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Foundations of Micropolar Mechanics Foundations of Micropolar Mechanics New Achievements in Continuum Mechanics and Thermodynamics *Mathematical Modeling in Mechanics of Granular Materials* **Advanced Methods of Continuum Mechanics for Materials and Structures Generalized Continua as Models for Classical and Advanced Materials** Plasticity of Pressure-Sensitive Materials *Shell and Membrane Theories in Mechanics and Biology* Numerical Mathematics and Advanced Applications - ENUMATH 2013 **Failure and Damage Analysis of Advanced Materials Nonlinear Wave Dynamics of Materials and Structures** Mathematical Modelling and Biomechanics of the Brain *Advanced Theories for Deformation, Damage and Failure in Materials* **Shell Structures: Theory and Applications Volume 4** *Kontinuumsmechanik Models and Theories in Social Systems Encyclopedia of Continuum Mechanics* **Generalized Continua - from the Theory to Engineering Applications Advances in Non-Integer Order Calculus and Its Applications Lipid Nanoparticles: Production, Characterization and Stability** Microcontinuum Field Theories Theory of Asymmetric Elasticity Analysis of Shells, Plates, and Beams *Shell-like Structures* Advanced Methods in the Fractional Calculus of Variations *Tensor-Valued Random Fields for Continuum Physics Microstructural Randomness and Scaling in Mechanics of Materials* Chaos and Complex Systems *Finsler Geometry and Applications* **Advanced Engineering Analysis Direct Methods in the Calculus of Variations** Random Fields of Piezoelectricity and Piezomagnetism **Tensor Analysis with Applications in Mechanics Functional Analysis** R for Finite Element Analyses of Size-dependent Microscale Structures *Micropolar Elasticity* **Functional Analysis in Mechanics Micropolar Fluids Approximating Perfection** *Handbook of Structural Life Assessment*

Generalized Continua as Models for Classical and Advanced Materials May 23 2022 This volume is devoted to an actual topic which is the focus world-wide of various research groups. It contains contributions describing the material behavior on different scales, new existence and uniqueness theorems, the formulation of constitutive equations for advanced materials. The main emphasis of the contributions is directed on the following items - Modelling and simulation of natural and artificial materials with significant microstructure, - Generalized continua as a result of multi-scale models, - Multi-field actions on materials resulting in generalized material models, - Theories including higher gradients, and - Comparison with discrete modelling approaches

Mathematical Modelling and Biomechanics of the Brain Nov 17 2021 This monograph aims to provide a rigorous yet accessible presentation of some fundamental concepts used in modeling brain mechanics and give a glimpse of the insights and advances that have arisen as a result of the nascent interaction of the mathematical and neurosurgical sciences. It begins with some historical perspective and a brief synopsis of the biomedical/biological manifestations of the clinical conditions/diseases considered. Each chapter proceeds with a discussion of the various mathematical models of the problems considered, starting with the simplest models and proceeding to more complex models where necessary. A detailed list of relevant references is provided at the end of each chapter. With the beginning research student in mind, the chapters have been crafted to be as self-contained as possible while addressing different clinical conditions and diseases. The book is intended as a brief introduction to both theoreticians and experimentalists interested in brain mechanics, with directions and guidance for further reading, for those who wish to pursue particular topics in greater depth. It can also be used as a complementary textbook in a graduate level course for neuroscientists and neuroengineers.

