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The Mathematical Theory of Plasticity Rodney Hill 1998 First published in 1950, this important and classic book presents a mathematical theory of plastic materials, written by one of the leading exponents.

**Mathematical Theory of Elastic and Elasto-Plastic Bodies** J. Necas 2017-02-01 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.

**Nonlinear Evolution Equations** Nina Nikolaevna Uraltseva 1995-05-19 This collection focuses on nonlinear problems in partial differential equations. Most of the papers are based on lectures presented at the seminar on partial differential equations and mathematical physics at St. Petersburg University. Among the topics explored are the existence and properties of solutions of various classes of nonlinear evolution equations, nonlinear imbedding theorems, bifurcations of solutions, and equations of mathematical physics (Navier-Stokes type equations and the nonlinear Schrodinger equation). The book will be useful to researchers and graduate students working in partial differential equations and mathematical physics.

Plasticity Weimin Han 2012-11-19 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)

*Physico-Mathematical Theory of High Irreversible Strains in Metals* V.M. Greshnov 2019-02-06 Presents a new physical and mathematical theory of irreversible deformations and ductile fracture of metals that acknowledges the continuous change in the structure of materials during deformation and the accumulation of deformation damage. Plastic deformation, viscous destruction, evolution of structure, creep processes, and long-term strength of metals and stress relaxation are described in the framework of a unified approach and model. The author then expands this into a mathematical model for determining the mechanical characteristics of quasi-samples of standard mechanical properties in deformed semi-finished products.

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*Plasticity and Creep of Metals* Andrew Rusinko 2011-07-24 This book serves both as a textbook and a scientific work. As a textbook, the work gives a clear, thorough and systematic presentation of the fundamental postulates, theorems and principles and their applications of the classical mathematical theories of plasticity and creep. In addition to the mathematical theories, the physical theory of plasticity, the book presents the Budiansky concept of slip and its modification by M. Leonov. Special attention is given to the analysis of the advantages and shortcomings of the classical theories. In its main part, the book presents the synthetic theory of irreversible deformations, which is based on the mathematical Sanders flow plasticity theory and the physical theory, the Budiansky concept of slip. The main peculiarity of the synthetic theory is that the formulae for both plastic and creep deformation, as well their interrelations, can be derived from the single constitutive equation. Furthermore, the synthetic theory, as physical one, can take into account the real processes that take place in solids at irreversible deformation. This widens considerably the potential of the synthetic theory. In the framework of the synthetic theory such problems as creep delay, the Hazen-Kelly effect, the deformation at the break of the load trajectory, the influence of the rate of loading on the stress-strain diagram, creep at the changes of load, creep at unloading and reversed creep, have been analytically described. In the last chapter, the book shows the solution of some contemporary problems of plasticity and creep: Creep deformation at cyclic abrupt changes of temperature, The influence of irradiation on the plastic and creep deformation, Peculiarities of deformation at the phase transformation of some metals.

**Applied Plasticity, Second Edition** Jagabandhu Chakrabarty 2009-11-05 This book begins with the fundamentals of the mathematical theory of plasticity. The discussion then turns to the theory of plastic stress and its applications to structural analysis. It concludes with a wide range of topics in dynamic plasticity including wave propagation, armor penetration, and structural impact in the plastic range. In view of the rapidly growing interest in computational methods, an appendix presents the fundamentals of a finite-element analysis of metal-forming problems.

*The Catalogue of Computational Material Models* Paul Steinmann 2021-03-20 This book gives a comprehensive account of the formulation and computational treatment of basic geometrically linear models in 1D. To set the stage, it assembles some preliminaries regarding necessary modelling, computational and mathematical tools. Thereafter, the remaining parts are concerned with the actual catalogue of computational material models. To this end, after starting out with elasticity as a reference, further 15 different basic variants of material models (5 x each of {visco-elasticity, plasticity, visco-plasticity}, respectively) are systematically explored. The presentation for each of these basic material models is a stand-alone account and follows in each case the same structure. On the one hand, this allows, in the true sense of a catalogue, to consult each of the basic material models separately without the need to refer to other basic material models. On the other hand, even though this somewhat repetitious concept may seem tedious, it allows to compare the formulation and resulting algorithmic setting of the various basic material models and thereby to uncover, in detail, similarities and differences. In particular, the response of each basic material model is analysed for the identical histories (Zig-Zag, Sine, Ramp) of prescribed strain and stress so as to clearly showcase and to contrast to each other the characteristics of the various modelling options.

