Mechanics Of Solids Horwood Series In Engineering Science

STOUT VEGA

An Introduction to the Mechanical Properties of Solid Polymers BoD – Books on Demand
The aim of this volume is to present to researchers and engineers working on problems concerned with the mechanics of solids and structures, the current state of the development and application to procedures for assessing the reliability of a system. Particular attention is paid to their use in the analysis of complex engineering systems. The topics covered reflect the need to integrate, within the overall methodology, statistical methods for dealing with uncertain parameters and random excitation with the development of a suitable safety indexes and design codes. The basic principles of reliability theory, together with current standard methodology, including a consideration of the operational, economic and legal aspects of reliability assurance, is reviewed, together with an introduction to new developments, such as the application of expert systems technology. Damage accumulation predictions, with applications in seismic engineering are also covered.
Foundations of Elastoplasticity: Subloading Surface Model Woodhead Publishing
The main goal of the book is a coherent treatment of the theory of propagation in materials of nonlinearly elastic waves of displacements, which corresponds to one modern line of development of the nonlinear theory of elastic waves. The book is divided on five basic parts: the necessary information on waves and materials; the necessary information on nonlinear theory of elasticity and elastic materials; analysis of one-dimensional nonlinear elastic waves of displacement – longitudinal, vertically and horizontally polarized transverse plane nonlinear elastic waves of displacement; analysis of one-dimensional nonlinear elastic waves of displacement – cylindrical and torsional nonlinear elastic waves of displacement; analysis of two-dimensional nonlinear elastic waves of displacement – Rayleigh and Love nonlinear elastic surface waves. The book is addressed first of all to people working in solid mechanics – from the students at an advanced undergraduate and graduate level to the scientists, professionally interesting in waves. But mechanics is understood in the broad sense, when it includes mechanical and other engineering, material science, applied mathematics and physics and so forth. The genesis of this book can be found in author's years of research and teaching while a head of department at SP Timoshenko Institute of Mechanics (National Academy of Sciences of Ukraine), a member of Center for Micro and Nanomechanics at Engineering School of University of Aberdeen (Scotland) and a professor at Physical-Mathematical Faculty of National Technical University of Ukraine "KPI". The book comprises 11 chapters. Each chapter is complemented by exercises, which can be used for the next development of the theory of nonlinear waves.

Structural Integrity and Durability of Advanced Composites Elsevier
Problems concerning non-classical elastic solids continue to attract the attention of mathematicians, scientists and engineers. Research in this area addresses problems concerning many substances, such as crystals, polymers, composites, ceramics and blood. This comprehensive, accessible work brings together recent research in this field, and will be of great interest to mathematicians, physicists and other specialists working in this area.
Linear, Nonlinear, Analytical and Computational Aspects Springer Science & Business Media
This volume explores the mechanics of the behaviour of solid polymers, discussing molecular and structural interpretations and emphasizing the physical rather than the engineering approach. Readers are provided with a set of elementary problems and their solutions.
Nonlinear Elastic Waves in Materials Springer
This text covers the main applications of statistical mechanics to gases, liquids and solids - including metals and semiconductors. The book opens with discussion of some of the fundamental ideas that lie behind the subject. After a review of the Boltzmann distribution and the partition function there is a comprehensive treatment of gases based on Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein statistics. Coverage of solids is given, followed by the application of statistical mechanics to liquids.
Comprehensive Structural Integrity Springer Science & Business Media
This book concerns the numerical simulation of dynamical systems whose trajec- ries may not be differentiable everywhere. They are named nonsmooth dynamical systems. They make an important class of systems, rst because of the many app- cations in which nonsmooth models are useful, secondly because they give rise to new problems in various elds of science. Usually nonsmooth dynamical systems are represented as differential inclusions, complementarity systems, evolution va- ational inequalities, each of these classes itself being split into several subclasses. The book is divided into four parts, the rst three parts being sketched in Fig. 0. 1. The aim of the rst part is to present the main tools from mechanics and applied mathematics which are necessary to understand how nonsmooth dynamical systems may be numerically simulated in a reliable way. Many examples illustrate the th- retical results, and an emphasis is put on mechanical systems, as well as on electrical circuits (the so-called Filippov's systems are also examined in some detail, due to their importance in control applications). The second and third parts are dedicated to a detailed presentation of the numerical schemes. A fourth part is devoted to the presentation of the software platform Siconos. This book is not a textbook on - merical analysis of nonsmooth systems, in the sense that despite the main results of numerical analysis (convergence, order of consistency, etc.) being presented, their proofs are not provided.
Variational Models and Methods in Solid and Fluid Mechanics CRC Press
This resource covers all areas of interest for the practicing engineer as well as for the student at various levels and educational institutions. It features the work of authors from all over the world who have contributed their expertise and support the globally working engineer in finding a solution for today's mechanical engineering problems. Each subject is discussed in detail and supported by numerous figures and tables.
Comprehensive Structural Integrity John Wiley & Sons
This book deals with finite element analysis of structures and will be of value to students of civil, structural and mechanical engineering at final year undergraduate and post-graduate level. Practising structural engineers and researchers will also find it useful. Authoritative and up-to-date, it provides a thorough grounding in matrix-tensor analysis and the underlying theory, and a logical development of its application to structures.
Thermomechanics of Solids, Second Edition Elsevier
This book is the standard text book of elastoplasticity in which the elastoplasticity theory is comprehensively described from the conventional theory for the monotonic loading to the unconventional theory for the cyclic loading behavior. Explanations of vector-tensor analysis and continuum mechanics are provided first as a foundation for elastoplasticity theory, covering various strain and stress measures and their rates with their objectivities. Elastoplasticity has been highly developed by the creation and formulation of the subloading surface model which is the unified fundamental law for irreversible mechanical phenomena in solids. The assumption that the interior of the yield surface is an elastic domain is excluded in order to describe the plastic strain rate due to the rate of stress inside the yield surface in this model aiming at the prediction of cyclic loading behavior, although the yield surface enclosing the elastic domain is assumed in all the elastoplastic models other than the subloading surface model. Then, the plastic strain rate develops continuously as the stress approaches the yield surface, providing the advantages: 1) The tangent modulus changes continuously, 2) The yield judgment whether the stress reaches the yield surface is not required, 3) The stress is automatically attracted to the yield surface even when it goes out from the yield surface by large loading increments in numerical calculation and 4) The finite strain theory based on the multiplicative decomposition of deformation gradient tensor is formulated exactly. Consequently,

