

Raport Badawczy
Research Report

RB/91/2003

Book review:
Modeling and mechanics of
granular and porous materials
by Gianfranco Capriz,
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MODELING AND MECHANICS OF GRANULAR AND POROUS
MATERIALS

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The book “Modeling and Mechanics of Granular and Porous Materials”, edited by G. Capriz, V.N. Ghionna and P. Giovine, published in the Series on Modeling and Simulation in Science, Engineering and Technology by Birkhäuser, offers a collection of eleven papers written by outstanding researchers in the field of soil mechanics.

Soils are complex materials that can be considered from the engineering viewpoint as aggregates of mineral grains resulting from degradation, erosion, transport and sedimentation of the rocks constituting the earth crust. Due to a granular structure fluids can seep through soil pores and mechanically interact with the solid skeleton. The field of soil mechanics is presently the subject of growing interest. This interest arises from a theoretical basis of the porous media mechanics as well as from important engineering applications.

The present book covers the major topics in modeling soil behaviour. It consists of three parts. Part I addresses the mechanics of porous and granular materials, Part II concerns the flow and transport phenomena in particular materials, and Part III presents numerical simulation methods.

The contributing authors, the engineers and mathematicians, are in Part I: F. Darve and F. Laouafa, J.T. Jenkins and L. La Ragione, N.P. Kirchner and K. Hutter, R. Nova, I. Vardoulakis, in Part II: D. Ambrosi, R. Lancellotta and L. Preziosi, P.A.C. Raats, K. Wilmański, in Part III: W. Ehlers, L. Sanavia, B.A. Schrefler and P. Steinmann, M. Pastor, M. Quecedo, P. Mira, J.A. Fernández - Merodo, Li Tongchun and Liu Xiaoqing.

Let us mention now some of the addressed issues, which provide for the particularly interesting open mathematical problems:

- The mathematical modeling of granular and porous materials at the microscopic level. This includes derivation of the governing equations from the first principles of thermodynamics. The constitutive equations are specified by means of the exploitation of the entropy principle. This issue is discussed in the papers by N.P. Kirchner and K. Hutter “Thermodynamic

modeling of granular continua exhibiting quasi-static frictional behaviour with abrasion”, and by K. Wilmański “Mass exchange, diffusion and large deformations of poroelastic materials”.

- The mathematical modeling of consolidation theory. This issue is outlined in the review paper by D. Ambrosi, R. Lancellotta and L. Preziosi “Mathematical models for soil consolidation problems: a state of the art report”.
- The mathematical models for flow of water in soils. This issue is addressed in the paper by P.A.C. Raats “Flow of water in rigid and non-rigid, saturated and unsaturated soils”.

The book is a unique position in the literature of this subject. It brings the reader to the present state of the research in the field of soil mechanics.

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G. Capriz, V. N. Ghionna, P. Giovine (Editors): *Modeling and Mechanics of Granular and Porous Materials*. series: Modeling and Simulation in Science, Engineering and Technology. Birkhäuser Verlag, Basel–Berlin–Boston, 384 pages, 2002. ISBN 0–8176–4241–2. Price: EUR 157.29– (hardcover).

