Fractional Calculus With Applications In Mechanics Wave Propagation Impact And Variational Principles Mechanical Engineering And Solid Mechanics

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Advanced Numerical Methods with Matlab 2 - Bouchaib Radi 2018-05-24
The purpose of this book is to introduce and study numerical methods basic and advanced ones for scientific computing. This last refers to the implementation of appropriate approaches to the treatment of a scientific problem arising from physics (meteorology, pollution, etc.) or of engineering (mechanics of structures, mechanics of fluids, treatment signal, etc.). Each chapter of this book recalls the essence of the different methods resolution and presents several applications in the field of engineering as well as programs developed under Matlab software.
Fractional Calculus And Waves In Linear Viscoelasticity: An Introduction To Mathematical Models (Second Edition) - Francesco Mainardi 2022-08-16
Fractional Calculus and Waves in Linear Viscoelasticity (Second Edition) is a self-contained treatment of the mathematical theory of linear (uni-axial) viscoelasticity (constitutive equation and waves) with particular regard to models based on fractional calculus. It serves as a general introduction to the above-mentioned areas of mathematical modeling. The explanations in the book are detailed enough to capture the interest of the curious reader, and complete enough to provide the necessary background material needed to delve further into the subject and explore the research literature. In particular the relevant role played by some special functions is pointed out along with their visualization through plots. Graphics are extensively used in the book and a large general bibliography is included at the end.This new edition keeps the structure of the first edition but each chapter has been revised and expanded, and new additions include a novel appendix on complete monotonic and Bernstein functions that are known to play a fundamental role in linear viscoelasticity.This book is suitable for engineers, graduate students and researchers interested in fractional calculus and continuum mechanics.
Modern Trends in Structural and Solid Mechanics 2 - Noel Challamel 2021-06-29
This book – comprised of three separate volumes – presents the recent developments and research discoveries in structural and solid mechanics; it is dedicated to Professor Isaac Elishakoff. This second volume is devoted to the vibrations of solid and structural members. Modern Trends in Structural and Solid Mechanics 2 has broad scope, covering topics such as: exact and approximate vibration solutions of rods, beams, membranes, plates and three-dimensional elasticity problems, Bolotins dynamic edge effect, the principles of plate theories in dynamics, nano- and microbeams,

nonlinear dynamics of shear extensible beams, the vibration and aeroelastic stability behavior of cellular beams, the dynamic response of elastoplastic softening oscillators, the complex dynamics of hysteretic oscillators, bridging waves, and the three-dimensional propagation of waves. This book is intended for graduate students and researchers in the field of theoretical and applied mechanics.

Non-local Structural Mechanics - Danilo Karlicic 2016-01-26

Serving as a review on non-local mechanics, this book provides an introduction to non-local elasticity theory for static, dynamic and stability analysis in a wide range of nanostructures. The authors draw on their own research experience to present fundamental and complex theories that are relevant across a wide range of nanomechanical systems, from the fundamentals of non-local mechanics to the latest research applications.

Virtual Work Approach to Mechanical Modeling - Jean Salençon 2018-03-27

This book is centred about the Principle of virtual work and the related method for mechanical modelling. It aims at showing and enhancing the polyvalence and versatility of the virtual work approach in the mechanical modelling process. The virtual work statement is set as the principle at the root of a force modelling method that can be implemented on any geometrical description. After experimentally induced hypotheses have been made on the geometrical parameters that describe the concerned system and subsystems, the method provides a unifying framework for building up consistently associated force models where external and internal forces are introduced through their virtual rates of work. Systems described as three-dimensional, curvilinear or planar continua are considered: force models are established with the corresponding equations of motion; the validation process points out that enlarging the domain of relevance of the model for practical applications calls for an enrichment of the geometrical description that takes into account the underlying microstructure.