Kontinuumsmechanik Aug 14 2021 Innovative technische Projekte mit komplexen Aufgabenstellungen

erfordern oft solide Kenntnisse in der Kontinuumsmechanik. Denn häufig handelt es sich um Mehrfeldprobleme, die sich im Rahmen klassischer Konzepte der Technischen Mechanik nicht lösen lassen. Das Buch führt leicht verständlich in das anspruchsvolle Gebiet der Kontinuumsmechanik ein. Der Schwerpunkt liegt bei festen deformierbaren Körpern, wobei sich die vorgestellten Konzepte problemlos auch auf Fluide übertragen lassen. Das Lehrbuch gliedert sich in vier Abschnitte: Grundbegriffe und mathematische Grundlagen, Materialunabhängige Gleichungen, Materialabhängige Gleichungen. Nach einer kurzen Einführung in Aufgaben, Betrachtungsweisen und Modelle der Kontinuumsmechanik werden zunächst die Grundzüge der Tensorrechnung vorgestellt. Die folgenden Kapitel behandeln systematisch die materialunabhängigen Aussagen der Kontinuumsmechanik, das heißt die Kinematik, die Kinetik und die Bilanzen. In den abschließenden Kapiteln zeigt der Autor anhand der für technische Anwendungen besonders wichtigen Teilgebiete (z.B. die lineare Theorie der Elastizität und der Thermoelastizität) wie die materialunabhängigen und die materialabhängigen Gleichungen zusammengefasst werden können. Zahlreiche Beispiele mit vollständigen Lösungen illustrieren den theoretischen Teil und erleichtern so das Verständnis. In der 4. Auflage wurden zahlreiche Abschnitte überarbeitet und präzisiert, wobei auch die unterschiedlichen Konzepte der Kontinuumsmechanik noch deutlicher gemacht werden. Zahlreiche Fehler wurden beseitigt. Gleichzeitig wurde die Referenzliteratur erweitert sowie die Liste der weiterführenden Literatur ergänzt und aktualisiert. Diese Einführung in die Kontinuumsmechanik richtet sich an Studierende an Universitäten und Fachhochschulen im Bereich Maschinenbau und Bauingenieurwesen, Physik und Technomathematik sowie an Wissenschaftler und Praktiker in der Industrie. Vorausgesetzt werden Kenntnisse der Höheren Mathematik, der Physik, der Technischen Mechanik, der Thermodynamik, der Strömungslehre und der Werkstoffkunde, wie sie zu Beginn der Ausbildung vermittelt werden.
Advanced Methods in the Fractional Calculus of Variations Oct 04 2020 This brief presents a general unifying perspective on the fractional calculus. It brings together results of several recent approaches in generalizing the least action principle and the Euler–Lagrange equations to include fractional derivatives. The dependence of Lagrangians on generalized fractional operators as well as on classical derivatives is considered along with still more general problems in which integer-order integrals are replaced by fractional integrals. General theorems are obtained for several types of variational problems for which recent results developed in the literature can be obtained as special cases. In particular, the authors offer necessary optimality conditions of Euler–Lagrange type for the fundamental and isoperimetric problems, transversality conditions, and Noether symmetry theorems. The existence of solutions is demonstrated under Tonelli type conditions. The results are used to prove the existence of eigenvalues and corresponding orthogonal eigenfunctions of fractional Sturm–Liouville problems. Advanced Methods in the Fractional Calculus of Variations is a self-contained text which will be useful for graduate students wishing to learn about fractional-order systems. The detailed explanations will interest researchers with backgrounds in applied mathematics, control and optimization as well as in certain areas of physics and engineering.
Advanced Methods of Continuum Mechanics for Materials and Structures Jun 24 2022 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.
Advanced Theories for Deformation, Damage and Failure in Materials Oct 16 2021 The book introduces advanced theories for deformation, damage, and failure in materials. The overall continuum mechanical framework was marked out and added by creep and damage mechanics of materials at elevated temperatures. The time-dependent and time-independent models of cyclic plasticity for low cycle and thermomechanical fatigue life assessment were specified in a very special manner: instead of three-dimensional statements, only one-dimensional rheological models were discussed. Anisotropic plasticity during non-proportional loading and anisotropy of yield/failure criteria is more and more important in modern applications. It is showing how the limit states of materials can be estimated. In addition, the damage and failure of composite materials demonstrate the possibility to extend continuum mechanics to continuum damage mechanics of composite materials.
R for Finite Element Analyses of Size-dependent Microscale Structures Nov 24 2019 This book addresses the static and dynamic analysis of linear elastic size-dependent structures based on the modified couple stress

