Mechanics Of Solid Polymers Theory And Computational Modeling

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Finite Element Modeling of Textiles in AbaqusTM CAE - Izabela Ciesielska-Wrobel 2019-07-26
The aim of the book is to provide engineers with a practical guide to Finite Element Modelling (FEM) in Abaqus CAE software. The guide is in the form of step-by-step procedures concerning yarns, woven fabric and knitted fabrics modelling, as well as their contact with skin so that the simulation of haptic perception between textiles and skin can be

CONAT 2016 International Congress of Automotive and Transport Engineering - Anghel Chiru 2016-10-31
The volume will include selected and reviewed papers from CONAT - International Congress of Automotive and Transport Engineering to be

held in Brasov, Romania, in October 2016. Authors are experts from research, industry and universities coming from 14 countries worldwide. The papers are covering the latest developments in automotive vehicles and environment, advanced transport systems and road traffic, heavy and special vehicles, new materials, manufacturing technologies and logistics, accident research and analysis and innovative solutions for automotive vehicles. The conference will be organized by SIAR (Society of Automotive Engineers from Romania) in cooperation with FISITA.

Constitutive Modeling of Engineering Materials - Vladimir Buljak 2021-02-18

Constitutive Modeling of Engineering Materials provides an extensive theoretical overview of elastic, plastic, damage, and fracture models, giving readers the foundational knowledge needed to successfully apply them to and solve common engineering material problems. Particular attention is given to inverse analysis, parameter identification, and the numerical implementation of models with the finite element method. Application in practice is discussed in detail, showing examples of working computer programs for simple constitutive behaviors. Examples explore the important components of material modeling which form the building blocks of any complex constitutive behavior. Addresses complex behaviors in a wide range of materials, from polymers, to metals and shape memory alloys Covers constitutive models with both small and large deformations Provides detailed examples of computer implementations for material models

Advanced Methods of Continuum Mechanics for Materials and Structures - Konstantin Naumenko 2016-05-12

This volume presents a collection of contributions on advanced approaches of continuum mechanics, which were written to celebrate the 60th birthday of Prof. Holm

Altenbach. The contributions are on topics related to the theoretical foundations for the analysis of rods, shells and three-dimensional solids, formulation of constitutive models for advanced materials, as well as development of new approaches to the modeling of damage and fractures.

Mechanical Behavior of Materials - Marc André Meyers 2008-11-06

A balanced mechanics-materials approach and coverage of the latest developments in biomaterials and electronic materials, the new edition of this popular text is the most thorough and modern book available for upper-level undergraduate courses on the mechanical behavior of materials. To ensure that the student gains a thorough understanding the authors present the fundamental mechanisms that operate at micro- and nano-meter level across a wide-range of materials, in a way that is mathematically simple and requires no extensive knowledge of materials. This integrated approach provides a conceptual presentation that shows how the microstructure of a material controls its mechanical behavior, and this is reinforced through extensive use of micrographs and illustrations. New worked examples and exercises help the student test their understanding. Further resources for this title, including lecture slides of select illustrations and solutions for exercises, are available online at www.cambridge.org/9780521866758.

Characterization of Polymers and Fibers - Mukesh Kumar Singh 2021-09-19

Characterization of Polymers and Fibres addresses an integral part of fiber and polymer manufacturing processes that is crucial in helping manufacturers ensure that final products achieve intended specifications. The characterization of fiber and polymers is needed for attributes including molecular weight, morphology, dyeing behavior, tensile, optical and

thermal behavior. This book covers a wide range of characterization techniques, including thermal, X-ray diffraction, solubility, tensile, optical, hygroscopic and particle size distribution. Introductions and definitions are provided where beneficial to make topics accessible to a broad range of readers in both academia and industry. Addressing advances from the fields of bioscience, polymer science, material science, and textile science, this book is wide in scope, drawing on the latest research to provide details of characterization techniques and equipment. Provides a thorough description of the material quality control process, including the latest industry practice Presents material characterization at all levels, from the atomic level to surface structure Covers technical advice on natural fiber characterization methods, including XRD, XPS, TGA, SEM, TEM, AFM, Contact angle, Particle size analysis, FTIR, and NMR