Material Forming Processes - Bouchaib Radi 2016-10-03

Manufacturing industries strive to improve the quality and reliability of their products, while simultaneously reducing production costs. To do this, modernized work tools must be produced; this will enable a reduction in the duration of the product development cycle, optimization of product development procedures, and ultimately improvement in the productivity of design and manufacturing phases. Numerical simulations of forming processes are used to this end, and in this book various methods and models for forming processes (including stamping, hydroforming and additive manufacturing) are presented. The theoretical and numerical advances of these processes involving large deformation mechanics on the basis of large transformations are explored, in addition to the various techniques for optimization and calculation of reliability. The advances and techniques within this book will be of interest to professional engineers in the automotive, aerospace, defence and other industries, as well as graduates and undergraduates in these fields.

Fractional Dynamics - Carlo Cattani 2015-01-01

The book is devoted to recent developments in the theory of fractional calculus and its applications. Particular attention is paid to the applicability of this currently popular research field in various branches of pure and applied mathematics. In particular, the book focuses on the more recent results in mathematical physics, engineering applications, theoretical and applied physics as quantum mechanics, signal analysis, and in those relevant research fields where nonlinear dynamics occurs and several tools of nonlinear analysis are required. Dynamical processes and dynamical systems of fractional order attract researchers from many areas of sciences and technologies, ranging from mathematics and physics to computer science.

Mechanics of Aeronautical Composite Materials - Christophe Bouvet 2017-08-10

This book presents the principles of composite laminate sizing widely used for composite structures. The focus is on aeronautics in particular, including the concepts of limit loads and ultimate loads. After a brief overview of the main composite materials used in aeronautics, the basic theory of laminated plates and the associated rupture criteria are given. The author presents two fundamental cases of the sizing of aeronautical composite structures: the

calculation of the holed structures and their subsequent multi-bolt joints, and the calculation of the buckling. The concept of damage tolerance is also explored, with a focus on its application for tolerance to impact damage. These notions are fundamental for understanding the specificities of the sizing of aeronautical composite structures. The book also contains corrected exercises for the reader to test their understanding of the different topics covered.

Theory and Applications of Non-integer Order Systems - Artur Babiarz 2016-09-15

This book collects papers from the 8th Conference on Non-Integer Order Calculus and Its Applications that have been held on September 20-21, 2016 in Zakopane, Poland. The preceding two conferences were held in Szczecin, Poland in 2015, and in Opole, Poland, in 2014. This conference provides a platform for academic exchange on the theory and application of fractional calculus between domestic and international universities, research institutes, corporate experts and scholars. The Proceedings of the 8th Conference on Non-Integer Order Calculus and Its Applications 2016 brings together rigorously reviewed contributions from leading international experts. The included papers cover novel various important aspects of mathematical foundations of fractional calculus, modeling and control of fractional systems as well as controllability, detectability, observability and stability problems for this systems.

Sustainable Masonry - Thierry Ciblac 2014-07-22

This book covers the impact of sustainable masonry on the environment, touting the many benefits of utilizing local and/or low embodied energy materials in the construction of sustainable buildings.

Fractional Calculus with Applications in Mechanics - Teodor M. Atanackovic 2014-03-17

This book contains mathematical preliminaries in which basic definitions of fractional derivatives and spaces are presented. The central part of the book contains various applications in classical mechanics including fields such as: viscoelasticity, heat conduction, wave propagation and variational Hamilton–type principles. Mathematical rigor will be observed in the applications. The authors provide some problems formulated in the classical setting and some in the distributional setting. The solutions to these problems are presented in analytical form and these solutions are then analyzed numerically. Theorems on the existence of solutions will be presented for all examples discussed. In using various constitutive equations the restrictions following from the second law of thermodynamics will be implemented. Finally, the physical implications of obtained solutions will be discussed in detail.

Heat Transfer 4 - Michel Ledoux 2023-01-12

Heat is a branch of thermodynamics that occupies a unique position due to its involvement in the field of practice. Being linked to the management, transport and exchange of energy in thermal form, it impacts all aspects of human life and activity. Heat transfers are, by nature, classified as conduction, convection (which inserts conduction into fluid mechanics) and radiation. The importance of these three transfer methods has resulted – justifiably – in a separate volume being afforded to each of them, with the subject of convection split into two volumes. This fourth volume is dedicated to convection, more specifically, the problem of particular convective transfers. Twophase convection is considered and a more recent and much lesser-known field is presented, that of phase change transfer. Particular significance is given to numerical applications, allowing the reader to handle orders of magnitude, an important point in all physics. Heat Transfer 4 combines a basic approach with a deeper understanding of the discipline and will therefore appeal to a wide audience, from technician to engineer, from doctoral student to teacher-researcher.

