

1. Record Nr.	UNINA9910552732303321
Titolo	Current trends and open problems in computational mechanics / / edited by Fadi Aldakheel [and five others]
Pubbl/distr/stampa	Cham, Switzerland : , : Springer, , [2022] ©2022
ISBN	3-030-87312-9
Descrizione fisica	1 online resource (587 pages)
Disciplina	620.10015118
Soggetti	Mechanics, Applied - Mathematical models
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	<p>Intro -- Preface -- Contents -- Multiphysics Computation of Thermomechanical Fatigue in Electronics Under Electrical Loading -- 1 Introduction -- 2 Governing Equations -- 3 Model Problem -- 4 Simulation and Results -- 5 Conclusion -- References -- Phase-Field Modeling of Fatigue Crack Propagation in Brittle Materials -- 1 Introduction -- 2 Phase-Field Modeling of Brittle Fracture -- 2.1 Basic Kinematics at Small Strains -- 2.2 Constitutive Work Density Function -- 2.3 Governing Equations -- 3 Phase-Field Model for Fatigue Crack Growth -- 4 Numerical Examples -- 4.1 Single-Edge Notched Test -- 4.2 Block with Multiple Holes Under Cyclic Loading -- 5 Conclusion -- References -- A Non-intrusive Global/Local Cycle-Jumping Techniques: Application to Visco-Plastic Structures -- 1 Introduction -- 2 Reference Problem and Solution -- 3 Summary of the Chosen Cycle-Jumping Technique -- 4 Coupling with the Global/Local Method -- 5 Conclusion -- References -- VEM Approach for Homogenization of Fibre-Reinforced Composites with Curvilinear Inclusions -- 1 Introduction -- 2 Asymptotic Homogenization of Doubly Periodic Fibre Reinforced Composite Materials -- 2.1 Homogenized Equilibrium Equation and Effective Material Moduli -- 3 C0 Curved Virtual Element Method -- 3.1 The Virtual Element Space -- 3.2 Numerical Test -- 4 Conclusion -- References -- Free Bloch Wave Propagation in Periodic Cauchy Materials: Analytical and Computational Strategies -- 1 Introduction -- 2 Wave Propagation in Periodic Cauchy Materials -- 2.1 Direct Strategy</p>

-- 2.2 Indirect Strategy -- 3 Dispersion Properties via Finite Element Formulation -- 3.1 Direct Strategy -- 3.2 Indirect Strategy -- 4 Conclusions -- References -- Divergence Free VEM for the Stokes Problem with No Internal Degrees of Freedom -- 1 Introduction -- 2 Discrete Velocity Spaces.

3 A Projection Operator and the Discrete Problem -- 4 Numerical Tests -- References -- Strategy for Preventing Membrane Locking Through Reparametrization -- 1 Introduction -- 2 Curved Bernoulli Beam -- 2.1 Standard Displacement Formulation (u,w) -- 2.2 Mixed Displacement Formulation (u,w,u) -- 3 Membrane Locking -- 4 Reparametrizations to Avoid Membrane Locking -- 4.1 First Reparametrization (u,u) -- 4.2 Second Reparametrization (u,w) -- 4.3 Third Reparametrization (u,Aw) -- 4.4 Mechanical Interpretation of u -- 5 Numerical Example -- 6 Conclusions -- References -- Model-Free Fracture Mechanics and Fatigue -- 1 Introduction -- 2 Classical Formulation -- 3 Data-Driven Approach -- 3.1 Rate-Independent Fracture -- 3.2 Rate-Dependent Fracture and Fatigue -- 4 Summary and Outlook -- References -- Node Based Non-invasive Form Finding Revisited-The Challenge of Remeshing -- 1 Introduction -- 2 A Brief Outline of Non-invasive Form Finding -- 2.1 The Quasi-Newton Update Iteration Step -- 2.2 Non-invasive Optimization -- 3 Mesh Transformation for Dealing with Remeshing -- 4 Academic Example -- 5 Summary -- References -- Micropolar Modelling of Periodic Cauchy Materials Based on Asymptotic Homogenization -- 1 Introduction -- 2 Microscopic and Macroscopic Governing Equations -- 3 Micro-Macro Kinematic Relations and Asymptotic Expansion of the Microscopic Governing Equations -- 4 Upscaling Relations and Third Order Polynomial Kinematic Map -- 5 Generalized Macro-Homogeneity Condition -- 6 Benchmark Test -- 7 Conclusions -- References -- Experimental and Numerical Investigation of Granules as Crash-Absorber in Ship Building -- 1 Introduction -- 2 Experimental Testing -- 3 Numerical Simulation -- 4 Conclusions -- References -- On Hydraulic Fracturing in Fully and Partially Saturated Brittle Porous Material -- 1 Introduction -- 2 Governing Equations.