theory. It focuses on establishing the governing equations of the size-dependent structures, deriving the associated finite element models, and implementing those models using the R programming language. The implemented functions are employed to develop a special R package (equivalent to a MATLAB toolbox) called microfiniteR for this book. In each chapter, the governing equations are formulated using the variational method, and the behaviour of the structures is examined on the basis of their load-deformation characteristics (in the case of static analyses) and by evaluating their eigenvalues (in the case of dynamics and buckling problems). The first chapter introduces readers to the R programming language, beginning with the resources needed to make use of the language and ending with a list of recommended texts. The remaining chapters cover the requisite linear elastic theory and highlight the implemented R functions. Each chapter concludes with a brief summary and relevant references.

Direct Methods in the Calculus of Variations Mar 29 2020 This book is developed for the study of vectorial problems in the calculus of variations. The subject is a very active one and almost half of the book consists of new material. This is a new edition of the earlier book published in 1989 and it is suitable for graduate students. The book has been updated with some new material and examples added. Applications are included.

Functional Analysis in Mechanics Sep 22 2019 This book covers functional analysis and its applications to continuum mechanics.; The mathematical material is treated in a non-abstract manner and is fully illuminated by the underlying mechanical ideas.; The presentation is concise but complete, and is intended for specialists in continuum mechanics who wish to understand the mathematical underpinnings of the discipline.; Graduate students and researchers in mathematics, physics, and engineering will find this book useful.; Exercises and examples are included throughout with detailed solutions provided in the appendix.

Lipid Nanoparticles: Production, Characterization and Stability Mar 09 2021 ?What are lipid nanoparticles? How are they structured? How are they formed? What techniques are best to characterize them? How great is their potential as drug delivery systems? These questions and more are answered in this comprehensive and highly readable work on lipid nanoparticles. This work sets out to provide the reader with a clear and understandable understanding of the current practices in formulation, characterization and drug delivery of lipid nanoparticles. A comprehensive description of the current understanding of synthesis, characterization, stability optimization and drug incorporation of solid lipid nanoparticles is provided. Nanoparticles have attracted great interest over the past few decades with almost exponential growth in their research and application. Their small particle size and subsequent high surface area make them ideal in many uses, but particularly as drug carrier systems. Nanoparticles made from lipids are especially attractive because of their enhanced biocompatibility imparted by the lipid. The work provides a detailed description of the types of lipid nanoparticles available (e.g. SLN, NLC, LDC, PLN) and how they range from imperfect crystalline to amorphous in structure. Current thoughts on where drugs are situated (e.g. in the core, or at the interface) and how this can be manipulated are discussed. The many techniques for production, including the author's own variant of microwave heating, are fully discussed. Techniques for measuring arguably the most important characteristics of particle size and polydispersity are discussed, along with techniques to measure crystallinity, shape and drug capacity. Finally, a full chapter on techniques for measuring stability, both in the absence and presence of drugs, is discussed, along with suggestions on how to optimize that stability. This work appeals to students of colloid science, practitioners of research into drug delivery and academics alike.

Shell Structures: Theory and Applications Volume 4 Sep 15 2021 Shells are basic structural elements of modern technology and everyday life. Examples of shell structures in technology include automobile bodies, water and oil tanks, pipelines, silos, wind turbine towers, and nanotubes. Nature is full of living shells such as leaves of trees, blooming flowers, seashells, cell membranes or wings of insects. In the human body arteries, the eye shell, the diaphragm, the skin and the pericardium are all shells as well. Shell Structures: Theory and Applications, Volume 4 contains 132 contributions presented at the 11th Conference on Shell Structures: Theory and Applications (Gdansk, Poland, 11-13 October 2017). The papers reflect a wide spectrum of scientific and engineering problems from theoretical modelling through strength, stability and dynamic behaviour, numerical analyses, biomechanic applications up to engineering design of shell structures. Shell Structures: Theory and Applications, Volume 4 will be of interest to academics, researchers, designers and engineers dealing with modelling and analyses of shell structures. It may also provide supplementary reading to graduate students in Civil, Mechanical, Naval and Aerospace Engineering.

