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Nota di contenuto	Part 1 Introduction -- History and Future -- What is Multiphysics -- How to Do Multiphysics -- Multiphysics in Porous Materials -- How to Use this Book -- Part 2 Mathematical Background -- Tensor and Field -- Tensor Analysis -- Index Notation and Tensor Notation -- Partial Differential Equations -- Numerical Solution of PDEs -- Part 3 Monolithic Physics -- Thermo: Heat Transfer -- Hydro: Pore Water Movement -- Concentrato: Transport of Dispersed Mass -- Mechano: Stress and Strain -- Dyno: Dynamics -- Chemico: Chemical Reaction -- Electro: Electrostatics -- Magneto: Magnetostatics -- Part 4 Multiphysics -- Thermomechanics: Non-Isothermal Mechanics -- Hydromechanics: Poroelasticity as a Simple Case -- Thermohydromechanics -- Electrokinetics -- Electromagnetics -- Fluid Dynamics -- Hydrodynomechanics: Fluid-Structure Interaction -- Thermoelectromagnetics -- Electromagnetomechanics -- Part 5 Implementation Methods -- Finite Difference Method -- Finite Volume

Method -- Finite Element Method -- References -- Index.

Sommario/riassunto

This book summarizes, defines, and contextualizes multiphysics with an emphasis on porous materials. It covers various essential aspects of multiphysics, from history, definition, and scope to mathematical theories, physical mechanisms, and numerical implementations. The emphasis on porous materials maximizes readers' understanding as these substances are abundant in nature and a common breeding ground of multiphysical phenomena, especially complicated multiphysics. Dr. Liu's lucid and easy-to-follow presentation serve as a blueprint on the use of multiphysics as a leading edge technique for computer modeling. The contents are organized to facilitate the transition from familiar, monolithic physics such as heat transfer and pore water movement to state-of-the-art applications involving multiphysics, including poroelasticity, thermohydro-mechanical processes, electrokinetics, electromagnetics, fluid dynamics, fluid structure interaction, and electromagnetomechanics. This volume serves as both a general reference and specific treatise for various scientific and engineering disciplines involving multiphysics simulation and porous materials. • Presents the essential components of multiphysics along with innovative numerical modeling techniques in the context of porous materials; • Structured for a wide range of readers from those new to the field to experts, instructors, researchers, software developers, and modelers from many scientific and engineering disciplines; • Organized using a practical approach that combines a logical presentation of theories with illustrative hands-on example problems; • Reinforces multiphysics concepts with applications demonstrating the use of common software to solve representative problems.