Configurational Forces: Thermomechanics, Physics, Mathematics, and Numerics (Modern Mechanics and Mathematics)

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Exploring recent developments in continuum mechanics, **Configurational Forces: Thermomechanics, Physics, Mathematics, and Numerics** presents the general framework for configurational forces. It also covers a range of applications in engineering and condensed matter physics.

The author presents the fundamentals of accepted standard continuum mechanics, before introducing Eshelby material stress, field theory, variational formulations, Noether's theorem, and the resulting conservation laws. In the chapter on complex continua, he compares the classical perspective of B.D. Coleman and W. Noll with the viewpoint linked to abstract field theory. He then describes the important notion of local structural rearrangement and its relationship to Eshelby stress. After looking at the relevance of Eshelby stress in the thermodynamic description of singular interfaces, the text focuses on fracture problems, microstructured media, systems with mass exchanges, and electromagnetic deformable media. The concluding chapters discuss the exploitation of the canonical conservation law of momentum in nonlinear wave propagation, the application of canonical-momentum conservation law and material force in numerical schemes, and similarities of fluid mechanics and aerodynamics.

Written by a long-time researcher in mechanical engineering, this book provides a detailed treatment of the theory of configurational forces?one of the latest and most fruitful advances in macroscopic field theories. Through many applications, it shows the depth and efficiency of this theory.

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