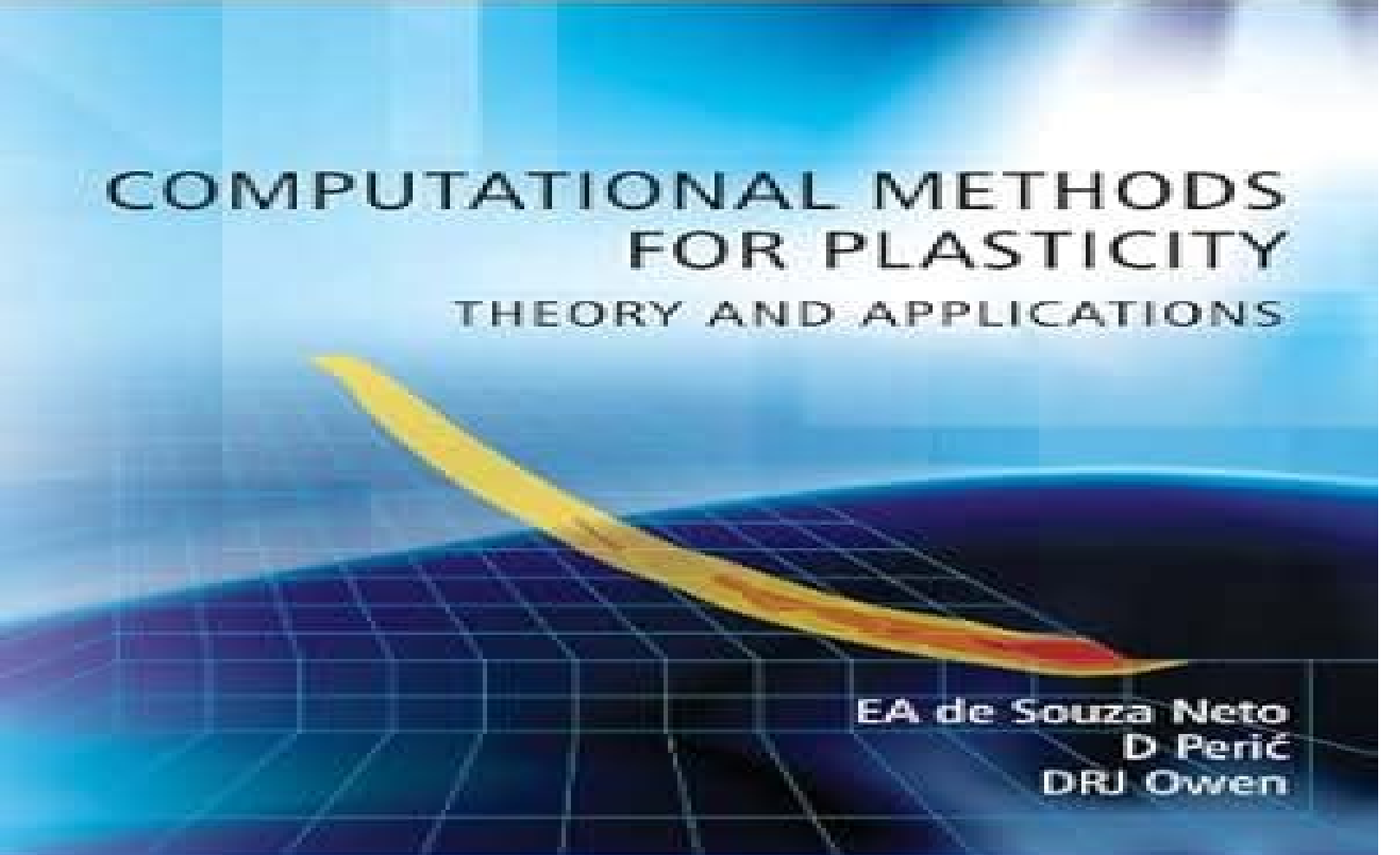


COMPUTATIONAL METHODS FOR PLASTICITY

THEORY AND APPLICATIONS

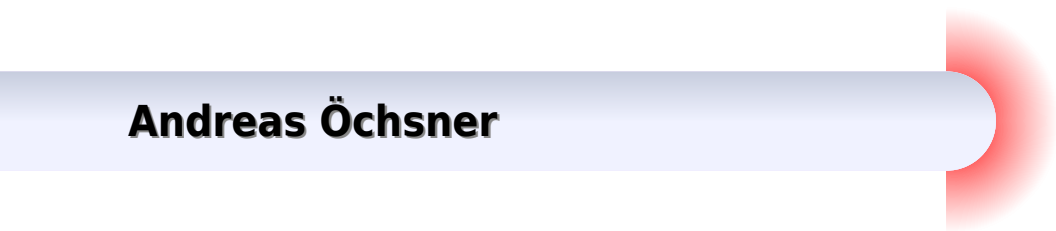


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Computational Methods For Plasticity Theory And Applications