Temperature-dependent Deformation and Fracture Behavior of a Talcum-filled Co-polymer - David Degenhardt 2020-04-18

David Degenhardt develops an elasto-viscoplastic material model in order to predict the temperature and strain rate-dependent deformation and fracture behavior of thermoplastic polymers. The model bases on three supporting ambient temperatures, where a thermoplastic polymer has been characterized profoundly at the stress states 1) uni-axial tension and compression, 2) bi-axial tension and 3) shear. The core of the material model builds a pressure-dependent yield function with a non-associated flow rule. Further, it contains an analytical hardening law and a strain rate-dependent fracture criterion. The model is validated with components subjected to impact loading at different ambient temperatures. The comparison of the simulation and the experiments shows that

stiffness, hardening, fractures strain as well as thicknesses can be well captured. About the Author: David Degenhardt is a calculation engineer in the chassis development department of a German automobile manufacturer and earned his doctorate while working at the Technische Universität Carolo-Wilhelmina zu Braunschweig, Germany.

Mechanics of Solid Polymers - Jorgen S. Bergstrom 2015-06-15

Very few polymer mechanics problems are solved with only pen and paper today, and virtually all academic research and industrial work relies heavily on finite element simulations and specialized computer software. Introducing and demonstrating the utility of computational tools and simulations, Mechanics of Solid Polymers provides a modern view of how solid polymers behave, how they can be experimentally characterized, and how to predict their behavior in different load environments. Reflecting the significant progress made in the understanding of polymer behaviour over the last two decades, this book will discuss recent developments and compare them to classical theories. The book shows how best to make use of commercially available finite element software to solve polymer mechanics problems, introducing readers to the current state of the art in predicting failure using a combination of experiment and computational techniques. Case studies and example Matlab code are also included. As industry and academia are increasingly reliant on advanced computational mechanics software to implement sophisticated constitutive models - and authoritative information is hard to find in one place - this book provides engineers with what they need to know to make best use of the technology available. Helps professionals deploy the latest experimental polymer testing methods to assess suitability for applications Discusses

material models for different polymer types Shows how to best make use of available finite element software to model polymer behaviour, and includes case studies and example code to help engineers and researchers apply it to their work

Applied Mechanics of Polymers - George Youssef 2021-12-02 Applied Mechanics of Polymers: Properties, Processing, and Behavior provides readers with an overview of the properties, mechanical behaviors and modeling techniques for accurately predicting the behaviors of polymeric materials. The book starts with an introduction to polymers, covering their history, chemistry, physics, and various types and applications. In addition, it covers the general properties of polymers and the common processing and manufacturing processes involved with them. Subsequent chapters delve into specific mechanical behaviors of polymers such as linear elasticity, hyperelasticity, creep, viscoelasticity, failure, and fracture. The book concludes with chapters discussing electroactive polymers, hydrogels, and the mechanical characterization of polymers. This is a useful reference text that will benefit graduate students, postdocs, researchers, and engineers in the mechanics of materials, polymer science, mechanical engineering and material science. Additional resources related to the book can be found at polymersmechanics.com. Provides examples of real-world applications that demonstrate the use of models in designing polymer-based components Includes access to a companion site from where readers can download FEA and MATLAB code, FEA simulation files, videos and other supplemental material Features end-of-chapter summaries with design and analysis guidelines, practice problem sets based on real-life situations, and both analytical and computational examples to bridge academic and industrial

applications

Theoretical Analyses, Computations, and Experiments of Multiscale Materials - Ivan Giorgio 2022

This book is devoted to the 60th birthday of the Prof. Francesco dellIsola, who is known for his long-term contribution in the field of multiscale materials. It contains several contributions from researchers in the field, covering theoretical analyses, computational aspects and experiments.

