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Plasticity in Structural Engineering, Fundamentals and Applications
A Modern Course in Aeroelasticity
Engineering Plasticity

KIRK MELODY

Fundamentals of the Theory of Plasticity Elsevier
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.
Modeling of Creep for Structural Analysis Springer Science & Business Media
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.
Mechanics Of Elastic Solids World Scientific Publishing Company
This book deals with various computational procedures for multiple repeated analyses (reanalysis) of structures, and presents them in a unified approach. It meets the need for a general text covering the basic concepts and methods as well as recent developments in this area. To clarify the presentation, many illustrative examples and numerical results are demonstrated. Previous books on structural analysis do not cover most of the material presented here.
IUTAM Symposium on Waves in Liquid/Gas

and Liquid/Vapour Two-Phase Systems CRC Press
Plasticity documents the proceedings of the Second Symposium on Naval Structural Mechanics held at Brown University, Rhode Island, 5-7 April 1960. It was sponsored jointly by the Office of Naval Research of the U.S. Navy and Brown University. The symposium was devoted to plasticity. The intention was to provide critical reviews of recent developments in certain areas of plasticity of particular current interest and importance, and to supplement these with short accounts of related current research work. The papers presented at the symposium covered the following areas: atomic theory of plastic flow and fracture; stress-strain relations including thermoplasticity and creep; basic theory including stability and uniqueness; boundary value problems including plates and shells; dynamic loading and plastic waves; and developments in design. Two talks were also held for the purpose of reviewing the present status of application of plasticity in design of naval vessels. The symposium was opened by Captain J. C. Myers on behalf of the Office of Naval Research and by Professor W. Prager on behalf of Brown University. Professor Prager closed the symposium by presenting a brief resume of the main accomplishments and trends in plasticity brought to light during the symposium.
Elasticity Elsevier
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.
Reanalysis of Structures CRC Press
The subject of Elasticity can be approached from several points of view, depending on whether the practitioner is principally interested in the mathematicalstructure of the subject or in its use in engineering applications and in the latter case, whether essentially numerical or analytical methods are envisaged as the solution method. My first introduction to the subject was in response to a need for information about a specific problem in Tribology. As a practising engineer with a background only in elementary Strength of Materials, I approached that problem initially using the con cepts of concentrated forces and superposition. Today, with a rather more extensive knowledge of analytical techniques in Elasticity, I still find it helpful to go back to these roots in the elementary theory and think through a problem physically as well as mathematically, whenever some new and unexpected feature presents difficulties in research. This way of thinking will be found to permeate this book. My engineering background will also reveal itself in a tendency to work examples through to final expressions for stresses and displacements, rather than leave the derivation at a point where the remaining manipulations would be routine. With the practical engineering reader in mind, I have endeavoured to keep to a minimum any dependence on previous knowledge of Solid Mechanics, Continuum Mechanics or Mathematics.
Elasticity and Plasticity of Large Deformations Springer Science & Business Media
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.
Non-homogeneity in Elasticity and Plasticity Springer Science & Business Media
The subject of Elasticity can be approached from several points of view, depending on whether the practitioner is principally interested in the mathematicalstructure of the subject or in its use in engineering applications and in the latter case, whether essentially numerical or analytical methods are envisaged as the solution method. My first introduction to the subject was in response to a need for information about a specific problem in Tribology. As a practising engineer with a background only in elementary Strength of Materials, I approached that problem initially using the con cepts of concentrated forces and superposition. Today, with a rather more extensive knowledge of analytical techniques in Elasticity, I still find it helpful to go back to these roots in the elementary theory and think through a problem physically as well as mathematically, whenever some new and unexpected feature presents difficulties in research. This way of thinking will be found to permeate this book. My engineering background will also reveal itself in a tendency to work examples through to final expressions for stresses and displacements, rather than leave the derivation at a point where the remaining manipulations would be routine. With the practical engineering reader in mind, I have endeavoured to keep to a minimum any dependence on previous knowledge of Solid Mechanics, Continuum Mechanics or Mathematics.
Elasticity, Plasticity and Structure of Matter World Scientific
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.
Continuum Mechanics Springer Science & Business Media
A IUTAM symposium on 'Waves in

