1. Record Nr. UNINA9910453831303321

Autore	Berezovski Arkadi
Titolo	Numerical simulation of waves and fronts in inhomogeneous solids [[electronic resource] /] / Arkadi Berezovski, Juri Engelbrecht, Gerard A Maugin
Pubbl/distr/stampa	Hackensack, NJ, : World Scientific, c2008
ISBN	1-281-96830-7 9786611968304 981-283-268-8
Descrizione fisica	1 online resource (236 p.)
Collana	World Scientific series on nonlinear science, , Series A Monographs and treatises ; ; v. 62
Altri autori (Persone)	EngelbrechtJuri MauginG. A <1944-> (Gerard A.)
Disciplina	530.4/12
Soggetti	Elastic solids Inhomogeneous materials Wave-motion, Theory of Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references (p. 209-219) and index.
Nota di contenuto	Preface; Contents; 1. Introduction; 1.1 Waves and fronts; 1.2 True and quasi-inhomogeneities; 1.3 Driving force and the corresponding dissipation; 1.4 Example of a straight brittle crack; 1.5 Example of a phase-transition front; 1.6 Numerical simulations of moving discontinuities; 1.7 Outline of the book; 2. Material Inhomogeneities in Thermomechanics; 2.1 Kinematics; 2.2 Integral balance laws; 2.3 Localization and jump relations; 2.3.1 Local balance laws; 2.3.2 Jump relations; 2.3.3 Constitutive relations; 2.4 True and quasi-material inhomogeneities; 2.4.1 Balance of pseudomomentum 2.5 Brittle fracture2.5.1 Straight brittle crack; 2.6 Phase-transition fronts; 2.6.1 Jump relations; 2.6.2 Driving force; 2.7 On the exploitation of Eshelby's stress in isothermal and adiabatic conditions; 2.7.1 Driving force at singular surface in adiabatic conditions; 2.7.2 Another approach to the driving force; 2.8 Concluding remarks; 3. Local Phase Equilibrium and Jump Relations at Moving Discontinuities;

3.1 Intrinsic stability of simple systems; 3.2 Local phase equilibrium; 3.2.1 Classical equilibrium conditions; 3.2.2 Local equilibrium jump relations; 3.3 Non-equilibrium states
3.4 Local equilibrium jump relations at discontinuity3.5 Excess quantities at a moving discontinuity; 3.6 Velocity of moving discontinuity; 3.7 Concluding remarks; 4. Linear Thermoelasticity; 4.1 Local balance laws; 4.2 Balance of pseudomomentum; 4.3 Jump relations; 4.4 Wave-propagation algorithm: an example of finite volume methods; 4.4.1 One-dimensional elasticity; 4.4.2 Averaged quantities; 4.4.3 Numerical fluxes; 4.4.4 Second order corrections; 4.4.5 Conservative wave propagation algorithm; 4.5 Local equilibrium approximation; 4.5.1 Excess quantities and numerical fluxes
4.5.2 Riemann problem4.5.3 Excess quantities at the boundaries between cells; 4.6 Concluding remarks; 5. Wave Propagation in Inhomogeneous Solids; 5.1 Governing equations; 5.2 One-dimensional waves in periodic media; 5.3 One-dimensional weakly nonlinear waves in periodic media; 5.4 One-dimensional linear waves in laminates; 5.5 Nonlinear elastic wave in laminates under impact loading; 5.5.1 Problem formulation; 5.5.2 Comparison with experimental data; 5.5.3 Discussion of results; 5.6 Waves in functionally graded materials; 5.7 Concluding remarks
6. Macroscopic Dynamics of Phase-Transition Fronts6.1 Isothermal impact-induced front propagation; 6.1.1 Uniaxial motion of a slab; 6.1.2 Excess quantities in the bulk; 6.1.3 Excess quantities at the phase boundary; 6.1.4 Initiation criterion for the stress-induced phase transformation; 6.1.5 Velocity of the phase boundary; 6.2 Numerical simulations; 6.2.1 Algorithm description; 6.2.2 Comparison with experimental data; 6.3 Interaction of a plane wave with phase boundary; 6.3.1 Pseudoelastic behavior; 6.4 One-dimensional adiabatic fronts in a bar; 6.4.1 Formulation of the problem
6.4.2 Adiabatic approximation

Sommario/riassunto

This book shows the advanced methods of numerical simulation of waves and fronts propagation in inhomogeneous solids and introduces related important ideas associated with the application of numerical methods for these problems. Great care has been taken throughout the book to seek a balance between the thermomechanical analysis and numerical techniques. It is suitable for advanced undergraduate and graduate courses in continuum mechanics and engineering. Necessary prerequisites for this text are basic continuum mechanics and thermodynamics. Some elementary knowledge of numerical methods for p