Molecular Mobility in Deforming Polymer Glasses - Nikhil Padhye 2021

This book bridges disparate fields in an exploration of the phenomena and applications surrounding molecular mobility in glassy materials experiencing inelastic deformation. The subjects of plastic deformation and polymer motion/interdiffusion currently belong to the two different fields of continuum mechanics and polymer physics, respectively. However, molecular motion associated with plastic deformation is a key ingredient to gain fundamental understanding, both at the macroscopic and microscopic level. This short monograph provides necessary background in the aforementioned fields before addressing the topic of molecular mobility accompanied by macroscopic inelastic deformation in an accessible and easy-to-understand manner. A new phenomenon of solid-state deformation-induced bonding in polymers is discussed in detail, along with some broad implications in several manufacturing sectors. Open questions pertaining to mechanisms, mechanics, and modeling of deformation-induced bonding in polymers are presented. The book's clear language and careful explanations will speak to readers of diverse backgrounds.

Electronic Structure of Organic Semiconductors - Luís Alcácer 2018-12-07

Written in the perspective of an experimental chemist, this book puts together some

fundamentals from chemistry, solid state physics and quantum chemistry, to help with understanding and predicting the electronic and optical properties of organic semiconductors, both polymers and small molecules. The text is intended to assist graduate students and researchers in the field of organic electronics to use theory to design more efficient materials for organic electronic devices such as organic solar cells, light emitting diodes and field effect transistors. After addressing some basic topics in solid state physics, a comprehensive introduction to molecular orbitals and band theory leads to a description of computational methods based on Hartree-Fock and density functional theory (DFT), for predicting geometry conformations, frontier levels and energy band structures. Topological defects and transport and optical properties are then addressed, and one of the most commonly used transparent conducting polymers, PEDOT:PSS, is described in some detail as a case study.

Microbial Nanobiotechnology - Agbaje Lateef 2021

This edited book serves as a vital resource on the contributions of microorganisms to advances in nanotechnology, establishing their applications in diverse areas of biomedicine, environment, biocatalysis, food and nutrition, and renewable energy. It documents the impacts of microorganisms in nanotechnology leading to further developments in microbial nanobiotechnology. This book appeals to researchers and scholars of microbiology, biochemistry and nanotechnology.

Current Perspectives and New Directions in Mechanics, Modelling and Design of Structural Systems - Alphose Zingoni 2022-08-24

Current Perspectives and New Directions in Mechanics, Modelling and Design of Structural Systems comprises 330 papers that were presented at the Eighth

International Conference on Structural Engineering, Mechanics and Computation (SEMC 2022, Cape Town, South Africa, 5-7 September 2022). The topics featured may be clustered into six broad categories that span the themes of mechanics, modelling and engineering design: (i) mechanics of materials (elasticity, plasticity, porous media, fracture, fatigue, damage, delamination, viscosity, creep, shrinkage, etc); (ii) mechanics of structures (dynamics, vibration, seismic response, soil-structure interaction, fluid-structure interaction, response to blast and impact, response to fire, structural stability, buckling, collapse behaviour); (iii) numerical modelling and experimental testing (numerical methods, simulation techniques, multi-scale modelling, computational modelling, laboratory testing, field testing, experimental measurements); (iv) design in traditional engineering materials (steel, concrete, steel-concrete composite, aluminium, masonry, timber); (v) innovative concepts, sustainable engineering and special structures (nanostructures, adaptive structures, smart structures, composite structures, glass structures, bio-inspired structures, shells, membranes, space structures, lightweight structures, etc); (vi) the engineering process and life-cycle considerations (conceptualisation, planning, analysis, design, optimization, construction, assembly, manufacture, maintenance, monitoring, assessment, repair, strengthening, retrofitting, decommissioning). Two versions of the papers are available: full papers of length 6 pages are included in an e-book, while short papers of length 2 pages, intended to be concise but self-contained summaries of the full papers, are in this printed book. This work will be of interest to civil, structural, mechanical, marine and aerospace engineers, as well as planners and architects.

Springer Handbook of Experimental Solid

Mechanics - William N. Sharpe 2008-12-04
As a reference book, the Springer Handbook provides a comprehensive exposition of the techniques and tools of experimental mechanics. An informative introduction to each topic is provided, which advises the reader on suitable techniques for practical applications. New topics include biological materials, MEMS and NEMS, nanoindentation, digital photomechanics, photoacoustic characterization, and atomic force microscopy in experimental solid mechanics. Written and compiled by internationally renowned experts in the field, this book is a timely, updated reference for both practitioners and researchers in science and engineering.

