

1. Record Nr.	UNINA9910139897203321
Autore	Gaudenzi Paolo
Titolo	Smart structures [[electronic resource] ] : physical behaviour, mathematical modelling and applications // Paolo Gaudenzi
Pubbl/distr/stampa	Hoboken, NJ, : Wiley, 2009
ISBN	1-282-36214-3 9786612362149 0-470-68240-X 0-470-68243-4
Descrizione fisica	1 online resource (195 p.)
Disciplina	624.1 624.17
Soggetti	Smart structures - Mathematical models Structural control (Engineering)
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 and index.
Nota di contenuto	Smart Structures; Contents; List of Figures; Preface; 1 Introduction to Smart Structures; 1.1 Smart Structures and Traditional Structures: Definition and Main Constituents; 1.2 Smart Structures and Active Materials; 1.3 The Physical Behaviour of Active Materials for Actuation and Sensing; 1.3.1 Piezoelectric Materials; 1.3.2 Electrostrictive Materials; 1.3.3 Magnetostrictive Materials; 1.3.4 Shape Memory Alloys; 1.4 Motivations for the Use of Smart Structure Technologies; 1.5 Monitoring Structural Integrity; 1.6 Shape Morphing; 1.7 Vibration Control; 1.8 Energy Harvesting; References 2 Mathematical Modeling of Piezoelectric Bodies 2.1 Analysis of Piezoelectric Continua; 2.1.1 Constitutive Relations of Piezoelectric Materials; 2.1.2 Energy Coupling Coefficients; 2.1.3 The Equations of Linear Piezoelectricity for a Three-dimensional Continuum; 2.1.4 Energy Considerations; 2.1.5 Governing Equations in Terms of Displacements and Electric Potential; 2.1.6 Analysis of a Two-dimensional Piezoelectric Continuum under Electrical and Mechanical Loading; 2.2 Finite Element Equations for Piezoelectric Problems; 2.2.1 Variational Principles

2.2.2 The Case of Linear Constitutive Relations 2.2.3 Finite Element Discretization of the Linear Piezoelectric Equations; 2.2.4 Finite Element Solution; 2.2.5 An Iterative Approach to the Solution; 2.2.6 The Case of Nonlinear Constitutive Relations; 2.3 Finite Element Simulation of Piezoelectric Analyses of Practical Interest; 2.4 Beam, Plate and Shell Models; References; 3 Actuation and Sensing Mechanisms; 3.1 The Induced Strain Actuation Mechanism; 3.2 Axial Actuation; 3.2.1 Static Actuation; 3.2.2 Dynamic Actuation; 3.3 Bending Actuation; 3.3.1 The Thermocouple Analogy 3.3.2 Pure Bending Induced by Patched Actuators 3.3.3 Pure Axial Extension Induced by Patched Actuators; 3.3.4 The Pin-force Model; 3.4 The Generalization of Pin-force and Euler-Bernoulli Beam Actuation; 3.4.1 Pin-force Model; 3.4.2 Euler-Bernoulli Model; 3.5 Static Response of a Beam Subjected to Bending Actuation; 3.6 Dynamic Response of a Beam Actuated in Bending; 3.7 Higher Order Models for Beam Bending Actuation; 3.7.1 Single Layer Higher Order Model; 3.7.2 Multilayer Higher Order Model; 3.7.3 Equilibrium Equations; 3.8 Sensing Mechanism; 3.9 Control Issues 3.9.1 The Use of Piezoelectric Materials for the Control of Structural Vibrations 3.9.2 Experimental Case Study; References; 4 Active Composites; 4.1 The Concept of Active Composites; 4.2 Piezoelectric Fibre Composites; 4.3 Interdigitated Electrodes for Piezoelectric Components; 4.4 Micromechanics of a Piezoelectric Fibre Composite; 4.4.1 Elastic Properties of a Fibre Composite; 4.4.2 Dielectric Properties of a Fibre Composite; 4.5 Finite Element Evaluation of the Piezoelectric Properties of the Active Composite; 4.6 Macromechanics of Active Composites 4.6.1 Constitutive Relations of a Piezocomposite Lamina

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Sommario/riassunto

Synthesizing knowledge acquired as a result of significant research and development over recent years, Smart Structures clearly illustrates why these structures are of such intense current interest. Gaudenzi offers valuable insight into both how they behave and how and at what cost they could be designed and produced for real life applications in cutting edge fields such as vibration control, shape morphing, structural health monitoring and energy transduction. Smart Structures offers a basic and fundamental description of smart structures from the physical, mathematics,

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