Elasticity And Plasticity The Mathematical Theory Of Elasticity And The Mathematical Theory Of Plasticity Survey In Applied Mathematics Volume 1

Mathematical Theory and Numerical Analysis
Elasticity, Fracture and Flow
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Mathematical Theory of Elasticity
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Theory and Applications
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The Mathematical Theory of Plasticity

Including Gradient Materials
Mechanical Behaviour of Materials
Applied Elasticity and Plasticity
The Mathematical Theory of Elasticity and The Mathematical Theory of Plasticity
with Engineering and Geological Applications
Elastic And Inelastic Stress Analysis
Continuum Mechanics
Elasticity and Plasticity of Large Deformations
Theory of Elasticity and Plasticity
Elastoplasticity Theory
Computational Methods in Elasticity and Plasticity
The Mathematical Theory of Plasticity
Mathematical Theory of Elasticity of Quasicrystals and Its Applications
Elasticity and Plasticity
Volume I: Elasticity and Plasticity
Elasticity and Plasticity of Large Deformations
Mathematical model of deformable solid bodies
Continuum Theory of Plasticity

ELLISON ELSA

Mathematical Theory and Numerical Analysis Springer Science & Business Media

IN this monograph I have attempted to set out, in as elemen tary a form as possible, the basic mathematics of the theories of elasticity, plasticity, viscosity, and rheology, together with a discussion of the properties of the materials involved and the way in which they are idealized to form a basis for the mathe matical theory. There are many mathematical text-books on these subjects, but they are largely devoted to methods for the solution of special problems, and, while the present book may be regarded as an introduction to these, it is also in tended for the large class of readers such as engineers and geologists who are more interested in the detailed analysis of stress and strain, the properties of some of the materials they use, criteria for flow and fracture, and so on, and whose interest in the theory is rather in the assumptions involved in it and the way in which they affect the solutions than in the study of special problems. The first chapter develops the analysis of stress and strain rather fully, giving, in particular, an account of Mohr's repre sentations of stress and of finite homogeneous strain in three dimensions. In the second chapter, on the behaviour of materials, the stress-strain relations for elasticity (both for isotropic and simple anisotropic substances), viscosity, plas ticity and some of the simpler rheological models are described.

Elasticity, Fracture and Flow Springer Science & Business Media

The book acquaints the reader with the basic concepts and relations of elasticity and plasticity, and also with the contemporary state of the theory, covering such aspects as the nonlinear models of elasto-plastic bodies and of large deflections of plates, unilateral boundary value problems, variational principles, the finite element method, and so on.

Mathematical Foundations of Elasticity Springer Science & Business Media

Applied Elasticity and Plasticity is a comprehensive work that introduces graduate students and professionals in civil, mechanical, aeronautical and metallurgical engineering to the basic theories of elasticity, plasticity and their practical applications. Based on experimental data of static tension tests of material, several elastic and plastic stress-strain relations are derived, and commonly-used yield criteria and strain hardening rules are discussed as well. Analysis of conventional, deviatoric and mathematical stress and strain in two and three dimensions is presented. Analytical applications include torsion and bending of structural components subjected to various loadings, thick-walled cylindrical and spherical vessels subjected to internal and external pressures, stress-concentrations around holes, stress-intensity factors in structural components containing circular, elliptical and many more concepts important for professionals and students alike.

Mathematical Theory of Elastic and Elasto-Plastic Bodies John Wiley & Sons

This careful and detailed introduction to non-linear continuum mechanics and to elasticity and platicity, with a unique mathematical foundation, starts right from the basics. The general theory of mechanical behaviour is particularized for the broad and important classes of elasticity and plasticity. Brings the reader to the forefront of today's knowledge. A list of notations and an index help the reader finding specific topics.

Nonlinear Problems of Elasticity Springer Science & Business Media

Presents certain key aspects of inelastic solid mechanics centered around viscoelasticity, creep, viscoplasticity, and plasticity. It is divided into three parts consisting of the fundamentals of elasticity, useful constitutive laws, and applications to simple structural members, providing extended treatment of basic problems in static structural mechanics, including elastic and inelastic effects. It contains worked-out examples and end-of-chapter problems.