Modeling and Analysis of Passive Vibration Isolation Systems - Sudhir Kaul 2021-07-30
Modeling and Analysis of Passive Vibration Isolators and Systems provides readers with a general background on vibration isolation and the modeling of single and multiple degree-of-freedom systems. Other sections cover a range of models that can be used in each system, discussing the pros and cons of the models and providing guidance on model selection. introduce models that can be used to comprehend some of the nonlinearities associated with the design of vibration isolation systems, and discuss specific attributes associated with elastomeric materials that need to be considered during the design and analysis of passive vibration isolators, along with applied examples that can be used for reference. Specific models from previous chapters are used to demonstrate the influence of model selection and parameter sensitivity. Practical exercises are highlighted at the end of each chapter, and appendices featuring differential equations and matrix algebra examples provide mathematical background in support of preceding chapters. Outlines the use of multiple models for

optimal passive vibration isolation system design Discusses the effects system design has on subsequent product development components and parameters Includes applied examples from the automotive, aerospace, civil engineering and machine tool industries Presents models that can be extended or modified to investigate different means of passive isolation, nonlinearities and specific design configurations Considers specific elastomer characteristics such as Mullins and Payne effects for theoretical modeling and analysis

Designing of Elastomer Nanocomposites: From Theory to Applications - Klaus Werner Stöckelhuber 2016-10-31

The series Advances in Polymer Science presents critical reviews of the present and future trends in polymer and biopolymer science. It covers all areas of research in polymer and biopolymer science including chemistry, physical chemistry, physics, material science.The thematic volumes are addressed to scientists, whether at universities or in industry, who wish to keep abreast of the important advances in the covered topics.Advances in Polymer Science enjoys a longstanding tradition and good reputation in its community. Each volume is dedicated to a current topic, and each review critically surveys one aspect of that topic, to place it within the context of the volume. The volumes typically summarize the significant developments of the last 5 to 10 years and discuss them critically, presenting selected examples, explaining and illustrating the important principles, and bringing together many important references of primary literature. On that basis, future research directions in the area can be discussed. Advances in Polymer Science volumes thus are important references for every polymer scientist, as well as for other scientists interested in polymer science - as an introduction to a neighboring

field, or as a compilation of detailed information for the specialist.Review articles for the individual volumes are invited by the volume editors. Single contributions can be specially commissioned.Readership: Polymer scientists, or scientists in related fields interested in polymer and biopolymer science, at universities or in industry, graduate students.

Computational Modeling of Polymers - Jozef Bicerano 1992-03-17

Mechanical and Dynamic Properties of Biocomposites - Senthilkumar Krishnasamy 2021-05-26

Mechanical and Dynamic Properties of Biocomposites A comprehensive review of the properties of biocomposites and their applications Mechanical and Dynamic Properties of Biocomposites offers a comprehensive overview of the mechanical and dynamic properties of biocomposites and natural fiber-reinforced polymer composites. This essential resource helps with materials selection in the development of products in the fields of automotive and aerospace engineering as well as the construction of structures in civil engineering. With contributions from a panel of experts in the field, the book reviews the mechanical and damping properties of lingo-cellulosic fibers and their composites. The authors highlight the factors that contribute to the improved properties and their advancements in modern industrialization. Besides, the book is designed to (a) introduce the mechanical and damping properties of lingo-cellulosic fibers and their composites, (b) factors that contribute to improvement in properties such as hybridization, chemical treatment of natural fibers, additive or fillers, etc. and (c) the real-time applications with case studies and future prospects. Key features: Presents viable alternatives to conventional composites

Examines the environmentally friendly and favorable mechanical properties of biocomposites Reviews the potential applications of biocomposites in the fields of automotive, mechanical and civil engineering Brings together in one comprehensive resource information found scattered across the professional literature Written for materials scientists, polymer chemists, chemists in industry, civil engineers, construction engineers, and engineering scientists in industry, Mechanical and Dynamic Properties of BIocomposites offers a compreshensive review of the properties and applications of biocomposites.