the monotonic, the cyclic, the non-proportional loading behaviors for wide classes of materials including soils, rocks and concretes in addition to metals can be described rigorously by the subloading surface model. Further, the viscoplastic constitutive equations in a general rate from the quasi-static to the impact loadings are described, and constitutive equations of friction behavior and its application to the prediction of stick-slip phenomena, etc. are also described in detail. In addition, the return-mapping algorithm, the consistent tangent modulus, etc. are explained for the numerical analyses. Further, the damage, the phase-transformation and the crystal plasticity models are also described in brief. All of them are based on the subloading surface model. The elastoplasticity analysis will be advanced steadily based on the subloading surface model.

Numerical Methods for Nonsmooth Dynamical Systems Macmillan International Higher Education

Fracture mechanics deals with the cracking behavior of materials, and cracking defines the limit state for many components of engineering systems. Fracture mechanics principles can help us design more robust components to ensure safer airplanes, space shuttles, ships, cranes, buildings, bridges, and mechanical systems. Written by researchers and experts of the field, this book examines recent progress in fracture mechanics applications. Chapters cover such topics as rupture theory, the J-integral, knitted fabric-reinforced polymer composites, and artificial neural networks to detect structural damage, among others. This volume is designed for graduate students, researchers, and practicing engineers.

Mechanics of Deformable Solids Springer Science & Business Media

The aim of this major reference work is to provide a first point of entry to the literature for the researchers in any field relating to structural integrity in the form of a definitive research/reference tool which links the various sub-disciplines that comprise the whole of structural integrity. Special emphasis will be given to the interaction between mechanics and materials and structural integrity applications. Because of the interdisciplinary and applied nature of the work, it will be of interest to mechanical engineers and materials scientists from both academic and industrial backgrounds including bioengineering, interface engineering and nanotechnology. The scope of this work encompasses, but is not restricted to: fracture mechanics, fatigue, creep, materials, dynamics, environmental degradation, numerical methods, failure mechanisms and damage mechanics, interfacial fracture and nano-technology, structural analysis, surface behaviour and heart valves. The structures under consideration include: pressure vessels and piping, off-shore structures, gas installations and pipelines, chemical plants, aircraft, railways, bridges, plates and shells, electronic circuits, interfaces, nanotechnology, artificial organs, biomaterial prostheses, cast structures, mining... and more. Case studies will form an integral part of the work.