Tensor Analysis with Applications in Mechanics Jan 27 2020 The tensorial nature of a quantity permits us

to formulate transformation rules for its components under a change of basis. These rules are relatively simple and easily grasped by any engineering student familiar with matrix operators in linear algebra. More complex problems arise when one considers the tensor fields that describe continuum bodies. In this case general curvilinear coordinates become necessary. The principal basis of a curvilinear system is constructed as a set of vectors tangent to the coordinate lines. Another basis, called the dual basis, is also constructed in a special manner. The existence of these two bases is responsible for the mysterious covariant and contravariant terminology encountered in tensor discussions. A tensor field is a tensor-valued function of position in space. The use of tensor fields allows us to present physical laws in a clear, compact form. A byproduct is a set of simple and clear rules for the representation of vector differential operators such as gradient, divergence, and Laplacian in curvilinear coordinate systems. This book is a clear, concise, and self-contained treatment of tensors, tensor fields, and their applications. The book contains practically all the material on tensors needed for applications. It shows how this material is applied in mechanics, covering the foundations of the linear theories of elasticity and elastic shells. The main results are all presented in the first four chapters. The remainder of the book shows how one can apply these results to differential geometry and the study of various types of objects in continuum mechanics such as elastic bodies, plates, and shells. Each chapter of this new edition is supplied with exercises and problems most with solutions, hints, or answers to help the reader progress. An extended appendix serves as a handbook-style summary of all important formulas contained in the book.

Mathematical Modeling in Mechanics of Granular Materials Jul 25 2022 This monograph contains original results in the field of mathematical and numerical modeling of mechanical behavior of granular materials and materials with different strengths. It proposes new models helping to define zones of the strain localization. The book shows how to analyze processes of the propagation of elastic and elastic-plastic waves in loosened materials, and constructs models of mixed type, describing the flow of granular materials in the presence of quasi-static deformation zones. In a last part, the book studies a numerical realization of the models on multiprocessor computer systems. The book is intended for scientific researchers, lecturers of universities, post-graduates and senior students, who specialize in the field of the deformable materials mechanics, mathematical modeling and adjacent fields of applied and calculus mathematics.

Microcontinuum Field Theories Feb 08 2021 Microcontinuum field theories extend classical field theories to microscopic spaces and short time scales. This volume is concerned with the kinematics of microcontinua. It begins with a discussion of strain, stress tensors, balance laws, and constitutive equations, and then discusses applications of the fundamental ideas to the theory of elasticity. The ideas developed here are important in modeling the fluid or elastic properties of porous media, polymers, liquid crystals, slurries, and composite materials.

Functional Analysis Dec 26 2019 This book started its life as a series of lectures given by the second author from the 1970's onwards to students in their third and fourth years in the Department of Mechanics and Mathematics at Rostov State University. For these lectures there was also an audience of engineers and applied mechanicists who wished to understand the functional analysis used in contemporary research in their fields. These people were not so much interested in functional analysis itself as in its applications; they did not want to be told about functional analysis in its most abstract form, but wanted a guided tour through those parts of the analysis needed for their applications. The lecture notes evolved over the years as the first author started to make more formal typewritten versions incorporating new material. About 1990 the first author prepared an English version and submitted it to Kluwer Academic Publishers for inclusion in the series Solid Mechanics and its Applications. At that state the notes were divided into three long chapters covering linear and nonlinear analysis. As Series Editor, the third author started to edit them. The requirements of lecture notes and books are vastly different. A book has to be complete (in some sense), self contained, and able to be read without the help of an instructor.