Essentials of Computational Chemistry - Christopher J. Cramer 2013-04-29
Essentials of Computational Chemistry provides a balanced introduction to this dynamic subject. Suitable for both experimentalists and theorists, a wide range of samples and applications are included drawn from all key areas. The book carefully leads the reader thorough the necessary equations providing information explanations and reasoning where necessary and firmly placing each equation in context.

Mechanical Properties of Polycarbonate - Weihong Zhang 2019-08-26
Mechanical Properties of Polycarbonate: Experiment and Modeling for Aeronautical and Aerospace Applications provides a detailed description on experimental characterization, material modeling and finite element simulation method for polycarbonate in aeronautical and aerospace applications. The book presents the experiment facilities and methods used in characterizing the mechanical properties of polycarbonate in a large range of strain rates and temperatures. The constitutive modeling of polycarbonate and the finite element simulation of polycarbonate products under impact loading are illustrated in detail. Finally, an optimization methodology is

devised to optimize the injection molding process parameters for high mechanical performance of the product under impact loading. Provides a detailed description of experimental methods and modeling technologies for the characterization of polycarbonate in aeronautical and aerospace applications Proposes an integrative method that combines treatment and mechanical simulations for polycarbonate products Helps readers learn how to test the mechanical properties of polycarbonate in a wide range of strain rates and temperatures

Reliability of Organic Compounds in Microelectronics and Optoelectronics - Willem Dirk van Driel 2022

This book aims to provide a comprehensive reference into the critical subject of failure and degradation in organic materials, used in optoelectronics and microelectronics systems and devices. Readers in different industrial sectors, including microelectronics, automotive, lighting, oil/gas, and petrochemical will benefit from this book. Several case studies and examples are discussed, which readers will find useful to assess and mitigate similar failure cases. More importantly, this book presents methodologies and useful approaches in analyzing a failure and in relating a failure to the reliability of materials and systems. Presents methodologies for analysing the reliability, failure, and degradation of different organic materials, used in optoelectronics and microelectronics; Provides an overview of different failure mechanisms in different organic materials; Explains how to correlate product performance and reliability to materials degradation; Provides an overview of simulation techniques and methodologies to predict lifetime and reliability of engineering materials and components; Integrates several degradation causes in different materials (thermal, moisture, light radiation, mechanical

damage, and more) into large-scale system solutions in several industrial domains (lighting, automotive, oil/gas, and transport and more); Includes case studies from different failure/degradation mechanisms in different industrial sectors.

An Introduction to the Mechanical Properties of Solid Polymers - I. M. Ward 2005-08-19

Provides a comprehensive introduction to the mechanical behaviour of solid polymers. Extensively revised and updated throughout, the second edition now includes new material on mechanical relaxations and anisotropy, composites modelling, non-linear viscoelasticity, yield behaviour and fracture of tough polymers. The accessible approach of the book has been retained with each chapter designed to be self contained and the theory and applications of the subject carefully introduced where appropriate. The latest developments in the field are included alongside worked examples, mathematical appendices and an extensive reference. Fully revised and updated throughout to include all the latest developments in the field Worked examples at the end of the chapter An invaluable resource for students of materials science, chemistry, physics or engineering studying polymer science

Applied Mechanics of Solids - Allan F. Bower 2009-10-05

Modern computer simulations make stress analysis easy. As they continue to replace classical mathematical methods of analysis, these software programs require users to have a solid understanding of the fundamental principles on which they are based.Develop Intuitive Ability to Identify and Avoid Physically Meaningless PredictionsApplied Mechanics o

Stability and Ductility of Steel Structures 2019 - František Wald 2019-08-30

For more than forty years the series of International Colloquia on Stability and Ductility of Steel Structures

has been supported by the Structural Stability Research Council (SSRC). Its objective is to present the latest results in theoretical, numerical and experimental research in the area of stability and ductility of steel and steel-concrete composite structures. In Stability and Ductility of Steel Structures 2019, the focus is on new concepts and procedures concerning the analysis and design of steel structures and on the background, development and application of rules and recommendations either appearing in recently published Codes or Specifications and in emerging versions, all in anticipation of the new edition of Eurocodes. The series of International Colloquia on Stability and Ductility of Steel Structures started in Paris in 1972, the last five being held in: Timisoara, Romania (1999), Budapest, Hungary (2002), Lisbon, Portugal (2006), Rio de Janeiro, Brazil (2010) and Timisoara, Romania (2016). The 2019 edition of SDSS is organized by the Czech Technical University in Prague.

