

1. Record Nr.	UNINA9910510535503321
Titolo	Mathematical applications in continuum and structural mechanics // Francesco Marmo [and three others]
Pubbl/distr/stampa	Cham, Switzerland : , : Springer International Publishing, , [2021] ©2021
ISBN	3-030-42707-2
Descrizione fisica	1 online resource (275 pages)
Collana	Advanced Structured Materials ; ; v.127
Disciplina	531
Soggetti	Continuum mechanics - Mathematical models Structural analysis (Engineering) - Mathematical models Mecànica dels medis continus Teoria de les estructures Models matemàtics Llibres electrònics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Intro -- Contents -- Contributors -- 1 Usage of Guided Wave Resonance Phenomena for Defect Detection in Laminate Elastic Structures -- 1.1 Introduction -- 1.2 Computational Models -- 1.3 Experimental Evaluation of Resonance Frequencies -- 1.4 Estimation of the Defect Size -- 1.5 Conclusion -- References -- 2 Modelling of Piezocomposites with Mechanical Interface Effects -- 2.1 Introduction -- 2.2 Effective Moduli Method for Homogenization of Two-Phase Piezoelectric Nanocomposite -- 2.3 Dimensionless Homogenization Problem -- 2.4 Finite Element Modelling -- 2.5 Modelling of Representative Volume Elements -- 2.6 Results and Discussion -- 2.7 Conclusion -- References -- 3 A Mathematical Model for Bone Cell Population Dynamics of Fracture Healing Considering the Effect of Energy Dissipation -- 3.1 Introduction -- 3.2 The Model -- 3.2.1 The Main Assumptions -- 3.2.2 The Governing Equations -- 3.2.3 The Stimulus -- 3.2.4 The Function () -- 3.2.5 The Mechanical Framework -- 3.2.6 Numerical Data -- 3.2.7 Healing of Bone -- 3.2.8 Dissipation -- 3.3 Results and Discussion -- 3.4