An Introduction Springer Science & Business Media

The scientists of the seventeenth and eighteenth centuries, led by Jas. Bernoulli and Euler, created a coherent theory of the mechanics of strings and rods undergoing planar deformations. They introduced the basic con cepts of strain, both extensional and flexural, of contact force with its com ponents of tension and shear force, and of contact couple. They extended Newton's Law of Motion for a mass point to a law valid for any deformable body. Euler formulated its independent and much subtler complement, the Angular Momentum Principle. (Euler also gave effective variational characterizations of the governing equations.) These scientists breathed life into the theory by proposing, formulating, and solving the problems of the suspension bridge, the catenary, the velaria, the elastica, and the small transverse vibrations of an elastic string. (The level of difficulty of some of these problems is such that even today their descriptions are sel dom vouchsafed to undergraduates. The realization that such profound and beautiful results could be deduced by mathematical reasoning from fundamental physical principles furnished a significant contribution to the intellectual climate of the Age of Reason.) At first, those who solved these problems did not distinguish between linear and nonlinear equations, and so were not intimidated by the latter. By the middle of the nineteenth century, Cauchy had constructed the basic framework of three-dimensional continuum mechanics on the founda tions built by his eighteenth-century predecessors.

Elasticity and Plasticity Elsevier

This book focuses on the theoretical aspects of small strain theory of elastoplasticity with hardening assumptions. It provides a comprehensive and unified treatment of the mathematical theory and numerical analysis. It is divided into three parts, with the first part providing a detailed introduction to plasticity, the second part covering the mathematical analysis of the elasticity problem, and the third part devoted to error analysis of various semi-discrete and fully discrete approximations for variational formulations of the elastoplasticity. This revised and expanded edition includes material on single-crystal and strain-gradient plasticity. In addition, the entire book has been revised to make it more accessible to readers who are actively involved in computations but less so in numerical analysis. Reviews of earlier edition: “The authors have written an excellent book which can be recommended for specialists in plasticity who wish to know more about the mathematical theory, as well as those with a background in the mathematical sciences who seek a self-contained account of the mechanics and mathematics of plasticity theory.” (ZAMM, 2002) “In summary, the book represents an impressive comprehensive overview of the mathematical approach to the theory and numerics of plasticity. Scientists as well as lecturers and graduate students will find the book very useful as a reference for research or for preparing courses in this field.” (Technische Mechanik) "The book is professionally written and will be a useful reference to researchers and students interested in mathematical and numerical problems of plasticity. It represents a major contribution in the area of continuum mechanics and numerical analysis." (Math Reviews)

<ins>Mathematical Problems in Plasticity</ins>

Elasticity and PlasticityThe Mathematical Theory of Elasticity and The Mathematical Theory of Plasticity

Understanding the elastoplastic

deformation of metals and geomaterials, including the constitutive description of the materials and analysis of structure undergoing plastic deformation, is an essential part of the background required by mechanical, civil, and geotechnical engineers as well as materials scientists. However, most books address the subject at a introductory level and within the infinitesimal strain context. Elastoplasticity Theory takes a different approach in an advanced treatment presented entirely within the framework of finite deformation. This comprehensive, self-contained text includes an introduction to nonlinear continuum mechanics and nonlinear elasticity. In addition to in-depth analysis of the mathematical and physical theories of plasticity, it furnishes an up-to-date look at contemporary topics, such as plastic stability and localization, monocrystalline plasticity, micro-to-macro transition, and polycrysalline plasticity models. Elastoplasticity Theory reflects recent trends and advances made in the theory of plasticity over the last four decades. It will not only help stimulate further research in the field, but will enable its readers to confidently select the appropriate constitutive models for the materials or structural members relevant to their own applications.

Plasticity Oxford University Press Nonlinear Continuum Mechanics for Finite Elasticity-Plasticity empowers readers to fully understand the constitutive equation of finite strain, an essential piece in assessing the deformation/strength of materials and safety of structures. The book starts by providing a foundational overview of continuum mechanics, elasticity and plasticity, then segues into more sophisticated topics such as multiplicative decomposition of deformation gradient tensor with the isoclinic concept and the underlying subloading surface concept. The subloading surface concept insists that the plastic strain rate is not induced suddenly at the moment when the stress reaches the yield surface but it develops continuously as the stress approaches the yield surface, which is crucially important for the precise description of cyclic loading behavior. Then, the exact formulations of the elastoplastic and viscoplastic constitutive equations based on the multiplicative decomposition are expounded in great detail. The book concludes with examples of these concepts and modeling techniques being deployed in real-world applications. Table of Contents: 1. Mathematical Basics 2. General (Curvilinear) Coordinate System 3. Description of Deformation/Rotation in Convected Coordinate System 4. Deformation/Rotation (Rate) Tensors 5. Conservation Laws and Stress Tensors 6. Hyperelastic Equations 7. Development of Elastoplastic Constitutive Equations 8. Multiplicative Decomposition of Deformation Gradient Tensor 9. Multiplicative Hyperelastic-based Plastic and Viscoplastic Constitutive Equations 10. Friction Model: Finite Sliding Theory Covers both the fundamentals of continuum mechanics and elastoplasticity while also introducing readers to more advanced topics such as the subloading surface model and the multiplicative decomposition among others Approaches finite elastoplasticity and viscoplasticty theory based on multiplicative decomposition and the subloading surface model Provides a thorough introduction to the general tensor formulation details for the embedded curvilinear coordinate