Reliability and Physics-of-Healthy in Mechatronics - Abdelkhalak El Hami 2023-01-12

This book illustrates simply, but with many details, the state of the art of reliability science, exploring clear reliability disciplines and applications through concrete examples from their industries and from real life, based on industrial experiences. Many experts believe that reliability is not only a matter of statistics but is a multidisciplinary scientific topic, involving materials, tests, simulations, quality

tools, manufacturing, electronics, mechatronics, environmental engineering and Big Data, among others. For a complex mechatronic system, failure risks have to be identified at an early stage of the design. In the automotive and aeronautic industries, fatigue simulation is used both widely and efficiently. Problems arise from the variability of inputs such as fatigue parameters and life curves. This book aims to discuss probabilistic fatigue and reliability simulation. To do this, Reliability and Physics-of-Healthy in Mechatronics provides a study on some concepts of a predictive reliability model of microelectronics, with examples from the automotive, aeronautic and space industries, based on entropy and Physics-of-Healthy

Finite Element Method and Medical Imaging Techniques in Bone Biomechanics - Rabeb Ben Kahla 2020-01-02

Digital models based on data from medical images have recently become widespread in the field of biomechanics. This book summarizes medical imaging techniques and processing procedures, both of which are necessary for creating bone models with finite element methods. Chapter 1 introduces the main principles and the application of the most commonly used medical imaging techniques. Chapter 2 describes the major methods and steps of medical image analysis and processing. Chapter 3 presents a brief review of recent studies on reconstructed finite element bone models, based on medical images. Finally, Chapter 4 reveals the digital results obtained for the main bone sites that have been targeted by finite element modeling in recent years.

Heat Transfer 3 - Michel Ledoux 2022-08-29

Heat is a branch of thermodynamics that occupies a unique position due to its involvement in the field of practice. Being linked to the management, transport and exchange of energy in thermal form, it impacts all aspects of human life and activity. Heat transfers are, by nature, classified as conduction, convection (which inserts conduction into fluid mechanics) and radiation. The importance of these three transfer methods has resulted – justifiably – in a separate volume being afforded to each of them, with the subject of convection split into two volumes. This third volume is dedicated to convection, more specifically, the foundations of convective transfers. Various angles are considered to cover this topic, including empirical relationships and analytically approaching boundary layers, including the integral methods and numerical approaches. The problem of heat exchangers is presented, without aiming to be an exhaustive treatise. Heat Transfer 3 combines a basic approach with a deeper understanding of the discipline and will therefore appeal to a wide audience, from technician to engineer, from doctoral student to teacher-researcher.

Symmetry with Operator Theory and Equations - Ioannis Argyros 2019-10-21

A plethora of problems from diverse disciplines such as Mathematics, Mathematical: Biology, Chemistry, Economics, Physics, Scientific Computing and also Engineering can be formulated as an equation defined in abstract spaces using Mathematical Modelling. The solutions of these equations can be found in closed form only in special case. That is why researchers and practitioners utilize iterative procedures from which a sequence is being generated approximating the solution under some conditions on the initial data. This type of research is considered most interesting and challenging. This is our motivation for the introduction of this special issue on Iterative Procedures.

Constitutive Modelling of Solid Continua - José Merodio 2019-11-14

This volume consists of a collection of chapters by recognized experts to provide a comprehensive fundamental theoretical continuum treatment of constitutive laws used for modelling the mechanical and coupled-field properties of various types of solid materials. It covers the main types of solid material behaviour, including isotropic and anisotropic nonlinear elasticity, implicit theories, viscoelasticity, plasticity, electro- and magneto-mechanical interactions, growth, damage, thermomechanics, poroelasticity, composites and homogenization. The volume provides a general framework for research in a wide range of applications involving the deformation of solid materials. It will be of considerable benefit to both established and early career researchers concerned with fundamental theory in solid mechanics and its applications by collecting

diverse material in a single volume. The readership ranges from beginning graduate students to senior researchers in academia and industry.

