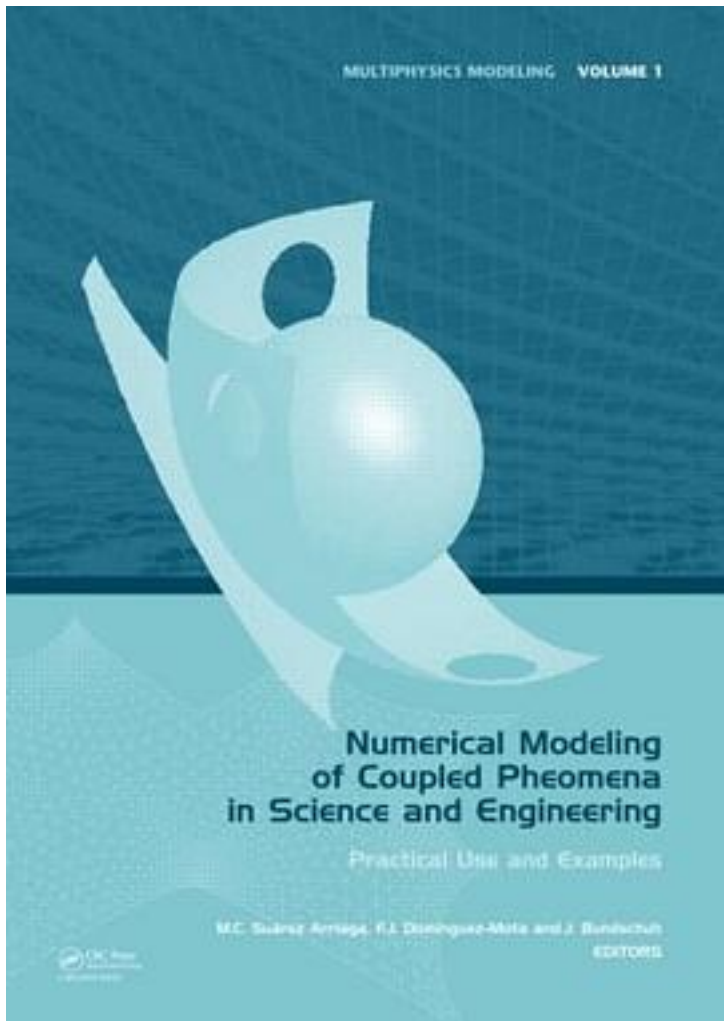


Numerical Modeling of Coupled Phenomena in Science and Engineering



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Mathematics is a universal language. Differential equations, mathematical modeling, numerical methods and computation form the underlying infrastructure of engineering and the sciences. In this context mathematical modeling is a very powerful tool for studying engineering problems, natural systems and human society. This interdisciplinary book contains a comprehensive overview, including practical examples, of the progress achieved to date in the modeling of coupled phenomena, computational mathematics and mechanics, heat transfer, fluid-structure interactions, biomechanics, and the flow of mass and energy in porous media. Numerical subjects such as grid generation, optimization, finite elements, finite differences, spectral methods, boundary elements, finite volumes and meshless methods are also discussed in detail using real examples. The book provides a thorough presentation of the existing numerical techniques with specific applications to concrete, practical topics. The models and solutions presented here describe various systems: mechanical, biological, geophysical, technical, ecological, etc. The book is organized in thirty six chapters, each written by distinguished experts in their respective fields. The topics presented cover the current state of knowledge in numerical engineering practice including recent and ongoing developments and the presentation of new ideas for future research on applied computational engineering mathematics. The book will be of interest to scientists working in engineering (structural, civil, mechanical), geology, geophysics, aquifer research, petroleum engineering, applied mathematics, and physics, as well as students in any of these areas.

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