system and the multiplicative decomposition of the deformation gradient
Solids and Porous Media CRC Press
The object of this book is to study, from a mathematical standpoint, the problem of the equilibrium of a perfectly plastic body under certain conditions. This involves the solution of two problems in the calculus of variations: the strain problem and the stress problem. These problems have only recently been solved, and this volume aims to give an up-to-date account of this work. The tools and methods used should be useful in a number of fields, in particular in solving problems relating to the 'evolution' of certain plastic phenomena, the mechanics of fracture, and certain optimal control problems.
An Introduction Springer Science & Business Media
The only modern, up-to-date introduction to plasticity Despite phenomenal progress in plasticity research over the past fifty years, introductory books on plasticity have changed very little. To meet the need for an up-to-date introduction to the field, Akhtar S. Khan and Sujian Huang have written Continuum Theory of Plasticity--a truly modern text which offers a continuum mechanics approach as well as a lucid presentation of the essential classical contributions. The early chapters give the reader a review of elementary concepts of plasticity, the necessary background material on continuum mechanics, and a discussion of the classical theory of plasticity. Recent developments in the field are then explored in sections on the Mroz Multisurface model, the Dafalias and Popov Two Surface model, the non-linear kinematic hardening model, the endochronic theory of plasticity, and numerous topics in finite deformation plasticity theory and strain space formulation for plastic deformation. Final chapters introduce the fundamentals of the micromechanics of plastic deformation and the analytical coupling between deformation of individual crystals and macroscopic material response of the polycrystal aggregate. For graduate students and researchers in engineering mechanics, mechanical, civil, and aerospace engineering, Continuum Theory of Plasticity offers a modern, comprehensive introduction to the entire subject of plasticity.
Elasticity and Plasticity of Large Deformations CRC Press
The most complete single-volume treatment of classical elasticity, this text features extensive editorial apparatus, including a historical introduction. Topics include stress, strain, bending, torsion, gravitational effects, and much more. 1927 edition.
Elasticity and Plasticity of Large Deformations CRC Press
Civil engineering structures tend to be fabricated from materials that respond elastically at normal levels of loading. Most such materials, however, would exhibit a marked and ductile inelasticity if the structure were overloaded by accident or by some improbable but naturally occuring phenomeon. Indeed, the very presence of such ductility constitutes an important safety provision for large-scale constructions where human life is at risk. In the comprehensive evaluation of safety in structural design, it is therefore unrealistic not to consider the effects of ductility. This book sets out to show that the bringing together of the theory and methods of mathematical programming with the mathematical theory of plasticity

furnishes a model which has a unifying theoretical nature and is entirely representative of observed structural behaviour. The contents of the book provide a review of the relevant aspects of mathematical programming and plasticity theory, together with a detailed presentation of the most interesting and potentially useful applications in both framed and continuum structures: ultimate strength and elastoplastic deformability; shakedown and practical upper bounds on deformation measures; evolutive dynamic response; large displacements and instability; stochastic and fuzzy programming for representing uncertainty in ultimate strength calculations. Besides providing a ready fund of computational algorithms, mathematical programming invests applications in mechanics with a refined mathematical formalism, rich in fundamental theorems, which often gives addi- tional insight into known results and occasionally lead to new ones. In addition to its obvious practical utility, the educational value of the material thoroughly befits a university discipline.
Applied Elasticity and Plasticity Springer Science & Business Media
Most books on continuum mechanics focus on elasticity and fluid mechanics. But whether student or practicing professional, modern engineers need a more thorough treatment to understand the behavior of the complex materials and systems in use today. Continuum Mechanics: Elasticity, Plasticity, Viscoelasticity offers a complete tour of the subject that includes not only elasticity and fluid mechanics but also covers plasticity, viscoelasticity, and the continuum model for fatigue and fracture mechanics. In addition to a broader scope, this book also supplies a review of the necessary mathematical tools and results for a self-contained treatment. The author provides finite element formulations of the equations encountered throughout the chapters and uses an approach with just the right amount of mathematical rigor without being too theoretical for practical use. Working systematically from the continuum model for the thermomechanics of materials, coverage moves through linear and nonlinear elasticity using both tensor and matrix notation, plasticity, viscoelasticity, and concludes by introducing the fundamentals of fracture mechanics and fatigue of metals. Requisite mathematical tools appear in the final chapter for easy reference. Continuum Mechanics: Elasticity, Plasticity, Viscoelasticity builds a strong understanding of the principles, equations, and finite element formulations needed to solve real engineering problems.
Plasticity Springer
The aim of Plasticity Theory is to provide a comprehensive introduction to the contemporary state of knowledge in basic plasticity theory and to its applications. It treats several areas not commonly found between the covers of a single book: the physics of plasticity, constitutive theory, dynamic plasticity, large-deformation plasticity, and numerical methods, in addition to a representative survey of problems treated by classical methods, such as elastic-plastic problems, plane plastic flow, and limit analysis; the problem discussed come from areas of interest to mechanical, structural, and geotechnical engineers, metallurgists and others. The necessary mathematics and basic mechanics and thermodynamics are covered in an introductory chapter,