Stochastic Dynamics of Structures - Abdelkhalak El Hami 2016-11-22

This book is dedicated to the general study of the dynamics of mechanical structures with consideration of uncertainties. The goal is to get the appropriate forms of a part in minimizing a given criterion. In all fields of structural mechanics, the impact of good design of a room is very important to its strength, its life and its use in service. The development of the engineer's art requires considerable effort to constantly improve structural design techniques.

Movement Equations 5 - Georges Vénizélos 2019-12-03

The final volume in the Non-deformable Solid Mechanics set, Movement Equations 5 deals with the dynamics of sets of solids. This volume provides the appropriate mathematical tools (torsor calculus and matrix calculus) to obtain and solve the equations of motion for a chain of solids. These equations are then used to acquire the information necessary for the design of mechanical systems. Also examined are the vibratory behavior of continuous (deformable) systems, rigid and deformable solids, and sets of several solids. The book concludes with a study of the response of an excited system as a function of the excitation frequency. Accompanied by detailed examples, this book is aimed primarily at students, but would also serve as a valuable support for working engineers and teacher-researchers.

Movement Equations 2 - Michel Borel 2017-01-03

The formalism processing of unbuckled solids mechanics involves several mathematical tools which are to be mastered at the same time. This volume collects the main points which take place in the course of the formalism, so that the user immediately finds what he needs without looking for it. Furthermore, the book contains a methodological formulary to guide the user in his approach.

Movement Equations 1 - Michel Borel 2016-09-16

The set of books on Mechanical Engineering and Solid Mechanics, of which this book is the first volume, is an essential tool for those looking to develop a rigorous knowledge of the discipline, whether students, professionals (in search of an approach to a problem they are dealing with), or anyone else interested. This volume deals with the elements required for establishing the equations of motion when dealing with solid bodies. Chapter 1 focuses on the systems of reference used to locate solid bodies relative to the observer, and demonstrates how to describe their position, orientation, and evolution during their motion. Chapter 2 introduces descriptors of motion such as velocity and acceleration, and develops the concept of torsor notation in relation to these descriptors. Finally, Chapter 3 concerns the notions of mass and inertia, as well as the kinetic torsor and dynamic torsor which consolidate the kinematic and kinetic aspects in a single concept.

Mechanics of Aeronautical Solids, Materials and Structures - Christophe Bouvet 2017-03-13

The objective of this work on the mechanics of aeronautical solids, materials and structures is to give an overview of the principles necessary for sizing of structures in the aeronautical field. It begins by introducing the classical notions of mechanics: stress, strain, behavior law, and sizing criteria, with an emphasis on the criteria specific to aeronautics, such as limit loads and ultimate loads. Methods of resolution are then presented, and in particular the finite element method. Plasticity is also covered in order to highlight its influence on the sizing of structures, and in particular its benefits for design criteria. Finally, the physics of the two main materials of aeronautical structures, namely aluminum and composite materials, is approached in order to clarify the sizing criteria stated in the previous chapters. Exercises, with detailed corrections, then make it possible for the reader to test their understanding of the different subjects.

Experimental Mechanics of Solids and Structures - Jérôme Molimard 2016-03-31

From the characterization of materials to accelerated life testing, experimentation with solids and structures is present in all stages of the design of mechanical devices. Sometimes only an experimental model can bring the necessary elements for understanding, the physics under study just being too complex for

an efficient numerical model. This book presents the classical tools in the experimental approach to mechanical engineering, as well as the methods that have revolutionized the field over the past 20 years: photomechanics, signal processing, statistical data analysis, design of experiments, uncertainty analysis, etc. Experimental Mechanics of Solids and Structures also replaces mechanical testing in a larger context: firstly, that of the experimental model, with its own hypotheses; then that of the knowledge acquisition process, which is structured and robust; finally, that of a reliable analysis of the results obtained, in a context where uncertainty could be important.