Models and Theories in Social Systems Jul 13 2021 This book concisely presents a broad range of models and theories on social systems. Because of the huge spectrum of topics involving social systems, various issues related to Mathematics, Statistics, Teaching, Social Science, and Economics are discussed. In an effort to introduce the subject to a wider audience, this volume, part of the series "Studies in Systems, Decision and Control", equally addresses the needs of mathematicians, statisticians, sociologists and philosophers. The studies examined here are divided into four parts. The first part, "Perusing the Minds Behind Scientific Discoveries", traces the winding path of Syamal K. Sen and Ravi P. Agarwal's scholarship throughout

history, and most importantly, the thought processes that allowed each of them to master their subject. The second part covers “Theories in Social Systems” and the third discusses “Models in Social Systems”, while the fourth and final part is dedicated to “Mathematical Methods in the Social Sciences”. Given its breadth of coverage, the book will offer inquisitive readers a valuable point of departure for exploring these rich, vast, and ever-expanding fields of knowledge.

Micropolar Elasticity Oct 24 2019

Chaos and Complex Systems Jul 01 2020 Complexity Science and Chaos Theory are fascinating areas of scientific research with wide-ranging applications. The interdisciplinary nature and ubiquity of complexity and chaos are features that provides scientists with a motivation to pursue general theoretical tools and frameworks. Complex systems give rise to emergent behaviors, which in turn produce novel and interesting phenomena in science, engineering, as well as in the socio-economic sciences. The aim of all Symposia on Chaos and Complex Systems (CCS) is to bring together scientists, engineers, economists and social scientists, and to discuss the latest insights and results obtained in the area of corresponding nonlinear-system complex (chaotic) behavior. Especially for the “4th International Interdisciplinary Chaos Symposium on Chaos and Complex Systems,” which took place April 29th to May 2nd, 2012 in Antalya, Turkey, the scope of the symposium had been further enlarged so as to encompass the presentation of work from circuits to econophysics, and from nonlinear analysis to the history of chaos theory. The corresponding proceedings collected in this volume address a broad spectrum of contemporary topics, including but not limited to networks, circuits, systems, biology, evolution and ecology, nonlinear dynamics and pattern formation, as well as neural, psychological, psycho-social, socio-economic, management complexity and global systems.

Microstructural Randomness and Scaling in Mechanics of Materials Aug 02 2020 An area at the intersection of solid mechanics, materials science, and stochastic mathematics, mechanics of materials often necessitates a stochastic approach to grasp the effects of spatial randomness. Using this approach, Microstructural Randomness and Scaling in Mechanics of Materials explores numerous stochastic models and methods used in the mechanics of random media and illustrates these in a variety of applications. The book first offers a refresher in several tools used in stochastic mechanics, followed by two chapters that outline periodic and disordered planar lattice (spring) networks. Subsequent chapters discuss stress invariance in classical planar and micropolar elasticity and cover several topics not yet collected in book form, including the passage of a microstructure to an effective micropolar continuum. After forming this foundation in various methods of stochastic mechanics, the book focuses on problems of microstructural randomness and scaling. It examines both representative and statistical volume elements (RVEs/SVEs) as well as micromechanically based stochastic finite elements (SFEs). The author also studies nonlinear elastic and inelastic materials, the stochastic formulation of thermomechanics with internal variables, and wave propagation in random media. The concepts discussed in this comprehensive book can be applied to many situations, from micro and nanoelectromechanical systems (MEMS/NEMS) to geophysics.

