testing of composite materials can present complex problems but is essential in order to ensure the reliable, safe and cost-effective performance of any engineering structure. This essentially practical book, compiled from the contributions of leading professionals in the field, describes a wide range of test methods which can be applied to various types of advanced fibre composites. The book focuses on high modulus, high strength fibre/plastic composites and also covers highly anisotropic materials such as carbon, aramid and glass. Engineers and designers specifying the use of materials in structures will find this book an invaluable guide to best practice throughout the range of industrial sectors where FRCs are employed.

BIM HANDBOOK

A GUIDE TO BUILDING INFORMATION MODELING FOR OWNERS, DESIGNERS, ENGINEERS, CONTRACTORS, AND FACILITY MANAGERS

John Wiley & Sons Discover BIM: A better way to build better buildings Building Information Modeling (BIM) offers a novel approach to design, construction, and facility management in which a digital representation of the building product and process is used to facilitate the exchange and interoperability of information in digital format. BIM is beginning to change the way buildings look, the way they function, and the ways in which they are designed and built. The BIM Handbook, Third Edition provides an in-depth understanding of BIM technologies, the business and organizational issues associated with its implementation, and the profound advantages that effective use of BIM can provide to all members of a project team. Updates to this edition include: Information on the ways in which professionals should use BIM to gain maximum value New topics such as collaborative working, national and major construction clients, BIM standards and guides A discussion on how various professional roles have expanded through the widespread use and the new avenues of BIM practices and services A wealth of new case studies that clearly illustrate exactly how BIM is applied in a wide variety of conditions Painting a colorful and thorough picture of the state of the art in building information modeling, the BIM Handbook, Third Edition guides readers to successful implementations, helping them to avoid needless frustration and costs and take full advantage of this paradigm-shifting approach to construct better buildings that consume fewer materials and require less time, labor, and capital resources.

APPLIED MECHANICS REVIEWS

MECHANICS OF COMPOSITE MATERIALS AND STRUCTURES

Springer Science & Business Media A compact presentation of the foundations, current state of the art, recent developments and research directions of all essential techniques related to the mechanics of composite materials and structures. Special emphasis is placed on classic and recently developed theories of composite laminated beams, plates and shells, micromechanics, impact and damage analysis, mechanics of textile structural composites, high strain rate testing and non-destructive testing of composite materials and structures. Topics of growing importance are addressed, such as: numerical methods and optimisation, identification and damage monitoring. The latest results are presented on the art of modelling smart composites, optimal design with advanced materials, and industrial applications. Each section of the book is written by internationally recognised experts who have dedicated

most of their research work to a particular field. Readership: Postgraduate students, researchers and engineers in the field of composites. Undergraduate students will benefit from the treatment of the foundations of the mechanics of composite materials and structures.

METAMATERIALS

PHYSICS AND ENGINEERING EXPLORATIONS

John Wiley & Sons Leading experts explore the exotic properties and exciting applications of electromagnetic metamaterials. *Metamaterials: Physics and Engineering Explorations* gives readers a clearly written, richly illustrated introduction to the most recent research developments in the area of electromagnetic metamaterials. It explores the fundamental physics, the designs, and the engineering aspects, and points to a myriad of exciting potential applications. The editors, acknowledged leaders in the field of metamaterials, have invited a group of leading researchers to present both their own findings and the full array of state-of-the-art applications for antennas, waveguides, devices, and components. Following a brief overview of the history of artificial materials, the publication divides its coverage into two major classes of metamaterials. The first half of the publication examines effective media with single (SNG) and double negative (DNG) properties; the second half examines electromagnetic band gap (EBG) structures. The book further divides each of these classes into their three-dimensional (3D volumetric) and two-dimensional (2D planar or surface) realizations. Examples of each type of metamaterial are presented, and their known and anticipated properties are reviewed. Collectively, *Metamaterials: Physics and Engineering Explorations* presents a review of recent research advances associated with a highly diverse set of electromagnetic metamaterials. Its multifaceted approach offers readers a combination of theoretical, numerical, and experimental perspectives for a better understanding of their behaviors and their potential applications in components, devices, and systems. Extensive reference lists provide opportunities to explore individual topics and classes of metamaterials in greater depth. With full-color illustrations throughout to clarify concepts and help visualize actual results, this book provides a dynamic, user-friendly resource for students, engineers, physicists, and other researchers in the areas of electromagnetic materials, microwaves, millimeter waves, and optics. It equips newcomers with a basic understanding of metamaterials and their potential applications. Advanced researchers will benefit from thought-provoking perspectives that will deepen their knowledge and lead them to new areas of investigation.

METAL FOAMS: A DESIGN GUIDE

Elsevier Metal foams are at the forefront of technological development for the automotive, aerospace, and other weight-dependent

industries. They are formed by various methods, but the key facet of their manufacture is the inclusion of air or other gaseous pockets in the metal structure. The fact that gas pockets are present in their structure provides an obvious weight advantage over traditionally cast or machined solid metal components. The unique structure of metal foams also opens up more opportunities to improve on more complex methods of producing parts with space inclusions such as sand-casting. This guide provides information on the advantages metal foams possess, and the applications for which they may prove suitable. Offers a concise description of metal foams, their manufacture, and their advantages in industry Provides engineers with answers to pertinent questions surrounding metal foams Satisfies a major need in the market for information on the properties, performance, and applications of these materials