Conclusion -- References -- 4 Second Gradient Linear and Nonlinear Constitutive Models of Architected Materials: Static and Dynamic Behaviors -- 4.1 Introduction -- 4.2 First- and Second-Order Effective Moduli of Periodic Networks -- 4.2.1 Analytical Method -- 4.2.2 Homogenized Viscoelastic Behavior -- 4.2.3 Incremental Scheme -- 4.3 Wave Propagation Analysis Based on Nonlinear Models -- 4.3.1 Strain Energy Density -- 4.4 Conclusion -- References -- 5 An Application of Coulomb-Friction Model to Predict Internal Dissipation in Concrete -- 5.1 Introduction -- 5.2 A Brief Synopsis of the Employed Model -- 5.2.1 3D Formulation of a Micromorphic Concrete-Based Material -- 5.2.2 Simplified Formulation for the Case of a Pure Compression -- 5.3 Numerical Simulations and Discussions. 5.4 Conclusion -- References -- 6 From the Swarm Robotics to Material Deformations -- 6.1 Introduction -- 6.2 Other Models in Literature -- 6.2.1 Position-Based Dynamics (PBD) -- 6.2.2 Swarm Robotics -- 6.3 The Model Here Proposed -- 6.3.1 A Recall About Graph Theory -- 6.3.2 Constructing the Model -- 6.3.3 Relationship with Other Models -- 6.3.4 Meaning of Neighbors -- 6.4 Numerical Simulations -- 6.4.1 Standard Simulations -- 6.4.2 Second Neighborhoods and Exotic Simulations -- 6.5 Conclusion -- References -- 7 A Review of the Class of Bouc-Wen Differential Models for Simulating Mechanical Hysteresis Phenomena -- 7.1 Introduction -- 7.2 Modeling of Symmetric Hysteresis Loops -- 7.2.1 Bouc Model and Its Modified Versions -- 7.2.2 Sensitivity Analysis -- 7.3 Modeling of Asymmetric Hysteresis Loops -- 7.3.1 Asymmetric Bouc-Wen Models -- 7.3.2 Sensitivity Analysis -- 7.4 Modeling of Pinched Hysteresis Loops -- 7.4.1 Pinching Bouc-Wen Models -- 7.4.2 Sensitivity Analysis -- 7.5 Modeling of Degrading Hysteresis Loops -- 7.5.1 Degrading Bouc-Wen Models -- 7.5.2 Sensitivity Analysis -- 7.6 Conclusion -- References -- 8 A Generalized Formulation of Time Integration Methods for Nonlinear Dynamic Analysis of Hysteretic Mechanical Systems -- 8.1 Introduction -- 8.2 Families of Time Integration Methods -- 8.2.1 Nonlinear Equilibrium Equations -- 8.2.2 Generalized Formulation of Time Integration Methods -- 8.3 Conventional Time Integration Methods -- 8.3.1 Newmark's Family of Methods -- 8.3.2 Some Instances of the NFMs -- 8.3.3 Implementation Scheme of the NFMs -- 8.4 Structure-Dependent Time Integration Methods -- 8.4.1 Chang's Family of Explicit Methods -- 8.4.2 Some Instances of the CFEMs -- 8.4.3 Implementation Scheme of the CFEMs -- 8.5 Numerical Experiments -- 8.5.1 Mechanical System Properties -- 8.5.2 Applied Generalized External Force. 8.5.3 Hysteretic Model Parameters -- 8.5.4 Results of the Nonlinear Time History Analyses -- 8.6 Conclusion -- References -- 9 Quasi-Harmonic Solutions for Transversely Isotropic Magneto-Electro-Thermo-Elasticity: A Symbolic Mathematics Approach -- 9.1 Introduction -- 9.2 Field Equations -- 9.3 A General Solution to the Field Equations in Terms of Quasi-Harmonic Potentials -- 9.3.1 Inversion of the Differential Operator \mathcal{L} -- 9.3.2 Factorization of the Differential Equation $\mathcal{L}u = 0$ -- 9.4 Automatic Evaluation of \mathcal{L} and \mathcal{L}^* and Relevant Coefficients -- 9.4.1 Evaluation of \mathcal{L} -- 9.4.2 Evaluation of \mathcal{L}^* -- 9.5 Conclusion -- References -- 10 Mathematical Tools for the Seismic Analysis of Reinforced Concrete Structures: A Selected Review -- 10.1 Introduction -- 10.2 Review of Strategies Accounting for Global Torsion in Buildings -- 10.2.1 Review of the Dynamic Equivalent Rotational Spectrum -- 10.3 Computation of Multicomponent Actions by Seismic Envelopes -- 10.4 Capacity Checks of Reinforced Concrete Beams -- 10.4.1 A General Algorithm to Perform Capacity Checks by the Supreme

Envelope -- 10.5 Conclusions -- References -- 11 Form Finding of Shell Structures by Using Membrane Theory -- 11.1 Introduction -- 11.2 The Membrane Theory of Shells -- 11.2.1 Global and Local Reference Frames -- 11.2.2 Transformation Formulas for Lengths and Areas -- 11.2.3 Distributed Loads and Stress Components -- 11.2.4 Equilibrium -- 11.3 Form-Finding Algorithm -- 11.3.1 Discretization of the Equilibrium Equations by the Finite Difference Method -- 11.3.2 Assigning the Distribution of Projected Membrane Stresses -- 11.3.3 Evaluation of the Shell Mid-Surface Height -- 11.3.4 Iterative Procedure for Assigning Projected Loads -- 11.4 Numerical Examples -- 11.4.1 Shell with One Free Side -- 11.4.2 Shell Supported at Corners. 11.5 Conclusion -- References -- 12 Influence of Non-structural Components on Equivalent Linearization of Buildings -- 12.1 Introduction -- 12.2 Brief Review of Tail-Equivalent Linearization -- 12.3 Influence of Secondary Devices on TELS -- 12.3.1 Frequency Content Comparison -- 12.3.2 First Excursion Probability Comparison -- 12.4 Conclusion -- References -- 13 Do We Really Need Pantographic Structures? -- 13.1 Introduction -- 13.2 Metamaterials Are (Natural) Materials on Demand -- 13.3 Second Gradient Theories -- 13.4 Microstructure in Continuum Mechanics -- 13.4.1 The Synthesis Problem -- 13.5 Why We Really Need Pantographic Structures -- 13.5.1 The Existence of Pantographic Metamaterial Motivates the Need of Second Gradient Theories -- 13.5.2 A Mechanical Diode -- 13.5.3 An Iterative Algorithm for Synthesising Metamaterials -- 13.6 Conclusion -- References.