Encyclopedia of Continuum Mechanics Jun 12 2021 This Encyclopedia covers the entire science of continuum mechanics including the mechanics of materials and fluids. The encyclopedia comprises mathematical definitions for continuum mechanical modeling, fundamental physical concepts, mechanical modeling methodology, numerical approaches and many fundamental applications. The modelling and analytical techniques are powerful tools in mechanical civil and areospsace engineering, plus in related fields of plasticity, viscoelasticity and rheology. Tensor-based and reference-frame-independent, continuum mechanics has recently found applications in geophysics and materials. This three-volume encyclopedia comprises approximately uniform 600 entries.

Shell and Membrane Theories in Mechanics and Biology Mar 21 2022 This book presents the latest results related to shells characterize and design shells, plates, membranes and other thin-walled structures, a multidisciplinary approach from macro- to nanoscale is required which involves the classical disciplines of mechanical/civil/materials engineering (design, analysis, and properties) and physics/biology/medicine among others. The book contains contributions of a meeting of specialists (mechanical engineers, mathematicians, physicists and others) in such areas as classical and non-classical shell theories. New trends with respect to applications in mechanical, civil and aero-space engineering, as well as in new branches like medicine and biology are presented which demand improvements of the theoretical foundations of these theories and a deeper understanding of the material behavior used in such structures.

Tensor-Valued Random Fields for Continuum Physics Sep 03 2020 Presents a complete description of

homogenous and isotropic tensor-valued random fields, including the problems of continuum physics, mathematical tools and applications.

Nonlinear Wave Dynamics of Materials and Structures Dec 18 2021 This book marks the 60th birthday of Prof. Vladimir Erofeev – a well-known specialist in the field of wave processes in solids, fluids, and structures. Featuring a collection of papers related to Prof. Erofeev's contributions in the field, it presents articles on the current problems concerning the theory of nonlinear wave processes in generalized continua and structures. It also discusses a number of applications as well as various discrete and continuous dynamic models of structures and media and problems of nonlinear acoustic diagnostics.

Plasticity of Pressure-Sensitive Materials Apr 22 2022 Classical plasticity theory of metals is independent of the hydrostatic pressure. However if the metal contains voids or pores or if the structure is composed of cells, this classical assumption is no more valid and the influence of the hydrostatic pressure must be incorporated in the constitutive description. Looking at the microlevel, metal plasticity is connected with the uniform planes of atoms organized with long-range order. Planes may slip past each other along their close-packed directions. The result is a permanent change of shape within the crystal and plastic deformation. The presence of dislocations increases the likelihood of planes slipping. Nowadays, the theory of pressure sensitive plasticity is successfully applied to many other important classes of materials (polymers, concrete, bones etc.) even if the phenomena on the micro-level are different to classical plasticity of metals. The theoretical background of this phenomenological approach based on observations on the macro-level is described in detail in this monograph and applied to a wide range of different important materials in the last part of this book.

Generalized Continua - from the Theory to Engineering Applications May 11 2021 On the roots of continuum mechanics in differential geometry -- a review.- Cosserat media.- Cosserat-type shells.- Cosserat-type rods.- Micromorphic media.- Electromagnetism and generalized continua.- Computational methods for generalized continua. The need of generalized continua models is coming from practice. Complex material behavior sometimes cannot be presented by the classical Cauchy continua. At present the attention of the scientists in this field is focused on the most recent research items • new models, • application of well-known models to new problems, • micro-macro aspects, • computational effort, and • possibilities to identify the constitutive equations The new research directions are discussed in this volume - from the point of view of modeling and simulation, identification, and numerical methods.

Shell-like Structures Nov 05 2020 The book presents mathematical and mechanical aspects of the theory of plates and shells, applications in civil, aero-space and mechanical engineering, as well in other areas. The focus relates to the following problems:• comprehensive review of the most popular theories of plates and shells,• relations between three-dimensional theories and two-dimensional ones,• presentation of recently developed new refined plates and shells theories (for example, the micropolar theory or gradient-type theories),• modeling of coupled effects in shells and plates related to electromagnetic and temperature fields, phase transitions, diffusion, etc.,• applications in modeling of non-classical objects like, for example, nanostructures,• presentation of actual numerical tools based on the finite element approach.