Plasticity and Textures W. Gambin 2001-12-31 This book unifies, for the first time in book form, the main concepts of the physical and mathematical theory of plasticity. It presents the foundations of modern anisotropic plasticity, which link microscopic observations of texture formation with macroscopic properties of plastically anisotropic materials. Progress in metal-forming technologies has created the necessity to express the plastic yield process in terms of mathematics in order to apply computer methods. In addition new materials used in structural elements require a more detailed description of their physical structure. Amongst both metallurgists and mechanical designers, a strong tendency exists to formulate the scientific material in a common language. This book meets this request, although it has no ambitions to summarise the existing state of knowledge, only to combine the mathematical and physical approaches. The book is mainly addressed to mechanical designers. It is written for researchers who have a knowledge of physics and who want a mathematical tool for using this knowledge for a better description of technological processes. Moreover, it will interest metallurgists who want to have a more general view of their field of research, as well as for mechanical and civil engineers who want to apply some microstructural knowledge in their work. It could also be useful for graduate students at post-doctorate level who want to enter the field of plastic deformation of polycrystalline metals with texture.

*Physico-Mathematical Theory of High Irreversible Strains in Metals* V.M. Greshnov 2019-02-06 Presents a new physical and mathematical theory of irreversible deformations and ductile fracture of metals that acknowledges the continuous change in the structure of materials during deformation and the accumulation of deformation damage. Plastic deformation, viscous destruction, evolution of structure, creep processes, and long-term strength of metals and stress relaxation are described in the framework of a unified approach and model. The author then expands this into a mathematical model for determining the mechanical characteristics of quasi-samples of standard mechanical properties in deformed semi-finished products.

Encyclopaedia of Mathematics (set) Michiel Hazewinkel 1994-02-28 The Encyclopaedia of Mathematics is the most up-to-date, authoritative and comprehensive English-language work of reference in mathematics which exists today. With over 7,000 articles from 'A-integral' to 'Zygmund Class of Functions', supplemented with a wealth of complementary information, and an index volume providing thorough cross-referencing of entries of related interest, the Encyclopaedia of Mathematics offers an immediate source of reference to mathematical definitions, concepts, explanations, surveys, examples, terminology and methods. The depth and breadth of content and the straightforward, careful presentation of the information, with the emphasis on accessibility, makes the Encyclopaedia of Mathematics an immensely useful tool for all mathematicians and other scientists who use, or are confronted by, mathematics in their work. The Enclycopaedia of Mathematics provides, without doubt, a reference source of mathematical knowledge which is unsurpassed in value and usefulness. It can be highly recommended for use in libraries of universities, research institutes, colleges and even schools.

Theorie ideal plastischer K□rper William Prager 2013-03-12

Variational Methods for Problems from Plasticity Theory and for Generalized Newtonian Fluids Martin Fuchs 2007-05-06 Variational methods are applied to prove the existence of weak solutions for boundary value problems from the deformation theory of plasticity as well as for the slow, steady state flow of generalized Newtonian fluids including the Bingham and Prandtl-Eyring model. For perfect plasticity the role of the stress tensor is emphasized by studying the dual variational problem in appropriate function spaces. The main results describe the analytic properties of weak solutions, e.g. differentiability of velocity fields and continuity of stresses. The monograph addresses researchers and graduate students interested in applications of variational and PDE methods in the mechanics of solids and fluids.

**Bruchmechanik** Dietmar Gross 2007-01-09 Grundlegende Prinzipien und Arbeitsmethoden der Bruch- und Mikromechanik: Im Vordergrund steht die mechanische Beschreibung, wobei diese Einf□hrung auch materialspezifische Aspekte diskutiert. Auf kontinuumsmechanische Grundlagen folgt ein Einblick in die klassischen Bruch- und Versagenshypothesen sowie in makro- und mikroskopische Ph□nomene des Bruchs. Ein umfangreicher Teil ist der linearen und elastisch-plastischen Bruchmechanik gewidmet.

**Large Deformation of Materials with Complex Rheological Properties at Normal and High Pressure** Valeri□ Il□ich Levitas 1996 Large Deformation of Materials with Complex Rheological Properties at Normal & High Pressure

*Soil Plasticity* W.F. Chen 1985-11-01 This book is addressed primarily to civil engineers familiar with such traditional topics as strength of materials, soil mechanics, and theory of elasticity and structures, but less familiar with the modern development of the mathematical theory of soil plasticity necessary to any engineer working under the general heading of nonlinear analysis of soil-structure system. This book will satisfy his needs in the case of the soil medium. It introduces the reader to the theory of soil plasticity and its numerical implementation into computer programs. The theory and method of computer implementation presented here are appropriate for solving nonlinear static dynamic problems in soil mechanics and are applicable for finite difference and finite element computer codes. A sample computer model subroutine is developed and this is used to study some typical soil mechanics problems. With its comprehensive coverage and simple, concise presentation, the book will undoubtedly prove to be very useful for consulting engineers, research and graduate students in geotechnical engineering.