Simulation of damage mechanisms in weave reinforced materials based on multiscale modeling - Naake, Dominik Robert 2020-09-18

A weave reinforced composite material with a thermoplastic matrix is investigated by using a multiscale chain to predict the macroscopic material behavior. A large-strain framework for constitutive modeling with focus on material non-linearities, i.e. plasticity and damage is defined. The ability of the geometric and constitutive models to predict the deformation and failure behavior is demonstrated by means of selected examples.

Plasticity - P.M. Dixit 2014-10-23

Explores the Principles of Plasticity Most undergraduate programs lack an undergraduate plasticity theory course, and many graduate programs in design and manufacturing lack a course on plasticity—leaving a number of engineering students without

adequate information on the subject. Emphasizing stresses generated in the material and its effect, Plasticity: Fundamentals and Applications effectively addresses this need. This book fills a void by introducing the basic fundamentals of solid mechanics of deformable bodies. It provides a thorough understanding of plasticity theory, introduces the concepts of plasticity, and discusses relevant applications. Studies the Effects of Forces and Motions on Solids The authors make a point of highlighting the importance of plastic deformation, and also discuss the concepts of elasticity (for a clear understanding of plasticity, the elasticity theory must also be understood). In addition, they present information on updated Lagrangian and Eulerian formulations for the modeling of metal forming and machining. Topics covered include: Stress Strain Constitutive relations Fracture Anisotropy Contact problems Plasticity: Fundamentals and Applications enables students to understand the basic fundamentals of plasticity theory, effectively use commercial finite-element (FE) software, and eventually develop their own code. It also provides suitable reference material for mechanical/civil/aerospace engineers, material processing engineers, applied mechanics researchers, mathematicians, and other industry professionals.

Mechanical Properties of Solid Polymers - Ian M. Ward 2012-10-22

Providing an updated and comprehensive account of the propertiesof solid polymers, the book covers all aspects of mechanicalbehaviour. This includes finite elastic behavior, linearviscoelasticity and mechanical relaxations, mechanical anisotropy,non-linear viscoelasicity, yield behavior and fracture. New to thisedition is coverage of polymer nanocomposites, and molecularinterpretations of yield, e.g. Bowden, Young, and Argon. The book begins by

focusing on the structure of polymers,including their chemical composition and physical structure. It goes on to discuss the mechanical properties and behaviour ofpolymers, the statistical molecular theories of the rubber-likestate and describes aspects of linear viscoelastic behaviour, itsmeasurement, and experimental studies. Later chapters cover composites and experimental behaviour,relaxation transitions, stress and yielding. The book concludeswith a discussion of breaking phenomena.

Predictive Theoretical and Computational Approaches for Additive Manufacturing - National Academies of Sciences, Engineering, and Medicine 2016-12-21

Additive manufacturing (AM) methods have great potential for promoting transformative research in many fields across the vast spectrum of engineering and materials science. AM is one of the leading forms of advanced manufacturing which enables direct computer-aided design (CAD) to part production without part-specific tooling. In October 2015 the National Academies of Sciences, Engineering, and Medicine convened a workshop of experts from diverse communities to examine predictive theoretical and computational approaches for various AM technologies. While experimental workshops in AM have been held in the past, this workshop uniquely focused on theoretical and computational approaches and involved areas such as simulation-based engineering and science, integrated computational materials engineering, mechanics, materials science, manufacturing processes, and other specialized areas. This publication summarizes the presentations and discussions from the workshop.

Unified Strength Theory and Its Applications - Mao-Hong Yu 2017-11-21

This book thoroughly describes a theory concerning the yield and failure of materials under multi-axial stresses – the

Unified Strength Theory, which was first proposed by the author and has been frequently quoted since. It provides a system of yield and failure criteria adopted for most materials, from metals to rocks, concretes, soils, and polymers. This new edition includes six additional chapters: General behavior of Strength theory function; Visualization of the Unified Strength Theory; Equivalent Stress of the UST and Comparisons with other criteria; Economic Signification of the UST; General form of failure criterion; Beauty of Strength Theories. It is intended for researchers and graduate students in various fields, including engineering mechanics, material mechanics, plasticity, soil mechanics, rock mechanics, mechanics of metallic materials and civil engineering, hydraulic engineering, geotechnical engineering, mechanical engineering and military engineering.