Fractional Calculus with Applications in Mechanics - Teodor M. Atanackovic 2014-03-17

The books Fractional Calculus with Applications in Mechanics: Vibrations and Diffusion Processes and Fractional Calculus with Applications in Mechanics: Wave Propagation, Impact and Variational Principles contain various applications of fractional calculus to the fields of classical mechanics. Namely, the books study problems in fields such as viscoelasticity of fractional order, lateral vibrations of a rod of fractional order type, lateral vibrations of a rod positioned on fractional order viscoelastic foundations, diffusion-wave phenomena, heat conduction, wave propagation, forced oscillations of a body attached to a rod, impact and variational principles of a Hamiltonian type. The books will be useful for graduate students in mechanics and applied mathematics, as well as for researchers in these fields. Part 1 of this book presents an introduction to fractional calculus. Chapter 1 briefly gives definitions and notions that are needed later in the book and Chapter 2 presents definitions and some of the properties of fractional integrals and derivatives. Part 2 is the central part of the book. Chapter 3 presents the analysis of waves in fractional viscoelastic materials in infinite and finite spatial domains. In Chapter 4, the problem of oscillations of a translatory moving rigid body, attached to a heavy, or light viscoelastic rod of fractional order type, is studied in detail. In Chapter 5, the authors analyze a specific engineering problem of the impact of a viscoelastic rod against a rigid wall. Finally, in Chapter 6, some results for the optimization of a functional containing fractional derivatives of constant and variable order are presented.

Basic Theory - Anatoly Kochubei 2019-02-19

This multi-volume handbook is the most up-to-date and comprehensive reference work in the field of fractional calculus and its numerous applications. This first volume collects authoritative chapters covering the mathematical theory of fractional calculus, including fractional-order operators, integral transforms and equations, special functions, calculus of variations, and probabilistic and other aspects.

Fractional Calculus with Applications in Mechanics - Teodor M. Atanackovic 2014-02-19

This book contains mathematical preliminaries in which basic definitions of fractional derivatives and spaces are presented. The central part of the book contains various applications in classical mechanics including fields such as: viscoelasticity, heat conduction, wave propagation and variational Hamilton–type principles. Mathematical rigor will be observed in the applications. The authors provide some problems formulated in the classical setting and some in the distributional setting. The solutions to these problems are presented in analytical form and these solutions are then analyzed numerically. Theorems on the existence of solutions will be presented for all examples discussed. In using various constitutive equations the restrictions following from the second law of thermodynamics will be implemented. Finally, the physical implications of obtained solutions will be discussed in detail.

Heat Transfer 1 - Michel Ledoux 2021-03-12

Heat is a branch of thermodynamics that occupies a unique position due to its involvement in the field of practice. Being linked to the management, transport and exchange of energy in thermal form, it impacts all aspects of human life and activity. Heat transfers are, by nature, classified as conduction, convection (which inserts conduction into fluid mechanics) and radiation. The importance of these three transfer methods has resulted – justifiably – in a separate volume being afforded to each of them. This first volume is dedicated to thermal conduction, and, importantly, assumes an analytical approach to the problems presented, and recalls the fundamentals. Heat Transfer 1

combines a basic approach with a deeper understanding of the discipline and will therefore appeal to a wide audience, from technician to engineer, from doctoral student to teacher-researcher.

Modern Trends in Structural and Solid Mechanics 3 - Noel Challamel 2021-06-29

This book – comprised of three separate volumes – presents the recent developments and research discoveries in structural and solid mechanics; it is dedicated to Professor Isaac Elishakoff. This third volume is devoted to non-deterministic mechanics. Modern Trends in Structural and Solid Mechanics 3 has broad scope, covering topics such: design optimization under uncertainty, interval field approaches, convex analysis, quantum inspired topology optimization and stochastic dynamics. The book is illustrated by many applications in the field of aerospace engineering, mechanical engineering, civil engineering, biomedical engineering and automotive engineering. This book is intended for graduate students and researchers in the field of theoretical and applied mechanics.