**Statics of Granular Media** V. V. Sokolovskii 2013-10-22 Statics of Granular Media focuses on the theory of limiting equilibrium of a granular medium. The book first discusses the limiting of equilibrium of a granular medium, including limiting conditions, limiting equilibrium of foundations, and limiting plane equilibrium of a granular medium. The text also focuses on the stability of foundations and slopes. Topics include normal restraining pressure on foundations; normal failure pressure on foundations; stability of slopes; and shape of curvilinear curves. The selection also highlights pressure of a fill on retaining walls, including active and passive pressure of a fill on retaining walls, twin retaining walls, and limiting plane equilibrium of a lamellar medium. The text also underscores limiting equilibrium of a cohesive medium. Topics include stability of a cohesive slope; shape of curvilinear slopes; pressure of a fill on retaining walls; and limiting plane equilibrium of a cohesive medium. Limiting the equilibrium of wedges is also discussed. The book is a valuable source of data for readers interested in the theory of limiting equilibrium of a granular medium.

**Plane-Strain Slip-Line Fields for Metal-Deformation Processes** W. Johnson 2013-09-03 Plane-Strain Slip-Line Fields for Metal-Deformation Processes: A Source Book and Bibliography provides information pertinent to the theory and application of plain-train slip fields to metal-working problems. This book discusses the industrial importance of axial symmetry. Organized into seven chapters, this book begins with an overview of the oldest processes of metal forming, including forging, coining, hammering, drifting, cutting, or parting. This text then examines the basic aspects of the basic theory of classical plasticity. Other chapters consider the governing equations of the plane plastic flow of a rigid-perfectly plastic solid. This book discusses as well the methods for the solution of problems of plane plastic flow of a rigid-perfectly plastic solid. The final chapter deals with the application of the theory of plasticity to the quasi-static plane-strain deformation of an isotropic rigid-perfectly plastic, rate insensitive material. This book is a valuable resource for mechanical engineers, materials scientists, teachers, and research workers.

**The Plane Problem of the Mathematical Theory of Plasticity in the Case where the External Forces are Applied Along a Closed Contour** S. Khristianovich 1946

**Variational Methods for Problems from Plasticity Theory and for Generalized Newtonian Fluids** Martin Fuchs 2000-12-12 Variational methods are applied to prove the existence of weak solutions for boundary value problems from the deformation theory of plasticity as well as for the slow, steady state flow of generalized Newtonian fluids including the Bingham and Prandtl-Eyring model. For perfect plasticity the role of the stress tensor is emphasized by studying the dual variational problem in appropriate function spaces. The main results describe the analytic properties of weak solutions, e.g. differentiability of velocity fields and continuity of stresses. The monograph addresses researchers and graduate students interested in applications of variational and PDE methods in the mechanics of solids and fluids.

**The Plasticity of Metals a Discussion of Mathematical Theory and Its Application to Civil Engineering Problems** Daniel Charles Drucker 1948

Hiromichi Itou 2016-11-18 This book focuses on mathematical theory and numerical simulation related to various aspects of continuum mechanics, such as fracture mechanics, elasticity, plasticity, pattern dynamics, inverse problems, optimal shape design, material design, and disaster estimation related to earthquakes. Because these problems have become more important in engineering and industry, further development of mathematical study of them is required for future applications. Leading researchers with profound knowledge of mathematical analysis from the fields of applied mathematics, physics, seismology, engineering, and industry provide the contents of this book. They help readers to understand that mathematical theory can be applied not only to different types of industry, but also to a broad range of industrial problems including materials, processes, and products.

Gerard A. Maugin 1992-05-21 This book concentrates upon the mathematical theory of plasticity and fracture as opposed to the physical theory of these fields, presented in the thermomechanical framework.

**Mathematical Problems in Plasticity** Roger Temam 2018-12-18 This study of the problem of the equilibrium of a perfectly plastic body under specific conditions employs tools and methods that can be applied to other areas, including the mechanics of fracture and certain optimal control problems. The three-part approach begins with an exploration of variational problems in plasticity theory, covering function spaces, concepts and results of convex analysis, formulation and duality of variational problems, limit analysis, and relaxation of the boundary condition. The second part examines the solution of variational problems in the finite-energy spaces; its topics include relaxation of the strain problem, duality between the generalized stresses and strains, and the existence of solutions to the generalized strain problem. The third and final part addresses asymptotic problems and problems in the theory of plates. The text includes a substantial bibliography and a new Preface and appendix by the author.

