

Progress in Mathematical Physics

Alfredo Bermúdez de Castro
**Continuum
Thermomechanics**



Birkhäuser

Continuum Thermomechanics Progress In Mathematical Physics

Lalao Rakotomanana

A decorative graphic element consisting of a light blue horizontal bar with a rounded right end, and a red circular gradient shape partially visible behind it.

Continuum Thermomechanics Progress In Mathematical Physics:

Continuum Thermomechanics Alfredo Bermúdez de Castro, 2006-03-17 The general goal of this book is to deduce rigorously from the first principles the partial differential equations governing the thermodynamic processes undergone by continuum media under forces and heat Solids and fluids are considered in a unified framework Reacting mixtures of fluids are also included for which general notions of thermodynamics are recalled such as the Gibbs equilibrium theory Linear approximate models are mathematically obtained by calculating the derivatives of the constitutive response functions They include the classical models for linear vibrations of thermoelastic solids and also for wave propagation in fluids dissipative and non dissipative acoustics and internal gravity waves Progress in Continuum Mechanics Holm Altenbach, Hans Irschik, Alexey V. Porubov, 2023-10-04 This book gives an insight into the current developments in the field of continuum mechanics Twenty five researchers present new theoretical concepts e g better inclusion of the microstructure in the models describing material behavior At the same time there are also more applications for the theories in engineering practice In addition to new theoretical approaches in continuum mechanics and applications the book puts an emphasis on discussing multi physics problems **A Geometric Approach to Thermomechanics of Dissipating Continua** Lalao Rakotomanana, 2012-09-08 Across the centuries the development and growth of mathematical concepts have been strongly stimulated by the needs of mechanics Vector algebra was developed to describe the equilibrium of force systems and originated from Stevin's experiments 1548 1620 Vector analysis was then introduced to study velocity fields and force fields Classical dynamics required the differential calculus developed by Newton 1687 Nevertheless the concept of particle acceleration was the starting point for introducing a structured spacetime Instantaneous velocity involved the set of particle positions in space Vector algebra theory was not sufficient to compare the different velocities of a particle in the course of time There was a need to parallel transport these velocities at a single point before any vector algebraic operation The appropriate mathematical structure for this transport was the connection I The Euclidean connection derived from the metric tensor of the referential body was the only connection used in mechanics for over two centuries Then major steps in the evolution of spacetime concepts were made by Einstein in 1905 special relativity and 1915 general relativity by using Riemannian connection Slightly later nonrelativistic spacetime which includes the main features of general relativity I It took about one and a half centuries for connection theory to be accepted as an independent theory in mathematics Major steps for the connection concept are attributed to a series of findings Riemann 1854 Christoffel 1869 Ricci 1888 Levi Civita 1917 Weyl 1918 Cartan 1923 Eshermann 1950 **Differential Geometry And Kinematics Of Continua** John D Clayton, 2014-07-31 This book provides definitions and mathematical derivations of fundamental relationships of tensor analysis encountered in nonlinear continuum mechanics and continuum physics with a focus on finite deformation kinematics and classical differential geometry Of particular interest are anholonomic aspects arising from a multiplicative decomposition of the

deformation gradient into two terms neither of which in isolation necessarily obeys the integrability conditions satisfied by the gradient of a smooth vector field The concise format emphasizes clarity and ease of reference and detailed step by step derivations of most analytical results are provided

IUTAM Symposium on Progress in the Theory and Numerics of Configurational Mechanics Paul Steinmann, 2009-08-03 Configurational mechanics has attracted quite a bit of attention from various search elds over the recent years decades Having been regarded in its infancy of the early years as a somewhat obscure and almost mystic eld of research that could only be understood by a happy few of insiders with a pronounced theoretical inclination configurational mechanics has developed by now into a versatile tool that can be applied to a variety of problems Since the seminal works of Eshelby a general notion of configurational mechanics has been developed and has successfully been applied to many problems involving various types of defects in continuous media The most prominent application is certainly the use of configurational forces in fracture mechanics However as configurational mechanics is related to arbitrary material inhomogeneities it has also very successfully been applied to many materials science and engineering problems such as phase transitions and inelastic deformations Also the modeling of materials with micro structure evolution is an important eld in which configurational mechanics can provide a better understanding of processes going on within the material Besides these mechanically physically and chemically motivated applications ideas from configurational mechanics are now increasingly applied within computational mechanics

Publicationes mathematicae Kossuth Lajos Tudományegyetem. Matematikai Intézet, 2006

The Mechanics and Thermodynamics of Continuous Media Miroslav Silhavy, 2014-10-05 From the reviews The book is excellent and covers a very broad area usually treated as separate topics from a unified perspective It will be very useful for both mathematicians and physicists EMS Newsletter

Randomness And Realism: Encounters With Randomness In The Scientific Search For Physical Reality John W Fowler, 2021-07-08 Randomness is an active element relevant to all scientific activities The book explores the way in which randomness suffuses the human experience starting with everyday chance events followed by developments into modern probability theory statistical mechanics scientific data analysis quantum mechanics and quantum gravity An accessible introduction to these theories is provided as a basis for going into deeper topics Fowler unveils the influence of randomness in the two pillars of science measurement and theory Some emphasis is placed on the need and methods for optimal characterization of uncertainty An example of the cost of neglecting this is the St Petersburg Paradox a theoretical game of chance with an infinite expected payoff value The role of randomness in quantum mechanics reveals another particularly interesting finding that in order for the physical universe to function as it does and permit conscious beings within it to enjoy sanity irreducible randomness is necessary at the quantum level The book employs a certain level of mathematics to describe physical reality in a more precise way that avoids the tendency of nonmathematical descriptions to be occasionally misleading Thus it is most readily digested by young students who have taken at least a class in introductory calculus or professional scientists and engineers

curious about the book's topics as a result of hearing about them in popular media. Readers not inclined to savor equations should be able to skip certain technical sections without losing the general flow of ideas. Still, it is hoped that even readers who usually avoid equations will give those within these pages a chance as they may be surprised at how potentially foreboding concepts fall into line when one makes a legitimate attempt to follow a succession of mathematical implications.

Thermomechanics of Viscoplasticity Milan Micunovic, 2009-04-20. This work examines the geometrical and thermodynamical properties of mechanical behavior of metals and many polymeric and paste-like materials which are indispensable for developing a rational theory of viscoplasticity. The book is intended for researchers as well as Ph.D. students in the fields of material science and continuum mechanics. Anyone involved in the design of large-scale industrial parts will also find this book highly useful. The concepts and results illustrated in this work are readily applicable to the rapidly developing field of biomechanics.

Métodos numéricos para problemas de convección-difusión. Aplicación a la convección natural. Marta Benítez García, 2010.

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