making the book a self-contained text suitable for advanced undergraduates and graduate students, as well as a reference for practitioners of solid mechanics.
&, *The Mathematical Theory of Plasticity* Springer
This volume comprises two classic essays on the mathematical theories of elasticity and plasticity by authorities in this area of engineering science. Undergraduate and graduate students in engineering as well as professional engineers will find these works excellent texts and references. The Mathematical Theory of Elasticity covers plane stress and plane strain in the isotropic medium, holes and fillets of assignable shapes, approximate conformal mapping, reinforcement of holes, mixed boundary value problems, the third fundamental problem in two dimensions, eigensolutions for plane and axisymmetric states, anisotropic elasticity, thermal stress, elastic waves induced by thermal shock, three-dimensional contact problems, wave propagation, traveling loads and sources of disturbance, diffraction, and pulse propagation. The Mathematical Theory of Plasticity explores the theory of perfectly plastic solids, the theory of strain-hardening plastic solids, piecewise linear plasticity, minimum principles of plasticity, bending of a circular plate, and other problems.
Mathematical Theory of Elasticity Springer Nature
Elasticity and PlasticityThe Mathematical Theory of Elasticity and The Mathematical Theory of PlasticityCourier Dover Publications
Mathematical Programming Methods in Structural Plasticity Elsevier
First published in 1950, this important and classic book presents a mathematical theory of plastic materials, written by one of the leading exponents.
Theory and Applications CRC Press
Foundations of the Theory of Elasticity, Plasticity, and Viscoelasticity details fundamental and practical skills and approaches for carrying out research in the field of modern problems in the mechanics of deformed solids, which involves the theories of elasticity, plasticity, and viscoelasticity. The book includes all modern methods of research as well as the results of the authors' recent work and is presented with sufficient mathematical strictness and proof. The first six chapters are devoted to the foundations of the theory of elasticity. Theory of stress-strain state, physical relations and problem statements, variation principles, contact and 2D problems, and the theory of plates are presented, and the theories are accompanied by examples of solving typical problems. The last six chapters will be useful to postgraduates and scientists engaged in nonlinear mechanics of deformed inhomogeneous bodies. The foundations of the modern theory of plasticity (general, small elastoplastic deformations and the theory of flow), linear, and nonlinear viscoelasticity are set forth. Corresponding research of three-layered circular plates of various materials is included to illustrate methods of problem solving. Analytical solutions and numerical results for elastic, elastoplastic, lineaer viscoelastic and viscoelastoplastic plates are also given. Thermoviscoelastoplastic characteristics of certain materials needed for numerical account are presented in the eleventh chapter. The informative book is intended for scientists, postgraduates and higher-level students of engineering spheres and

will provide important practical skills and approaches.
Nonlinear Continuum Mechanics for Finite Elasticity-Plasticity CRC Press
This book presents an introduction to material theory and, in particular, to elasticity, plasticity and viscoelasticity, to bring the reader close to the frontiers of today’s knowledge in these particular fields. It starts right from the beginning without assuming much knowledge of the subject. Hence, the book is generally comprehensible to all engineers, physicists, mathematicians, and others. At the beginning of each new section, a brief Comment on the Literature contains recommendations for further reading. This book includes an updated reference list and over 100 changes throughout the book. It contains the latest knowledge on the subject. Two new chapters have been added in this new edition. Now finite viscoelasticity is included, and an Essay on gradient materials, which have recently drawn much attention.