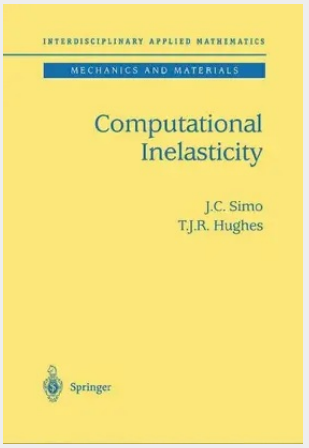
Simo / Hughes

Computational Inelasticity



This book describes the theoretical foundations of inelasticity, its numerical formulation and implementation. The subject matter described herein constitutes a representative sample of state-of-the-art methodology currently used in inelastic calculations. Among the numerous topics covered are small deformation plasticity and viscoplasticity, convex optimization theory, integration algorithms for the constitutive equation of plasticity and viscoplasticity, the variational setting of boundary value problems and discretization by finite element methods. Also addressed are the generalization of the theory to non-smooth yield surface, mathematical numerical analysis issues of general return mapping algorithms, the generalization to finite-strain inelasticity theory, objective integration algorithms for rate constitutive equations, the theory of hyperelastic-based plasticity models and small and large deformation viscoelasticity. Computational Inelasticity will be of great interest to researchers and graduate students in various branches of engineering, especially civil, aeronautical and mechanical, and applied mathematics. Stanford University, Stanford, CA, USA Computational Mathematics and Scientific Computing / Symbolic Computation, Computer Algebra / Mathematical Physics

This book goes back a long way. There is a tradition of research and teaching in inelasticity at Stanford that goes back at least to Wilhelm Flugge ¿ and Erastus Lee. I joined the faculty in 1980, and shortly thereafter the Chairman of the Applied Mechanics Division, George Herrmann, asked me to present a course in plasticity. I decided to develop a new two-quarter sequence entitled "Theoretical and C- putational Plasticity" which combined the basic theory I had learned as a graduate student at the University of California at Berkeley from David Bogy, James Kelly, Jacob Lubliner, and Paul Naghdi with new computational techniques from the ?nite-element literature and my personal research. I taught the course a couple of times and developed a set of notes that I passed on to Juan Simo when he joined thefacultyin1985. IwasChairmanatthattimeandlaskedJuantofurtherdevelop the course into a full year covering inelasticity from a more comprehensive p- spective. Juan embarked on this path creating what was to become his signature course. He eventually renamed it "Computational and Theoretical Inelasticity" and it covered much of the material that was the basis of his research in material modeling and simulation for which he achieved international recognition. At the outset we decided to write a book that would cover the material in the course.

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