The Equilibrium Theory of Inhomogeneous Polymers - Glenn Fredrickson 2006

This book provides a pedagogical introduction to the theoretical and computer simulation techniques that are useful in the design of polymer formulations including personal care products, multiphase plastic materials, processed foods, and colloidal and nanoparticle dispersions. The book serves to unify previous work in a common language and provides a balanced treatment of analytical theory and numerical techniques, including an introduction to the exciting new field offield-theoretic polymer simulations - the direct numerical simulation of field theory models of meso-structured polymer melts, solutions, and dispersions.

Handbook of Materials Behavior Models, Three-Volume Set - Jean LeMaitre 2001-11-17

This first of a kind reference/handbook deals with nonlinear models and properties of material. In the study the behavior of materials' phenomena no unique laws

exist. Therefore, researchers often turn to models to determine the properties of materials. This will be the first book to bring together such a comprehensive collection of these models. The Handbook deals with all solid materials, and is organized first by phenomena. Most of the materials models presented in an applications-oriented fashion, less descriptive and more practitioner-geared, making it useful in the daily working activities of professionals. The Handbook is divided into three volumes. Volume I, Deformation of Materials, introduces general methodologies in the art of modeling, in choosing materials, and in the "so-called" size effect. Chapters 2-5 deal respectively with elasticity and viscoelasticity, yield limit, plasticity, and visco-plasticity. Volume II, Failures in Materials, provides models on such concerns as continuous damage, cracking and fracture, and friction wear. Volume III, Multiphysics Behavior, deals with multiphysics coupled behaviors. Chapter's 10 and 11 are devoted to special classes of materials (composites, biomaterials, and geomaterials). The different sections within each chapter describe one model each with its domain of validity, its background, its formulation, the identification of material parameters for as many materials as possible, and advice on how to implement or use the model. The study of the behavior of materials, especially solids, is related to hundreds of areas in engineering design and control. Predicting how a material will perform under various conditions is essential to determining the optimal performance of machines and vehicles and the structural integrity of buildings, as well as safety issues. Such practical examples would be how various new materials, such as those used in new airplane hulls, react to heat or cold or sudden temperature changes, or how new building materials hold up under extreme earthquake conditions. The Handbook of

Materials Behavior Models: Gathers together 117 models of behavior of materials written by the most eminent specialists in their field Presents each model's domain of validity, a short background, its formulation, a methodology to identify the materials parameters, advise on how to use it in practical applications as well as extensive references Covers all solid materials: metals, alloys, ceramics, polymers, composites, concrete, wood, rubber, geomaterials such as rocks, soils, sand, clay, biomaterials, etc Concerns all engineering phenomena: elasticity, viscoelasticity, yield limit, plasticity, viscoplasticity, damage, fracture, friction, and wear

Mechanical Properties of Solid Polymers - I. M. Ward 1983-06-27

A concise, self-contained introduction to solid polymers, the mechanics of their behavior and molecular and structural interpretations. This updated edition provides extended coverage of recent developments in rubber elasticity, relaxation transitions, non-linear viscoelastic behavior, anisotropic mechanical behavior, yield behavior of polymers, breaking phenomena, and other fields.

Continuum Mechanics of Solids - Lallit Anand 2020-07-21

Continuum Mechanics of Solids is an introductory text for graduate students in the many branches of engineering, covering the basics of kinematics, equilibrium, and material response. As an introductory book, most of the emphasis is upon the kinematically linear theories of elasticity, plasticity, and viscoelasticity, with two additional chapters devoted to topics in finite elasticity. Further chapters cover topics in fracture and fatigue and coupled field problems, such as thermoelasticity, chemoelasticity, poroelasticity, and piezoelectricity. There is ample material for a two semester course, or by selecting only topics of interest for a one-semester offering.

The text includes numerous examples to aid the student. A companion text with over 180 fully worked problems is also available.

