

## PREFACE

This book is the fruit of several years of courses for graduate students, Ph.D. students and researchers. The intention of the book is to provide a thorough exposition of elasto-plasticity, viscoplasticity, creep and viscoelasticity regarding both their constitutive modeling and their computational treatment.

Any text is subject to limitations, and we have chosen to assume the existence of small displacement gradients. Since research activities within constitutive mechanics are highly intensive, a huge number of constitutive models and corresponding numerical strategies can be found in the literature. It is not our intention to try to cover as many of these models as possible. Instead, the exposition is geared to a presentation of various important concepts. Even so, a number of specific models must still be addressed, however, each of these formulations will involve fundamental features not covered by the other models. For every topic considered, the exposition is self-contained, with an extensive list of references where the reader can find further details and ramifications.

For constitutive modeling, our viewpoint will be purely phenomenological with the focus on the macroscopical material response. Although major emphasis will be placed on issues within plasticity theory, it will turn out that advantage can be taken of a number of these concepts when dealing with viscoplasticity and creep.

Approximately, the first half of the book deals with quite classical concepts within constitutive modeling. Experimental evidence for various phenomena are used as a basis for construction of constitutive theories. Against this background, the second half of the book treats the thermodynamic framework for constitutive modeling and the computational treatment of plasticity, viscoplasticity, creep and viscoelasticity.

The book starts with topics of a relatively elementary nature; gradually, the topics and style become more abstract and the later part of the book deals with issues of current research interest. Whereas many other books focus on a specific group of materials, for instance, steel or concrete, we try to be as general as possible and, thus, the exposition should be of interest for a broad engineering audience.

For graduate students, we have successfully created courses comprising most of the first half of the book together with some of the computational topics. The

second half of the book has turned out to be useful for Ph.D. courses and other research programs.

In the running battle against misprints, we have had notable help from our colleague tech. Dr. Mathias Wallin and our Ph.D. students, tech. Lic. Magnus Fredriksson, M. Sc. Anders Harrysson, M. Sc. Magnus Harrysson, M. Sc. Håkan Hallberg and tech. Lic. Paul Håkansson; a special tribute to Mag. art. Kerstin Saabye Wullt for her judicious linguistic support and for her enthusiasm.

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Niels Saabye Ottosen and Matti Ristinmaa