Spatial Filtering for the Control of Smart Structures AIAA

Three subjects of major interest in one textbook: linear elasticity, mechanics of structures in linear isotropic elasticity, and nonlinear mechanics including computational algorithms. After the simplest possible, intuitive approach there follows the mathematical formulation and analysis, with computational methods occupying a good portion of the book. There are several worked-out problems in each chapter and additional exercises at the end of the book, plus mathematical expressions are bery often given in more than one notation. The book is intended primarily for students and practising engineers in mechanical and civil engineering, although students and experts from applied mathematics, materials science and other related fields will also find it useful.

Incremental Finite Element Modelling in Non-Linear Solid Mechanics Springer Science & Business Media

Explore a Unified Treatment of the Finite Element Method The finite element method has matured to the point that it can accurately and reliably be used, by a careful analyst, for an amazingly wide range of applications. With expanded coverage and an increase in fully solved examples, the second edition of Finite Element Analysis: Thermomechanics of Solids presents a unified treatment of the finite element method in theremomechanics, from the basics to advanced concepts. An Integrated Presentation of Critical Technology As in the first edition, the author presents and explicates topics in a way that demonstrates the highly unified structure of the finite element method. The presentation integrates continuum mechanics and relevant mathematics with persistent reliance on variational and incremental-variational foundations. The author exploits matrix-vector formalisms and Kronecker product algebra to provide transparent and consistent notation throughout the text. Nearly twice as long as the first edition, this second edition features: § Greater integration and balance between introductory and advanced material § Increased number of fully solved examples § Selected developments in numerical methods, detailing accelerating computations in eigenstructure extraction, time integration, and stiffness matrix triangularization § More extensive coverage of the arc length method for nonlinear problems § Expanded and enhanced treatment of rotating bodies and buckling Provides Sophisticated Understanding of Capabilities and Limitations This new edition of a popular text includes significant illustrative examples and applications, modeling strategies, and explores a range of computational issues. Written by a professor with years of practical engineering and instructional experience, the book provides a strong foundation for those requiring a sophisticated understanding of the method’s capabilities and limitations.

Computer Methods in Structural Analysis Mechanics of Solids

Bringing together basic ideas, classical theories, recent experimental and theoretical aspects, this book explains desiccation cracks from simple, easily-comprehensible cases to more complex, applied situations. The ideal team of authors, combining experimental and theoretical backgrounds, and with experience in both physical and earth sciences, discuss how the study of cracks can lead to the design of crack-resistant materials, as well as how cracks can be grown to generate patterned surfaces at the nano- and micro-scales. Important research and recent developments on tailoring desiccation cracks by different methods are covered, supported by straightforward, yet deep theoretical models. Intended for a broad readership spanning physics, materials science, and engineering to the geosciences, the book also includes additional reading especially for students engaged in pattern formation research.

Computational Fluid and Solid Mechanics 2003 Springer Science & Business Media

A practical learning tool for building a solid understanding of biomedical ultrasound Basics of Biomedical Ultrasound for Engineers is a structured textbook that leads the novice through the field in a clear, step-by-step manner. Based on twenty years of teaching experience, it begins with the most basic definitions of waves, proceeds to ultrasound in fluids and solids, explains the principles of wave attenuation and reflection, then introduces to the reader the principles of focusing devices, ultrasonic transducers, and acoustic fields, and then delves into integrative applications of ultrasound in conventional and advanced medical imaging techniques (including Doppler imaging) and therapeutic ultrasound. Demonstrative medical applications are interleaved within the text and exemplary questions with solutions are provided on every chapter. Readers will come away with the basic toolkit of knowledge they need to successfully use ultrasound in biomedicine and conduct research. Encompasses a wide range of topics within biomedical ultrasound, from attenuation and eflection of waves to the intricacies of focusing devices, transducers, acoustic fields, modern medical imaging techniques, and therapeutics Explains the most common applications of biomedical ultrasound from an engineering point of view Provides need-to-know information in the form of physical and mathematical principles directed at concrete applications Fills in holes in knowledge caused by ever-increasing new applications of ultrasonic imaging and therapy Basics of Biomedical Ultrasound for Engineers is designed for undergraduate and graduate engineering students; academic/research engineers unfamiliar with ultrasound; and physicians and researchers in biomedical disciplines who need an introduction to the field. This book is meant to be “my first book on biomedical ultrasound” for anyone who is interested in the field.