The Rayleigh-Ritz Method for Structural Analysis - Sinniah Ilanko 2014-12-01

A presentation of the theory behind the Rayleigh-Ritz (R-R)method, as well as a discussion of the choice of admissiblefunctions and the use of penalty methods, including recentdevelopments such as using negative inertia and bi-penaltyterms. While presenting the mathematical basis of the R-Rmethod, the authors also give simple explanations and analogies tomake it easier to understand. Examples include calculation ofnatural frequencies and critical loads of structures and structuralcomponents, such as beams, plates, shells and solids. MATLAB codesfor some common problems are also supplied.

Modern Trends in Structural and Solid Mechanics 1 - Noel Challamel 2021-06-29

This book - comprised of three separate volumes - presents the recent developments and research discoveries in structural and solid mechanics; it is dedicated to Professor Isaac Elishakoff. This first volume is devoted to the statics and stability of solid and structural members. Modern Trends in Structural and Solid Mechanics 1 has broad scope, covering topics such as: buckling of discrete systems (elastic chains, lattices with short and long range interactions, and discrete arches), buckling of continuous structural elements including beams, arches and plates, static investigation of composite plates, exact solutions of plate problems, elastic and inelastic buckling, dynamic buckling under impulsive loading, buckling and post-buckling investigations, buckling of conservative and non-conservative systems and buckling of micro and macro-systems. This book is intended for graduate students and researchers in the field of theoretical and applied mechanics.

Introduction to Fractional Differential Equations - Constantin Milici 2018-10-28

This book introduces a series of problems and methods insufficiently discussed in the field of Fractional Calculus – a major, emerging tool relevant to all areas of scientific inquiry. The authors present examples based on symbolic computation, written in Maple and Mathematica, and address both mathematical and computational areas in the context of mathematical modeling and the generalization of classical integer-order methods. Distinct from most books, the present volume fills the gap between mathematics and computer fields, and the transition from integer- to fractional-order methods.

Fluid-Structure Interactions and Uncertainties - Abdelkhalak El Hami 2017-02-07

This book is dedicated to the general study of fluid structure interaction with consideration of uncertainties. The fluid-structure interaction is the study of the behavior of a solid in contact with a fluid, the response can be strongly affected by the action of the fluid. These phenomena are common and are sometimes the cause of the operation of certain systems, or otherwise manifest malfunction. The vibrations affect the integrity of structures and must be predicted to prevent accelerated wear of the system by material fatigue or even its destruction when the vibrations exceed a certain threshold.

Biomechanics - Ghias Kharmanda 2017-01-03

In this book, the authors present in detail several recent methodologies and algorithms that they developed during the last fifteen years. The deterministic methods account for uncertainties through empirical safety factors,

which implies that the actual uncertainties in materials, geometry and loading are not truly considered. This problem becomes much more complicated when considering biomechanical applications where a number of uncertainties are encountered in the design of prosthesis systems. This book implements improved numerical strategies and algorithms that can be applied to biomechanical studies.

Dynamics of Large Structures and Inverse Problems - Abdelkhalak El Hami 2017-08-07

This book deals with the various aspects of stochastic dynamics, the resolution of large mechanical systems, and inverse problems. It integrates the most recent ideas from research and industry in the field of stochastic dynamics and optimization in structural mechanics over 11 chapters. These chapters provide an update on the various tools for dealing with uncertainties, stochastic dynamics, reliability and optimization of systems. The optimization–reliability coupling in structures dynamics is approached in order to take into account the uncertainties in the modeling and the resolution of the problems encountered. Accompanied by detailed examples of uncertainties, optimization, reliability, and model reduction, this book presents the newest design tools. It is intended for students and engineers and is a valuable support for practicing engineers and teacher-researchers.