2.1 Fracturing of Brittle Porous Solids -- 2.2 Fluid Components -- 2.3 Equations Governing the Numerical Computations -- 3 Numerical Example -- 4 Conclusion -- References -- Efficient Two-Scale Modeling of Porous Media Using Numerical Model Reduction with Fully Computable Error Bounds -- 1 Introduction -- 2 Computational Homogenization with Model Reduction -- 3 Estimation of the NMR Error for the RVE Problem -- 4 Conclusions -- References -- Perspectives on the Master-Master Contact Formulation -- 1 Introduction -- 1.1 Master-Slave Scheme -- 1.2 Contact Contributions in a Numerical Model -- 2 Pointwise Contact -- 2.1 Master-Master Scheme -- 3 Challenges for Future Research -- References -- Remarks on the History of Glacier Research and the Flow Law of Ice -- 1 Beginnings of Glacier Ice Research -- 2 First Measurements and Link with Young Thermodynamics -- 3 Creep Law for Ice -- 4 Beyond the Power Law -- References -- Anisotropic Failure Criteria in Relation to Crack Phase-Field Modeling at Finite Strains -- 1 Introduction -- 2 Anisotropic Crack Phase-Field Modeling -- 2.1 Geometrical Aspects of Anisotropic Phase-Field Modeling -- 2.2 Balance Equations of Phase-Field Modeling of Rupture -- 2.3 Constitutive Aspects of Anisotropic Phase-Field Modeling -- 3 Discussion -- References -- A Poroelastic Element for FEAP Using AceGen -- 1 Introduction to Poroelasticity -- 2 Linear Poroelasticity -- 2.1 Theory -- 2.2 Variational Equations -- 2.3 Finite Element Solution -- 3 Automated Computational Modeling Using AceGen -- 4 Results and Discussion -- 4.1 Mandel Problem -- 4.2

Consolidation Problem -- 5 Closure -- References -- Contact
Formulation for Second Gradient Materials -- 1 Introduction -- 2 Finite Strain Second Gradient Material -- 3 Contact Constraints -- 4 Conclusions -- References.
Locking-Free Mixed Finite Element Methods and Their Spurious Hourglassing Patterns -- 1 Introduction -- 2 The Five-Field Finite Element Formulation -- 2.1 Deformation Gradient -- 2.2 Variational Framework -- 2.3 Discretization -- 3 Numerical Investigations -- 3.1 Cook's Membrane -- 3.2 Stability Test -- 3.3 Necking Plane Strain -- 3.4 Necking Circular Bar -- 3.5 Spherical Shell with Opening -- 4 Conclusion -- References -- Adaptive Virtual Element Method for Large-Strain Phase-Field Fracture -- 1 Introduction -- 2 Phase-Field Modeling of Brittle Fracture -- 2.1 Basic Kinematics -- 2.2 Constitutive Work Density Function -- 2.3 Governing Equations -- 3 The VEM -- 3.1 The VEM Projection -- 3.2 Construction of the Virtual Element -- 4 Mesh Refinement -- 5 Numerical Examples -- 5.1 Single-Edge Notched Tension Test -- 5.2 Single-Edge Notched Shear Test -- 6 Conclusion -- References -- Galerkin Formulations with Greville Quadrature Rules for Isogeometric Shell Analysis: Higher Order Elements and Locking -- 1 Introduction -- 2 Greville Quadrature -- 2.1 Definition of Greville Quadrature -- 2.2 Greville Quadrature for Shells -- 2.3 Scordelis-Lo Roof -- 3 Conclusions -- References -- Thermodynamic Topology Optimization of Layered Anisotropic Materials -- 1 Introduction -- 2 Thermodynamic Optimization -- 2.1 Design Variables -- 2.2 Material Definition -- 2.3 Optimization Model -- 2.4 Stationarity Conditions and Evolution Equations -- 3 Numerical Solution -- 3.1 Program Structure -- 3.2 Initial Conditions -- 3.3 Material Orientation Filter -- 4 Numerical Results -- 4.1 Material Parameters and Boundary Conditions -- 4.2 Results Without Material Orientation Filter -- 4.3 Material Orientation Filter -- 4.4 Prescribing the Layer Normal -- 5 Conclusions and Outlook -- References -- A Review of Nonlocality in Computational Contact Mechanics -- 1 Introduction.
2 Nonlocal Interactions in Discretized Models -- 3 Nonlocal Interaction Through a Fictitious Medium -- 4 Nonlocal Interaction Through Integral Operators -- 5 Borrowing from Peridynamics: Frictional Nonlocal Contact -- 6 Conclusions and Future Directions -- References -- Optimal Control for Phase-Field Fracture: Algorithmic Concepts and Computations -- 1 Introduction -- 2 Problem Statements -- 2.1 Phase-Field Fracture Forward Problem -- 2.2 Optimization Problem -- 3 Reduced Optimization Problem -- 4 Algorithmic Realization -- 5 Numerical Example -- References -- A Strong Form Meshfree Collocation Method: Engineering Applications Including Frictional Contact -- 1 A Strong Form Meshfree Collocation Method -- 1.1 Approximation of Derivative Operators -- 1.2 Discretization of a Strong Form for Frictional Contact -- 2 Applications Including Frictional Contact -- References -- A Mixed XFEM Formulation to Simulate Dynamic Wave Propagation in Nearly Incompressible Materials -- 1 Introduction -- 2 The XQ1XP0 Formulation for Small Deformations and Dynamic Problems -- 3 Quasi-longitudinal Wave Reflection Pattern of a Cylindrical Heterogeneity -- 4 Conclusions -- References -- What Machine Learning Can Do for Computational Solid Mechanics -- 1 Introduction -- 2 Material Modeling -- 2.1 Accelerating Multiscale Simulations -- 2.2 Data-Driven Constitutive Models: Beyond Simulation-Based Training -- 2.3 Learning to Solve PDEs -- 3 Design of (meta-)materials -- 3.1 Accelerating Topology Optimization -- 3.2 Efficiently Exploring Design Spaces -- 3.3 Inverting Structure-Property Maps -- 4 Conclusions and Outlook -- References -- On a Physics-Compatible Approach for Data-Driven Computational Mechanics -- 1

Introduction -- 2 Basic Ideas -- 2.1 The Computation Problem -- 2.2
Principle P1: Separation of Equations -- 2.3 Principle P2: The
Experimental Constitutive Manifold.
2.4 Structure Computation.