Liquid/Gas and Liquid/Vapor Two-Phase Systems' was held in Kyoto, Japan, 9-13 May 1994. Sixty-three scientists partici pated coming from ten countries, and forty-two lectures were presented. The list of participants and the program are included in this volume. The symposium was held in response to the request of the participants in the IUTAM symposium 'Adiabatic Waves in Liquid-Vapor System' held at Gottingen in 1989. At that time, the need for another symposium in about five years had been indicated by all the participants. This symposium intends to develop the subject of wave properties in more general liquid-gas two-phase systems. Topics in this symposium may be classified as (1) waves in liquid-gas bubble systems including interfacial effects, (2) waves in gas(vapor)-droplets systems, (3) waves in films or stratified systems, (4) waves with liquid-vapor transition, (5) waves with vapor-liquid transition, (6) wave propagation near the critical point and (7) waves with low pressure effect. As for topic (1), experiments, numerical simulations and analytical approaches to waves in bubly liquids were discussed. The importance of interbubble interactions through the liquid-field is now well established at least in terms of potential theory. There was also a progress concerning the well-posedness of governing equations for void waves. For pressure waves there were some new phenomena, such as bubble cluster formation and the occurrence of three-dimensional structures, in addition to a progress from more qualitative studies to quantitative ones.

Elasticity of Transversely Isotropic Materials World Scientific

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.

Elasticity, Plasticity and Structure of Matter Bull Ridge Corporation

Engineering Plasticity deals with certain features of the theory of plasticity that can be applied to engineering design. Topics covered range from specification of an ideal plastic material to the behavior of structures made of idealized elastic-plastic material, theorems of plastic theory, and rotating discs, along with torsion, indentation problems, and slip-line fields. This book consists of 12 chapters and begins by providing an engineering background for the theory of plasticity, with emphasis on the use of metals in structural engineering; the nature of physical theories; and the conceptual simplicity and power of plastic theory. The next chapter explains how to set up a model of the plastic behavior of metal for use in analysis and design of structures and forming processes, paying particular attention to the plastic deformation that occurs when a specimen of metal is stressed. Subsequent chapters focus on the behavior of a simple structure made of elastic-plastic material; theorems of plastic theory; rotating discs; and indentation problems. Torsion, slip-line fields, and circular plates under transverse loading are also discussed, together with wire-drawing and extrusion and the effects of changes in geometry on structure. This monograph is written primarily for engineering students.

Trends in Structural Mechanics Springer Science & Business Media

This book examines the issues across the breadth of elasticity theory. Firstly, the underpinning mathematics of vectors and matrices is covered. Thereafter, the equivalence between the inidicial, symbolic and matrix notations used for tensors is illustrated in the preparation for specific types of material behaviour to be expressed, usually as a response function from which a constitutive stress-strain relation follow.Mechanics of Elastic Solids shows that the elastic response of solid materials has many forms. Metals and their alloys confirm dutifully to Hooke's law. Non-metals do not when the law connecting stress to strain is expressed in polynomial, exponential and various empirical, material specific forms. Hyper- and hypo- elasticity theories differ in that the former is restricted to its thermodynamic basis while the latter pervades many an observed response with its release from thermal restriction, but only at the risk of contravening the laws of thermodynamics.This unique compendium is suitable for a degree or diploma course in engineering and applied mathematics, as well as postgraduate and professional researchers.

Applied Plasticity, Second Edition CRC Press

The classical theory of elasticity maintains a place of honour in the science ofthe behaviour ofsolids. Its basic definitions are general for all branches of this science, whilst the methods forstating and solving these problems serve as examples of its application. The theories of plasticity, creep, viscoelas ticity, and failure of solids do not adequately encompass the significance of the methods of the theory of elasticity for substantiating approaches for the calculation of stresses in structures and machines. These approaches constitute essential contributions in the sciences of material resistance and structural mechanics. The first two chapters form Part I of this book and are devoted to the basic definitions ofcontinuum mechanics; namely stress tensors (Chapter 1) and strain tensors (Chapter 2). The necessity to distinguish between initial and actual states in the nonlinear theory does not allow one to be content with considering a single strain measure. For this reason, it is expedient to introduce more rigorous tensors to describe the stress-strain state. These are considered in Section 1.3 for which the study of Sections 2.3-2.5 should precede. The mastering of the content of these sections can be postponed until the nonlinear theory is studied in Chapters 8 and 9.

