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Autore	Fish J (Jacob)
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Soggetti	Mechanical engineering - Mathematical models Continuum mechanics - Mathematical models Materials - Mathematical models Multiscale modeling Scaling laws (Statistical physics) Mechanical engineering - Computer simulation Continuum mechanics - Computer simulation Materials - Computer simulation Electronic books.
Lingua di pubblicazione	Inglese
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Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Chapter 1. Introduction to multiscale methods -- The rationale for multiscale computations -- The hype and the reality -- Examples and qualification of multiscale methods -- Nomenclature and definitions -- Notation -- Chapter 2. Upscaling/Downscaling of Continua -- Homogenizaton of linear heterogeneous media -- Upscaling based on enhanced kinematics -- Homogenization of nonlinear heterogeneous media -- Higher order homogenization -- Multiple-scale homogenization -- Going beyond upscaling : homogenization-based multigrid -- Chapter 3. Upscaling/Downscaling of Atomistic/Continuum Media -- Governing equations -- Generalized mathematical homogenization (GMH) -- Finite element implementation and numerical verification -- Statistical ensemble -- Verification -- Going beyond upscaling -- Chapter 4. Reduced Order Homogenization

-- Reduced order homogenization for two-scale problems -- Lower order approximation of eigenstrains -- Extension to nonlocal heterogeneous media -- Extension to dispersive heterogeneous media -- Extension to multiple spatial scales -- Extension to large deformations -- Extension to multiple temporal scales with application to fatigue -- Extension to multiphysics problems -- Chapter 5. Scale-separation-free Upscaling/Downscaling of Continua -- Computational continua (C2) -- Reduced order computational continua (RC2) -- Nonlocal quadrature in multidimensions -- Model Verification -- Chapter 6. Multiscale Design Software -- Microanalysis with MDS-Lite -- Macroanalysis with MDS-Lite.

Sommario/riassunto

"Practical Multiscaling covers fundamental modelling techniques aimed at bridging diverse temporal and spatial scales ranging from the atomic level to a full-scale product level. It focuses on practical multiscale methods that account for fine-scale (material) details but do not require their precise resolution. The text material evolved from over 20 years of teaching experience at Rensselaer and Columbia University, as well as from practical experience gained in the application of multiscale software. This book comprehensively covers theory and implementation, providing a detailed exposition of the state-of-the-art multiscale theories and their insertion into conventional (single-scale) finite element code architecture. The robustness and design aspects of multiscale methods are also emphasised, which is accomplished via four building blocks: upscaling of information, systematic reduction of information, characterization of information utilizing experimental data, and material optimization. To ensure the reader gains hands-on experience, a companion website hosting a lite version of the multiscale design software (MDS-Lite) is available. Key features: Combines fundamental theory and practical methods of multiscale modelling Covers the state-of-the-art multiscale theories and examines their practical usability in design; covers applications of multiscale methods; accompanied by a continuously updated website hosting the multiscale design software; illustrated with colour images. Practical Multiscaling is an ideal textbook for graduate students studying multiscale science and engineering. It is also a must-have reference for government laboratories, researchers and practitioners in civil, aerospace, pharmaceutical, electronics, and automotive industries, and commercial software vendors"--