Plasticity Mathematical Theory And Numerical Analysis Interdisciplinary Applied Mathematics V 9

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Mathematical Theory of Elasticity of Quasicrystals and Its Applications Cambridge University Press
The papers in this volume were presented at the 4th International Conference on Large-Scale Scientific Computations ICLSSC 2003. It was held in Sozopol, Bulgaria, June 4-8, 2003. The conference was organized and sponsored by the Central Laboratory for Parallel Processing at the Bulgarian Academy of Sciences. Support was also provided from the Center of Excellence "BIS 21" (funded by the European Commission), SIAM and GAMM. A co-organizer of this traditional scientific meeting was the Division of Numerical Analysis and Statistics of the University of Rousse. The success of the conference and the present volume in particular are the outcome of the joint efforts of many colleagues from various institutions and organizations. First thanks to all the members of the Scientific Committee for their valuable contribution to forming the scientific face of the conference, as well as for their help in reviewing contributed papers. We would like to specially thank the organizers of the special sessions: R. Blaheta, N. Dimitrova, A. Ebel, K. Georgiev, O. Iliev, A. Karaivanova, H. Kosina, M. Krastanov, U. Langer, P. Minev, M. Neytcheva, M. Sch¨ afer, V. Veliov, and Z. Zlatev. We are also grateful to the staff involved in the local organization. Special Events: - The conference was devoted to the 60th anniversary of Raytcho Lazarov. - During the conference, the nomination for the World Level of the Hall of Fame for Engineering, Science and Technology, HOFEST, was officially awarded to Owe Axelsson.

Foundations of the Theory of Plasticity Springer
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.

The Mathematical Theory of Plasticity Springer Science & Business Media
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.

Mathematical Methods And Models In Composites (Second Edition) 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.

Foundations of the Theory of Elasticity, Plasticity, and Viscoelasticity John Wiley & Sons
The subject of computational plasticity encapsulates the numerical methods used for the finite element simulation of the behaviour of a wide range of engineering materials considered to be plastic – i.e. those that undergo a permanent change of shape in response to an applied force. Computational Methods for Plasticity: Theory and Applications describes the theory of the associated numerical methods for the simulation of a wide range of plastic engineering materials; from the simplest infinitesimal plasticity theory to more complex damage mechanics and finite strain crystal plasticity models. It is split into three parts - basic concepts, small strains and large strains. Beginning with elementary theory and progressing to advanced, complex theory and computer implementation, it is suitable for use at both introductory and advanced levels. The book: Offers a self-contained text that allows the reader to learn computational plasticity theory and its implementation from one volume. Includes many numerical examples that illustrate the application of the methodologies described. Provides introductory material on related disciplines and procedures such as tensor analysis, continuum mechanics and finite elements for non-linear solid mechanics. Is accompanied by purpose-developed finite element software that illustrates many of the techniques discussed in the text, downloadable from the book ' s companion website. This comprehensive text will appeal to postgraduate and graduate students of civil, mechanical, aerospace and materials engineering as well as applied mathematics and courses with computational mechanics components. It will also be of interest to research engineers, scientists and software developers working in the field of computational solid mechanics.

Plasticity Springer
Mechanics of Solids and Materials intends to provide a modern and integrated treatment of the foundations of solid mechanics as applied to the mathematical description of material behavior. The 2006 book blends both innovative (large strain, strain rate, temperature, time dependent deformation and localized plastic deformation in crystalline solids, deformation of biological networks) and traditional (elastic theory of torsion, elastic beam and plate theories, contact mechanics) topics in a coherent theoretical framework. The extensive use of transform methods to generate solutions makes the book also of interest to structural, mechanical, and aerospace engineers. Plasticity theories, micromechanics, crystal plasticity, energetics of elastic systems, as well as an overall review of math and thermodynamics are also covered in the book.