THEORY OF ELASTICITY AND PLASTICITY Courier Dover Publications

This book develops methods to simulate and analyze the time-dependent changes of stress and strain states in engineering structures up to the critical stage of creep rupture. The objective of this book is to review some of the classical and recently proposed approaches to the modeling of

creep for structural analysis applications. It also aims to extend the collection of available solutions of creep problems by new, more sophisticated examples.
Elasticity, Plasticity and Structure of Matter Springer Science & Business Media
Theory of Elasticity and Plasticity is designed as a textbook for both undergraduate and postgraduate students of engineering in civil, mechanical and aeronautical disciplines. This book has been written with the objective of bringing the concepts of elasticity and plasticity to the students in a simplified and comprehensive manner. The basic concepts, definitions, theory as well as practical applications are discussed in a clear, logical and concise manner for better understanding. Starting with, general relationships between stress, strain and deformations, the book deals with specific problems on plane stress, plane strain and torsion in non-circular sections. Advanced topics such as membrane analogy, beams on elastic foundations and plastic analysis of pressure vessels are also discussed elaborately. For better comprehension, the text is well supported with: □ Large number of worked-out examples in each chapter. □ Well-labelled illustrations. □ Numerous Review Questions that reinforce the understanding of the subject. As all the concepts are covered extensively with a blend of theory and practice, this book will be a useful resource to the students.
Structural Mechanics with Introductions to Elasticity and Plasticity Springer Science & Business Media
In recent years, "intelligent (sm. o. rt) structures antlllJ/stems" has become an emerging new research area that is multi-disciplinary in nature, requiring technical expertise from mechanical engineering, structural engineering, electrical engineering, applied mechanics, engineering mathematics, material science, computer science, biological science, etc. This technology is quite likely to contribute significant advancements in the design of high-performance structures, adaptive structures, high-precision systems, micro-systems, etc. Although this emerging area has been rapidly gathering momentum in the last few years, researchers are aware that to some extent only initial, but highly feasible studies of the concepts proposed have been conducted. It is obvious that many important, pertinent fundamental research subjects must yet be investigated and resolved in the near future. We have the privilege to invite a number of highly regarded research scientists and engineers to summarize and contribute the results of their years of research experience with the evolution of intelligent (smart) structures and systems to the collection of chapters contained in this book. Their research topics include current intelligent (smart) structures research activities, piezoelectric structures, shape memory alloy reinforced composites, applications of electrorheological fluids, intelligent sensor systems, adaptive precision trusses, damage detection, model refinement, control of axial moving continua, distributed transducers, etc. These subjects represent only a small portion of the complete picture; indeed, the fundamentally important development of smart or intelligent materials is not addressed in detail here.
A Modern Course in Aeroelasticity Courier Corporation
Dams and Appurtenant Hydraulic Structures, now in its second edition, provides a comprehensive and complete overview of all kinds of dams and appurtenant hydraulic structures throughout the world. The reader is guided through different aspects of dams and appurtenant hydraulic structures in 35 chapters, which are subdivided in five themes: I. Dams and appurtenant hydraulic structures – General; II. Embankment dams; III. Concrete dams; IV. Hydromechanical equipment and appurtenant hydraulic structures; V. Hydraulic schemes. Subjects treated are general questions, design, construction, surveillance, maintenance and reconstruction of various embankment and concrete dams, hydromechanical equipment, spillway structures, bottom outlets, special hydraulic structures, composition of structures in river hydraulic schemes, reservoirs, environmental effects of river hydraulic schemes and reservoirs and environmental protection. Special attention is paid to advanced methods of static and dynamic analysis of embankment dams. The wealth of experience gained by the author over the course of 35 years of research and practice is incorporated in this richly-illustrated, fully revised, updated and expanded edition. For the original Macedonian edition of Dams and Appurtenant Hydraulic Structures, Ljubomir Tanchev was awarded the Goce Delchev Prize, the highest state prize for achievements in science in the Republic of Macedonia. This work is intended for senior students, researchers and professionals in civil, hydraulic and environmental engineering and dam construction and exploitation.
Deformation Theory of Plasticity Springer Science & Business Media
The fifteen chapters of this book are arranged in a logical progression. The text begins with the more fundamental material on stress and strain transformations with elasticity theory for plane and axially symmetric bodies, followed by a full treatment of the theories of bending and torsion. Coverage of moment distribution, shear flow, struts and energy methods precede a chapter on finite elements. Thereafter, the book presents yield and strength criteria, plasticity, collapse, creep, visco-elasticity, fatigue and fracture mechanics. Appended is material on the properties of areas, matrices and stress concentrations. Each topic is illustrated by worked examples and supported by numerous exercises drawn from the author's teaching experience and professional institution examinations (CEI).This edition includes new material and an extended exercise section for each of the fifteen chapters, as well as three appendices. The broad text ensures its suitability for undergraduate and postgraduate courses in which the mechanics of solids and structures form a part including: mechanical, aeronautical, civil, design and materials engineering.
Variational Methods in Elasticity and Plasticity Elsevier
Intended for use by advanced engineering students and professionals, this volume focuses on plastic deformation of metals at normal temperatures, as applied to strength of machines and structures. 1971 edition.

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