The Physics of Deformation and Fracture of Polymers - A. S. Argon 2013-03-07

A physical, mechanism-based presentation of the plasticity and fracture of polymers, covering industrial scale applications through to nanoscale biofluidic devices.

Fatigue Crack Growth in Rubber Materials - Gert Heinrich 2021-03-23

The book summarizes recent international research and experimental developments regarding fatigue crack growth investigations of rubber materials. It shows the progress in fundamental as well as advanced research of fracture investigation of rubber material under fatigue loading conditions, especially from the experimental point of view. However, some chapters will describe the progress in numerical modeling and physical description of fracture mechanics and cavitation phenomena in rubbers. Initiation and propagation of cracks in rubber materials are dominant phenomena which determine the lifetime of these soft rubber materials and, as a consequence, the lifetime of the corresponding final rubber parts in various fields of application. Recently, these phenomena became of great scientific interest due to the development of new experimental methods, concepts and models. Furthermore, crack phenomena have an extraordinary impact on rubber wear and abrasion of automotive tires; and understanding of crack initiation and growth in rubbers will help to support the growthing number of activities and worldwide efforts of reduction of tire wear losses and abrasion based emissions.

Dynamic Behavior of Materials, Volume 1 - Jamie Kimberley 2017-10-29

Dynamic Behavior of Materials, Volume 1 of the Proceedings of the 2017 SEM Annual Conference& Exposition on

Experimental and Applied Mechanics, the first 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 Experimental Mechanics, including papers on: Quantitative Visualization Fracture & Fragmentation Dynamic Behavior of Low Impedance Materials Shock & Blast Dynamic Behavior of Composites Novel Testing Techniques Hybrid Experimental & Computational Methods Dynamic Behavior of Geo-materials General Material Behavior

Mechanics of Solid Polymers - Jorgen S Bergstrom 2015-07-11

Very few polymer mechanics problems are solved with only pen and paper today, and virtually all academic research and industrial work relies heavily on finite element simulations and specialized computer software. Introducing and demonstrating the utility of computational tools and simulations, Mechanics of Solid Polymers provides a modern view of how solid polymers behave, how they can be experimentally characterized, and how to predict their behavior in different load environments. Reflecting the significant progress made in the understanding of polymer behaviour over the last two decades, this book will discuss recent developments and compare them to classical theories. The book shows how best to make use of commercially available finite element software to solve polymer mechanics problems, introducing readers to the current state of the art in predicting failure using a combination of experiment and computational techniques. Case studies and example Matlab code are also included. As industry and academia are increasingly reliant on advanced computational mechanics software to implement sophisticated constitutive models – and

authoritative information is hard to find in one place - this book provides engineers with what they need to know to make best use of the technology available. Helps professionals deploy the latest experimental polymer testing methods to assess suitability for applications Discusses material models for different polymer types Shows how to best make use of available finite element software to model polymer behaviour, and includes case studies and example code to help engineers and researchers apply it to their work

Fiber-dependent injection molding simulation of discontinuous reinforced polymers - Wittemann, Florian 2022-11-18

This work presents novel simulation techniques for injection molding of fiber reinforced polymers. These include approaches for anisotropic flow modeling, hydrodynamic forces from fluid on fibers, contact forces between fibers, a novel fiber breakage modeling approach and anisotropic warpage analysis. Due to the coupling of fiber breakage and anisotropic flow modeling, the fiber breakage directly influences the modeled cavity pressure, which is validated with experimental data.

Polymer-Based Additive Manufacturing - Declan M. Devine 2019-09-16

This book aims to give readers a basic understanding of commonly used additive manufacturing techniques as well as the tools to fully utilise the strengths of additive manufacturing through the modelling and design phase all the way through to post processing. Guidelines for 3D-printed biomedical implants are also provided. Current biomedical applications of 3D printing are discussed, including indirect applications in the rapid manufacture of prototype tooling and direct applications in the orthopaedics, cardiovascular, drug delivery, ear-nose-throat, and tissue engineering fields. Polymer-Based Additive Manufacturing: Biomedical

Applications is an ideal resource for students, researchers, and those working in industry seeking to better understand the medical applications of additive manufacturing.