Basics of Biomedical Ultrasound for Engineers Elsevier

Structural Integrity and Durability of Advanced Composites: Innovative Modelling Methods and Intelligent Design presents scientific and technological research from leading composite materials scientists and engineers that showcase the fundamental issues and practical problems that affect the development and exploitation of large composite structures. As predicting precisely where cracks may develop in materials under stress is an age old mystery in the design and building of large-scale engineering structures, the burden of testing to provide "fracture safe design" is imperative. Readers will learn to transfer key ideas from research and development to both the design engineer and end-user of composite materials. This comprehensive text provides the information users need to understand deformation and fracture phenomena resulting from impact, fatigue, creep, and stress corrosion cracking and how these phenomena can affect reliability, life expectancy, and the durability of structures. Presents scientific and technological research from leading composite materials scientists and engineers that showcase fundamental issues and practical problems Provides the information users need to understand deformation and fracture phenomena resulting from impact, fatigue, creep, and stress corrosion cracking Enables readers to transfer key ideas from research and development to both the design engineer and end-user of composite materials

Computational Nonlinear Mechanics in Aerospace Engineering Cambridge University Press

Bringing together the world's leading researchers and practitioners of computational mechanics, these new volumes meet and build on the eight key challenges for research and development in computational mechanics. Researchers have recently identified eight critical research tasks facing the field of computational mechanics. These tasks have come about because it appears possible to reach a new level of mathematical modelling and numerical solution that will lead to a much deeper understanding of nature and to great improvements in engineering design. The eight tasks are: The automatic solution of mathematical models Effective numerical schemes for fluid flows The development of an effective mesh-free numerical solution method The development of numerical procedures for multiphysics problems The development of numerical procedures for multiscale problems The modelling of uncertainties The analysis of complete life cycles of systems Education - teaching sound engineering and scientific judgement Readers of Computational Fluid and Solid Mechanics 2003 will be able to apply the combined experience of many of the world's leading researchers to their own research needs. Those in academic environments will gain a better insight into the needs and constraints of the industries they are involved with; those in industry will gain a competitive advantage by gaining insight into the cutting edge research being carried out by colleagues in academia. Features Bridges the gap between academic researchers and practitioners in industry Outlines the eight main challenges facing Research and Design in Computational mechanics and offers new insights into the shifting the research agenda Provides a vision of how strong, basic and exciting education at university can be harmonized with life-long learning to obtain maximum value from the new powerful tools of analysis

An Introduction Springer

This book considers the modelling and analysis of the many types of ropes, linear fibre assemblies. The construction of these structures is very diverse and in the work these are considered from the modelling point of view. As well as the conventional twisted structures, braid and plaited structures and parallel assemblies are modelled and analysed, first for their assembly and secondly for their mechanical behaviour. Also since the components are assemblies of components, fibres into yarns, into strands, and into ropes the hierarchical nature of the construction is considered. The focus of the modelling is essentially toward load extension behaviour but there is reference to bending of ropes, encompassed by the two extremes, no slip between the components and zero friction resistance to component slip. Friction in ropes is considered both between the rope components, sliding, sawing and scissoring, and within the components, dilation and distortion, these latter modes being used to model component set, the phenomenon instrumental in rope proofing. The exploitation of the modelling is closed by the suggested modelling and analysis of component wear and life limitation and also of rope steady state heating. These will require extensive experimentation to extract the necessary coefficients, achievable by parallel testing of prototypes and similar structures. This development is focused on the modelling and analysis of ropes and other similar structures. All the modelling is based on the Principle of Virtual Work and admissible modes of deformation. Finally this book is directed towards the various industries involved in design, manufacture and use of ropes, stays and other similar structures.

Waves in Nonlinear Pre-Stressed Materials Courier Corporation

What follows is my personal perspective on early events that played a signi?cant role in the formation of the ?eld now known as Smart Structures. It is by no means meant to be all inclusive or de?nitive in any way, but merely an account of personal experiences that ultimately lead to the development of the material contained and presented herein. On March 23, 1983 then President Ronald Reagan announced his intentions to develop a new system to reduce the threat of nuclear attack and end the strategy of mutual deterrence in an address to the nation entitled, Address to the Nation on Defense and National Security. The system he proposed became known as “Star Wars,” after the popular movie, because it was meant to provide a protective shield over the nation from space. His speech mobilized the entire nation on a research and development path toward this end. Investigations were conducted into new areas such as space based radar, large aperture antennae and large ?exible mirror concepts. These proposed systems r- resented an entirely new class of structures that proved to provide new challenges in materials, structures, control systems and modeling. For example antennae needed to monitor large areas of real estate in the continental United States required ap- tures on the order of 100 m.

Mechanics of Solids Springer Nature

Self-contained treatment supplements standard texts by focusing on analytical methods for determining crack-tip stress and strain fields. Topics include plastic zone transitions, environmental cracking, more. "Recommended." — Applied Mechanics Review.