Foundations of Micropolar Mechanics Sep 27 2022 The book presents foundations of the micropolar continuum mechanics including a short but comprehensive introduction of stress and strain measures, derivation of motion equations and discussion of the difference between Cosserat and classical (Cauchy) continua, and the discussion of more specific problems related to the constitutive modeling, i.e. constitutive inequalities, symmetry groups, acceleration waves, etc.

Theory of Asymmetric Elasticity Jan 07 2021

Finsler Geometry and Applications May 31 2020

Approximating Perfection Jul 21 2019 This is a book for those who enjoy thinking about how and why Nature can be described using mathematical tools. Approximating Perfection considers the background behind mechanics as well as the mathematical ideas that play key roles in mechanical applications. Concentrating on the models of applied mechanics, the book engages the reader in the types of nuts-and-bolts considerations that are normally avoided in formal engineering courses: how and why models remain imperfect, and the factors that motivated their development. The opening chapter reviews and reconsiders the basics of calculus from a fully applied point of view; subsequent chapters explore selected topics from solid mechanics, hydrodynamics, and the natural sciences. Emphasis is placed on the logic that underlies modeling in mechanics and the many surprising parallels that exist between seemingly diverse areas. The mathematical

demands on the reader are kept to a minimum, so the book will appeal to a wide technical audience.
Numerical Mathematics and Advanced Applications - ENUMATH 2013 Feb 20 2022 This book gathers a selection of invited and contributed lectures from the European Conference on Numerical Mathematics and Advanced Applications (ENUMATH) held in Lausanne, Switzerland, August 26-30, 2013. It provides an overview of recent developments in numerical analysis, computational mathematics and applications from leading experts in the field. New results on finite element methods, multiscale methods, numerical linear algebra and discretization techniques for fluid mechanics and optics are presented. As such, the book offers a valuable resource for a wide range of readers looking for a state-of-the-art overview of advanced techniques, algorithms and results in numerical mathematics and scientific computing.
Advances in Non-Integer Order Calculus and Its Applications Apr 10 2021 This book provides an overview of some recent findings in the theory and applications of non-integer order systems. Discussing topics ranging from the mathematical foundations to technical applications of continuous-time and discrete-time fractional calculus, it includes 22 original research papers and is subdivided into four parts: • Mathematical Foundations • Approximation, Modeling and Simulations • Fractional Systems Analysis and Control • Applications The papers were selected from those presented at the 10th International Conference of Non-integer Order Calculus and its Applications, which was held at the Bialystok University of Technology, Poland, September 20–21, 2018. Thanks to the broad spectrum of topics covered, the book is suitable for researchers from applied mathematics and engineering. It is also a valuable resource for graduate students, as well as for scholars looking for new mathematical tools.
Advanced Engineering Analysis Apr 29 2020 Advanced Engineering Analysis: The Calculus of Variations and Functional Analysis with Applications in Mechanics Advanced Engineering Analysis is a textbook on modern engineering analysis, covering the calculus of variations, functional analysis, and control theory, as well as applications of these disciplines to mechanics. The book offers a brief and concise, yet complete explanation of essential theory and applications. It contains exercises with hints and solutions, ideal for self-study. Book jacket.
Foundations of Micropolar Mechanics Oct 28 2022 The book presents foundations of the micropolar continuum mechanics including a short but comprehensive introduction of stress and strain measures, derivation of motion equations and discussion of the difference between Cosserat and classical (Cauchy) continua, and the discussion of more specific problems related to the constitutive modeling, i.e. constitutive inequalities, symmetry groups, acceleration waves, etc.
Handbook of Structural Life Assessment Jun 19 2019 This important, self-contained reference deals with structural life assessment (SLA) and structural health monitoring (SHM) in a combined form. SLA periodically evaluates the state and condition of a structural system and provides recommendations for possible maintenance actions or the end of structural service life. It is a diversified field and relies on the theories of fracture mechanics, fatigue damage process, and reliability theory. For common structures, their life assessment is not only governed by the theory of fracture mechanics and fatigue damage process, but by other factors such as corrosion, grounding, and sudden collision. On the other hand, SHM deals with the detection, prediction, and location of crack development online. Both SLA and SHM are combined in a unified and coherent treatment.
Random Fields of Piezoelectricity and Piezomagnetism Feb 26 2020 Random fields are a necessity when formulating stochastic continuum theories. In this book, a theory of random piezoelectric and piezomagnetic materials is developed. First, elements of the continuum mechanics of electromagnetic solids are presented. Then the relevant linear governing equations are introduced, written in terms of either a displacement approach or a stress approach, along with linear variational principles. On this basis, a statistical description of second-order (statistically) homogeneous and isotropic rank-3 tensor-valued random fields is given. With a group-theoretic foundation, correlation functions and their spectral counterparts are obtained in terms of stochastic integrals with respect to certain random measures for the fields that belong to orthotropic, tetragonal, and cubic crystal systems. The target audience will primarily comprise researchers and graduate students in theoretical mechanics, statistical physics, and probability.
New Achievements in Continuum Mechanics and Thermodynamics Aug 26 2022 This book presents a liber amicorum dedicated to Wolfgang H. Müller, and highlights recent advances in Prof. Müller's major fields of research: continuum mechanics, generalized mechanics, thermodynamics, mechanochemistry, and geomechanics. Over 50 of Prof. Müller's friends and colleagues contributed to this book, which