A Treatise on the Mathematical Theory of Elasticity Springer
Nonlinear Continuum Mechanics is a rapidly growing field of research. Since the last edition of this book, many important results in this field have been published. This new edition refers to the most important results. The part on hyperelastic models and anisotropic yield criteria has been enlarged and an outlook on Material Plasticity has been added.

Error-controlled Adaptive Finite Elements in Solid Mechanics Springer Science & Business Media
Zur numerischen L ö sung partieller Differentialgleichungen greift man in der Technik h ä ufig auf finite Elemente zur ü ck. Seitdem Computer mit Millionen ben ö tigter Variabler zurechtkommen, ist es zunehmend wichtig, Fehler automatisch abzusch ä tzen und die Methoden entsprechend anzupassen. Neun Wissenschaftler haben sich in einem sechsj ä hrigen Forschungsprojekt der DFG mit diesem Thema befasst und geben in diesem Band ihre Erfahrungen an weiter. Jedes Kapitel ist in sich geschlossen mit theoretischen und algorithmischen Informationen, Angaben zur Software und durchgerechneten Ü bungsaufgaben. Besonders interessant sind mehrere sorgf ä ltig erarbeitete Benchmarks von 2D- und 3D-Anwendungen.

Elastoplasticity Theory Cambridge University Press
Mathematical Methods and Models in Composites (Second Edition) provides an in-depth treatment of modern and rigorous mathematical methods and models applied to composites modeling on the micro-, meso-, and macro scale. There has been a steady growth in the diversity of such methods and models that are used in the analysis and characterization of composites, their behavior, and their associated phenomena and processes. This second edition expands upon the success of the first edition, and has been substantially revised and updated.Written by well-known experts in different areas of applied mathematics, physics, and composite engineering, this book is mainly focused on continuous fiber reinforced composites and their ever increasing range of applications (for example, in the aerospace industry), though it also covers other kind of composites. The chapters cover a range of topics including, but not limited to: scaling and homogenization procedures in composites, thin plate and wave solutions in anisotropic materials, laminated structures, fiber-reinforced nonlinearly elastic solids, buckling and postbuckling, fracture and damage analysis of composites, and highly efficient methods for simulation of composites manufacturing such as resin transfer molding. The results presented are useful for the design, fabrication, testing and industrial applications of composite components and structures.This book is an essential reference for graduate and doctoral students, as well as researchers in mathematics, physics and composite engineering. Explanations and references in the book are sufficiently detailed so as to provide the necessary background to further investigate the fascinating subject of composites modeling and explore relevant research literature. It is also suitable for non-experts who wish to have an overview of the mathematical methods and models used for composites, and of the open problems in this area that require further research.

The Thermomechanics of Plasticity and Fracture Springer Nature
Computational Methods in Elasticity and Plasticity: Solids and Porous Media presents the latest developments in the area of elastic and elasto-plastic finite element modeling of solids, porous media and pressure-dependent materials and structures. The book covers the following topics in depth: the mathematical foundations of solid mechanics, the finite element method for solids and porous media, the theory of plasticity and the finite element implementation of elasto-plastic constitutive models. The book also includes: -A detailed coverage of elasticity for isotropic and anisotropic solids. -A detailed treatment of nonlinear iterative methods that could be used for nonlinear elastic and elasto-plastic analyses. -A detailed treatment of a kinematic hardening von Mises model that could be used to simulate cyclic behavior of solids. -Discussion of recent advances in the analysis of porous media and pressure-dependent materials in more detail than other books currently available. Computational Methods in Elasticity and Plasticity: Solids and Porous Media also contains problem sets, worked examples and a solutions manual for instructors.