**Praktische Betriebsinformatik** Paul Sch□nsleben 1994

**Encyclopaedia of Mathematics** Michiel Hazewinkel 2012-12-06 This ENCYCLOPAEDIA OF MA THEMA TICS aims to be a reference work for all parts of mathe matics. It is a translation with updates and editorial comments of the Soviet Mathematical Encyclopaedia published by 'Soviet Encyclopaedia Publishing House' in five volumes in 1977-1985. The annotated translation consists of ten volumes including a special index volume. There are three kinds of articles in this ENCYCLOPAEDIA. First of all there are survey-type articles dealing with the various main directions in mathematics (where a rather fine subdivi sion has been used). The main requirement for these articles has been that they should give a reasonably complete up-to-date account of the current state of affairs in these areas and that they should be maximally accessible. On the whole, these articles should be understandable to mathematics students in their first specialization years, to graduates from other mathematical areas and, depending on the specific subject, to specialists in other domains of science, en gineers and teachers of mathematics. These articles treat their material at a fairly general level and aim to give an idea of the kind of problems, techniques and concepts involved in the area in question. They also contain background and motivation rather than precise statements of precise theorems with detailed definitions and technical details on how to carry out proofs and constructions. The second kind of article, of medium length, contains more detailed concrete problems, results and techniques.

**Applied Mechanics Reviews** 1973

Swindells, Arthur John 1971

**Error-controlled Adaptive Finite Elements in Solid Mechanics** Ekkehard Ramm 2003-08-01 Finite Element Methods are used for numerous engineering applications where numerical solutions of partial differential equations are needed. As computers can now deal with the millions of parameters used in these methods, automatic error estimation and automatic adaptation of the utilised method (according to this error estimation), has become a hot research topic. This text offers comprehensive coverage of this new field of automatic adaptation and error estimation, bringing together the work of eight outstanding researchers in this field who have completed a six year national research project within the German Science Foundation. The result is a state-of-the-art work in true reference style. Each chapter is self-contained and covers theoretical, algorithmic and software presentations as well as solved problems. A main feature consists of several carefully elaborated benchmarks of 2D- and 3D-applications. * First book to go beyond the Finite Element Method in itself * Covers material from a new research area * Presents benchmarks of 2D- and 3D- applications * Fits with the new trend for genetic strategies in engineering

**Proceedings** 1952

Matrix-tensor Methods in Continuum Mechanics Sidney F. Borg 1990 The purposes of the text are: To introduce the engineer to the very important discipline in applied mathematics-tensor methods as well as to show the fundamental unity of the different fields in continuum mechanics-with the unifying material formed by the matrix-tensor theory and to present to the engineer modern engineering problems.

**Fracture Mechanics** Dietmar Gross 2011-07-03 - self-contained and well illustrated - complete and comprehensive derivation of mechanical/mathematical results with enphasis on issues of practical importance - combines classical subjects of fracture mechanics with modern topics such as microheterogeneous materials, piezoelectric materials, thin films, damage - mechanically and mathematically clear and complete derivations of results

**A Survey of Complete Solutions to Limit Design Problems in the Mathematical Theory of Perfect Plasticity (microfilm).** Arthur John Swindells 1971

**Scientific and Technical Aerospace Reports** 1990

Encyclopaedia of Mathematics M. Hazewinkel 2013-12-01

Mathematical Programming Methods in Structural Plasticity D. Lloyd Smith 2014-05-04 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.

J. N. Goodier 2016-03-17 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.

**Plasticity** Weimin Han 2006-05-17 Focussing on theoretical aspects of the small-strain theory of hardening elastoplasticity, this monograph provides a comprehensive and unified treatment of the mathematical theory and numerical analysis, exploiting in particular the great advantages gained by placing the theory in a convex analytic context. Divided into three parts, the first part of the text provides a detailed introduction to plasticity, in which the mechanics of elastoplastic behaviour is emphasised, while the second part is taken up with mathematical analysis of the elastoplasticity problem. The third part is devoted to error analysis of various semi-discrete and fully discrete approximations for variational formulations of the elastoplasticity.

Shunsuke Takagi 1973 One of the difficulties that have hampered the development of the mathematical theory of soil plasticity was recently overcome by Mandl and Luque. They showed that the non-coaxiality of the principal axes of a stress tensor and a strain-rate tensor can occur only in plane deformation. Their assumption that the angle of non-coaxiality should be a material constant cannot be supported, however, The angle of non-coaxiality should be determined so that the solution to the given problem can exist. It is demonstrated in one of the examples in the report that a well-known solution in which the angle of non-coaxiality is assumed to be zero does violate the assumed boundary condition. The theory was reorganized by using new insights given by Mandl and Luque. It is concluded that still missing is one condition that enables us to determine the angle of non-coaxiality as a function of space. (Author).

*Mathematical Analysis of Continuum Mechanics and Industrial Applications*

*The Thermomechanics of Plasticity and Fracture*

*A Survey of Complete Solutions to Limit Design Problems in the Mathematical Theory of Perfect Plasticity [microform]*


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