commemorates his 60th birthday and was published in recognition of his outstanding contributions.
Analysis of Shells, Plates, and Beams Dec 06 2020 This book commemorates the 75th birthday of Prof. George Jaiani – Georgia's leading expert on shell theory. He is also well known outside Georgia for his individual approach to shell theory research and as an organizer of meetings, conferences and schools in the field. The collection of papers presented includes articles by scientists from various countries discussing the state of the art and new trends in the theory of shells, plates, and beams. Chapter 20 is available open access under a Creative Commons Attribution 4.0 International License via link.springer.com.
Failure and Damage Analysis of Advanced Materials Jan 19 2022 The papers in this volume present basic concepts and new developments in failure and damage analysis with focus on advanced materials such as composites, laminates, sandwiches and foams, and also new metallic materials. Starting from some mathematical foundations (limit surfaces, symmetry considerations, invariants) new experimental results and their analysis are shown. Finally, new concepts for failure prediction and analysis will be introduced and discussed as well as new methods of failure and damage prediction for advanced metallic and non-metallic materials. Based on experimental results the traditional methods will be revised.
Micropolar Fluids Aug 22 2019 Micropolar fluids are fluids with microstructure. They belong to a class of fluids with nonsymmetric stress tensor that we shall call polar fluids, and include, as a special case, the well-established Navier-Stokes model of classical fluids that we shall call ordinary fluids. Physically, micropolar fluids may represent fluids consisting of rigid, randomly oriented (or spherical) particles suspended in a viscous medium, where the deformation of fluid particles is ignored. The model of micropolar fluids introduced in [65] by C. A. Eringen is worth studying as a very well balanced one. First, it is a well-founded and significant generalization of the classical Navier-Stokes model, covering, both in theory and applications, many more phenomena than the classical one. Moreover, it is elegant and not too complicated, in other words, man ageable to both mathematicians who study its theory and physicists and engineers who apply it. The main aim of this book is to present the theory of micropolar fluids, in particular its mathematical theory, to a wide range of readers. The book also presents two applications of micropolar fluids, one in the theory of lubrication and the other in the theory of porous media, as well as several exact solutions of particular problems and a numerical method. We took pains to make the presentation both clear and uniform.