Plasticity Springer Science & Business Media

Comprehensive introduction to finite elastoplasticity,addressing various analytical and numerical analyses &including state-of-the-art theories Introduction to Finite Elastoplasticity presentsintroductory explanations that can be readily understood by readerswith only a basic knowledge of elastoplasticity, showing physicalbackgrounds of concepts in detail and derivation processes ofalmost all equations. The authors address various analytical andnumerical finite strain analyses, including new theories developedin recent years, and explain fundamentals including thepush-forward and pull-back operations and the Lie derivatives oftensors. As a foundation to finite strain theory, the authors begin byaddressing the advanced mathematical and physical properties ofcontinuum mechanics. They progress to explain a finiteelastoplastic constitutive model, discuss numerical issues onstress computation, implement the numerical algorithms for stresscomputation into large-deformation finite element analysis andillustrate several numerical examples of boundary-value problems.Programs for the stress computation of finite elastoplastic modelsexplained in this book are included in an appendix, and the codecan be downloaded from an accompanying website.

Foundations of Elastoplasticity: Subloading Surface Model Springer Science & Business Media

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.

Computational Methods for Plasticity Springer Science & Business Media

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 Theory Springer

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)

IUTAM Symposium on Theoretical, Computational and Modelling Aspects of Inelastic Media Springer Science & Business Media

Comprising two classic essays by experts on the mathematical theories of elasticity and plasticity, this volume is noteworthy for its contributions by Russian authors and others previously unrecognized in Western literature. 1958 edition.

Modelling and Control in Solid Mechanics Springer Nature

This work comprises papers based on some of the talks presented at the IUTAM Symposium of the same name, held in Cape Town, January 14-18, 2008. This volume treats cutting-edge issues in modelling, the behaviour of various classes of inelastic media, and associated algorithms for carrying out computational simulations. A key feature of the contributions are works directed at modelling behaviour at the meso and micro-scales, and at bridging the micro-macro scales.

Large-Scale Scientific Computing CRC Press

Plasticity and Geotechnics is the first attempt to summarize and present in a single volume the major achievements in the field of plasticity theory for geotechnical materials and its applications to geotechnical analysis and design. The book emerges from the author ’ s belief that there is an urgent need for the geotechnical and solid mechanics community to have a unified presentation of plasticity theory and its application to geotechnical engineering.

Computational Methods in Elasticity and Plasticity Courier Dover Publications

First published in 1950, this important and classic book presents a mathematical theory of plastic materials, written by one of the leading exponents.

Nonsmooth Mechanics and Applications John Wiley & Sons

This monograph provides both an introduction to and a thorough exposition of the theory of rate-independent systems, which the authors have been working on with a lot of collaborators over 15 years. The focus is mostly on fully rate-independent systems, first on an abstract level either with or even without a linear structure, discussing various concepts of solutions with full mathematical rigor. Then, usefulness of the abstract concepts is demonstrated on the level of various applications primarily in continuum mechanics of solids, including suitable approximation strategies with guaranteed numerical stability and convergence. Particular applications concern inelastic processes such as plasticity, damage, phase transformations, or adhesive-type contacts both at small strains and at finite strains. A few other physical systems, e.g. magnetic or ferroelectric materials, and couplings to rate-dependent thermodynamic models are considered as well. Selected applications are accompanied by numerical simulations illustrating both the models and the efficiency of computational algorithms. In this book, the mathematical framework for a rigorous mathematical treatment of "rate-independent systems" is presented in a comprehensive form for the first time. Researchers and graduate students in applied mathematics, engineering, and computational physics will find this timely and well written book useful.

Variational Principles in the Mathematical Theory of Plasticity Courier Corporation

There have been many excellent books written on the subject of plastic deformation in solids, but rarely can one find a textbook on this subject. “ Plasticity Modeling & Computation ” is a textbook written specifically for students who want to learn the theoretical, mathematical, and computational aspects of inelastic deformation in solids. It adopts a simple narrative style that is not mathematically overbearing, and has been written to emulate a professor giving a lecture on this subject inside a classroom. Each section is written to provide a balance between the relevant equations and the explanations behind them. Where relevant, sections end with one or more exercises designed to reinforce the understanding of the “ lecture. ” Color figures enhance the presentation and make the book very pleasant to read. For professors planning to use this textbook for their classes, the contents are sufficient for Parts A and B that can be taught in sequence over a period of two semesters or quarters.