Fractional Derivative Modeling in Mechanics and Engineering - Wen Chen (College teacher) 2022

This book highlights the theory of fractional calculus and its wide applications in mechanics and engineering. It describes research findings in using fractional calculus methods for modeling and numerical simulation of complex mechanical behavior. It covers the mathematical basis of fractional calculus, the relationship between fractal and fractional calculus, unconventional statistics and anomalous diffusion, typical applications of fractional calculus, and the numerical solution of the fractional differential equation. It also summaries the latest findings, such as variable order derivative, distributed order derivative, and its applications. The book avoids lengthy mathematical demonstrations and presents the theories related to the applications in an easily readable manner. This textbook intends for students, researchers, and professionals in applied physics, engineering mechanics, and applied mathematics. It is also of high reference value for those in environmental mechanics, geotechnical mechanics, biomechanics, and rheology.

Galilean Mechanics and Thermodynamics of Continua - Géry de Saxcé 2016-01-07

This title proposes a unified approach to continuum mechanics which is consistent with Galilean relativity. Based on the notion of affine tensors, a simple generalization of the classical tensors, this approach allows gathering the usual mechanical entities — mass, energy, force, moment, stresses, linear and angular momentum — in a single tensor. Starting with the basic subjects, and continuing through to the most advanced topics, the authors' presentation is progressive, inductive and bottom-up. They begin with the concept of an affine tensor, a natural extension of the classical tensors. The simplest types of affine tensors are the points of an affine space and the affine functions on this space, but there are more complex ones which are relevant for mechanics − torsors and momenta. The essential point is to derive the balance equations of a continuum from a unique principle which claims that these tensors are affine-divergence free.

Lagrangian Mechanics - Anh Le Van 2019-06-18

Lagrangian Mechanics explains the subtleties of analytical mechanics and its applications in rigid body mechanics. The authors demonstrate the primordial role of parameterization, which conditions the equations and thus the information obtained; the essential notions of virtual kinematics, such as the virtual derivative and the dependence of the virtual quantities with respect to a reference frame; and the key concept of perfect joints and their intrinsic character, namely the invariance of the fields of compatible virtual velocities with respect to the parameterization. Throughout the book, any demonstrated results are stated with the respective hypotheses, clearly indicating the applicability conditions for the results to be ready for use. Numerous examples accompany the text, facilitating the understanding of the calculation mechanisms. The book is mainly intended for Bachelor's, Master's or engineering students who are interested in an in-depth study

of analytical mechanics and its applications.

Compressible Flow Propulsion and Digital Approaches in Fluid Mechanics - Michel Ledoux 2017-01-18

This book aims to provide an efficient methodology of solving a fluid mechanics problem, based on an awareness of the physical. It meets different objectives of the student, the future engineer or scientist: Simple sizing calculations are required to master today's numerical approach for solving complex practical problems.

Fractional Dynamics on Networks and Lattices - Thomas Michelitsch 2019-04-10

This book analyzes stochastic processes on networks and regular structures such as lattices by employing the Markovian random walk approach. Part 1 is devoted to the study of local and non-local random walks. It shows how non-local random walk strategies can be defined by functions of the Laplacian matrix that maintain the stochasticity of the transition probabilities. A major result is that only two types of functions are admissible: type (i) functions generate asymptotically local walks with the emergence of Brownian motion, whereas type (ii) functions generate asymptotically scale-free non-local “fractional” walks with the emergence of Lévy flights. In Part 2, fractional dynamics and Lévy flight behavior are analyzed thoroughly, and a generalization of Pólya's classical recurrence theorem is developed for fractional walks. The authors analyze primary fractional walk characteristics such as the mean occupation time, the mean first passage time, the fractal scaling of the set of distinct nodes visited, etc. The results show the improved search capacities of fractional dynamics on networks.

From Prognostics and Health Systems Management to Predictive Maintenance 2 - Brigitte Chebel-Morello 2017-08-07

This book is the second volume in a set of books dealing with the evolution of technology, IT and organizational approaches and what this means for industrial equipment. The authors address this increasing complexity in two parts, focusing specifically on the field of Prognostics and Health Management (PHM). Having tackled the PHM cycle in the first volume, the purpose of this book is to tackle the other phases of PHM, including the traceability of data, information and knowledge, and the ability to make decisions accordingly. The book concludes with a summary analysis and perspectives regarding this emerging domain, since without traceability, knowledge and decision, any prediction of the health state of a system cannot be exploited.