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Plasticity Theory Andreas Öchsner, 2024-05-30 This book provides a comprehensive exploration of the fundamentals experimental techniques and simulation methodologies related to advanced engineering materials It addresses the challenges posed by these materials introduces the concept of stress invariants and demonstrates their implementation in finite element programs for accurate simulations The book serves as a valuable resource for researchers engineers and students interested in the cutting edge developments in materials science and engineering Elements of Classical Plasticity Theory Andreas Öchsner, 2022-11-08 This monograph provides a compact introduction into the classical i e rate independent plasticity theory Starting from the engineering stress strain diagram the concept of elastic and elasto plastic material behavior is introduced as well as the concept of uniaxial and multiaxial stress states Continuum mechanical modeling in the elasto plastic range requires in regards to the constitutive equation in addition to the elastic law e g Hooke s law a yield condition a flow rule and a hardening rule These basic equations are thoroughly introduced and explained for one dimensional stress states Considering three dimensional plasticity different sets of stress invariants to characterize the stress matrix and the decomposition of the stress matrix in its hydrostatic and deviatoric part are introduced Furthermore the concept of the yield condition flow rule and hardening rule is generalized for multiaxial stress states Some typical yield conditions are introduced and their graphical representation in different stress spaces is discussed in detail The book concludes with an introduction in the elasto plastic finite element simulation of mechanical structures In the context of numerical approximation methods the so called predictor corrector methods are used to integrate the constitutive equations This is again introduced in detail based on one dimensional stress states and afterwards generalized to the three dimensional case Test your knowledge with questions and answers about the book in the Springer Nature Flashcards app **The**

Catalogue of Computational Material Models Paul Steinmann, Kenneth Runesson, 2021-02-16 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

Engineering Design Applications II Andreas Öchsner, Holm Altenbach, 2019-06-27 This book offers an update on recent developments in modern engineering design Different engineering disciplines such as mechanical materials computer and process engineering provide the foundation for the design and development of improved structures materials and processes The modern design cycle is characterized by the interaction between various disciplines and a strong shift to computer based approaches where only a few experiments are conducted for verification purposes A major driver for this development is the increased demand for cost reduction which is also linked to environmental demands In the transportation industry e g automotive or aerospace the demand for higher fuel efficiency is related to reduced operational costs and less environmental damage One way to fulfil such requirements is lighter structures and or improved processes for energy conversion Another emerging area is the interaction of classical engineering with the health and medical sector

Virtual Element Methods in Engineering Sciences Peter Wriggers, Fadi Aldakheel, Blaž Hudobivnik, 2023-10-28 This book provides a comprehensive treatment of the virtual element method VEM for engineering applications focusing on its application in solid mechanics Starting with a continuum mechanics background the book establishes the necessary foundation for understanding the subsequent chapters It then delves into the VEM s Ansatz functions and projection techniques both for solids and the Poisson equation which are fundamental to the method The book explores the virtual element formulation for elasticity problems offering insights into its advantages and capabilities Moving beyond elasticity the VEM is extended to problems in dynamics enabling the analysis of dynamic systems with accuracy and efficiency The book also covers the virtual element formulation for finite plasticity providing a framework for simulating the behavior of materials undergoing plastic deformation Furthermore the VEM is applied to thermo mechanical problems where it allows for the investigation of coupled

thermal and mechanical effects The book dedicates a significant portion to the virtual elements for fracture processes presenting techniques to model and analyze fractures in engineering structures It also addresses contact problems showcasing the VEM s effectiveness in dealing with contact phenomena The virtual element method s versatility is further demonstrated through its application in homogenization offering a means to understand the effective behavior of composite materials and heterogeneous structures Finally the book concludes with the virtual elements for beams and plates exploring their application in these specific structural elements Throughout the book the authors emphasize the advantages of the virtual element method over traditional finite element discretization schemes highlighting its accuracy flexibility and computational efficiency in various engineering contexts *Computational Solid Mechanics* Marco L.

Bittencourt,2014-09-19 Presents a Systematic Approach for Modeling Mechanical Models Using Variational Formulation Uses Real World Examples and Applications of Mechanical Models Utilizing material developed in a classroom setting and tested over a 12 year period *Computational Solid Mechanics Variational Formulation and High Order Approximation* details an approach that e **Automation of Finite Element Methods** Jože Korelc,Peter Wriggers,2016-06-08 New finite elements are needed as well in research as in industry environments for the development of virtual prediction techniques The design and implementation of novel finite elements for specific purposes is a tedious and time consuming task especially for nonlinear formulations The automation of this process can help to speed up this process considerably since the generation of the final computer code can be accelerated by order of several magnitudes This book provides the reader with the required knowledge needed to employ modern automatic tools like AceGen within solid mechanics in a successful way It covers the range from the theoretical background algorithmic treatments to many different applications The book is written for advanced students in the engineering field and for researchers in educational and industrial environments

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