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Nota di contenuto	Health Monitoring of Structural Materials and Components; Contents; Preface; Acknowledgments; 1 Introduction; 1.1 Basics of Health Monitoring; 1.2 Commercial Needs for Health Monitoring Technology; 1.3 Defense Needs for Health Monitoring Technology; 1.4 Technical Approach to Health Monitoring; 1.5 Definitions of Common Terminology; 1.6 Comparison of Nondestructive Testing (NDT) and Health Monitoring Techniques; 1.7 Potential Impact of Health Monitoring Technologies; 1.8 Overview of Technical Areas in Health Monitoring; 1.9 Summary; References; Problems; 2 Modeling Components 2.1 Modeling Needs 2.2 First-Principle Models; 2.2.1 Component Vibration Models; 2.2.2 Vibration Natural Frequencies and Modal Deflection Shapes; 2.2.3 Free Vibration Response; 2.2.4 Forced Vibration Response (Frequency Response Models); 2.2.5 Impedance and Compliance Models; 2.2.6 Transmissibility Forced Response Models; 2.2.7 Nonlinear Dynamic Models; 2.2.8 Wave Propagation Models (One Dimensional); 2.2.8.1 Analytical Solution for Longitudinal Waves;

2.2.8.2 Longitudinal Wave Propagation Finite Element Model; 2.2.8.3 Analytical Solution for Rod with Transverse Waves
2.2.8.4 Transverse Wave Propagation Finite Element Model
2.2.9 Wave Propagation Models (Two Dimensional); 2.3 Data-Driven Models; 2.3.1 Experimental Time Domain Models; 2.3.1.1 Direct Parameter Models; 2.3.1.2 Restoring Force and Phase-Plane Models; 2.3.1.3 Discrete Time Models; 2.3.2 Experimental Frequency Response Models; 2.3.2.1 Frequency Response Sensitivity Functions; 2.3.2.2 Virtual Force Models; 2.3.3 Experimental Modal Vibration Models; 2.3.4 Other Data-Driven Models; 2.4 Load Models; 2.4.1 External Mechanical Excitations; 2.4.1.1 Impulsive Excitations; 2.4.1.2 Narrowband Excitations
2.4.1.3 Broadband Random Excitations
2.4.2 Acoustic Pressure, Temperature and Other Environmental Loads; 2.5 Summary; References; Problems; 3 Modeling Damage; 3.1 Static Damage Models; 3.1.1 Fasteners and Joints; 3.1.2 Cracking; 3.1.3 Plastic Deformation, Penetration and Erosion; 3.1.4 Delamination, Debonding and Separation; 3.1.5 Creep and Buckling; 3.1.6 Corrosion and Oxidation; 3.1.6.1 Fiber Pull Out and Fiber Breakage; 3.1.7 Matrix Cracking; 3.1.8 Microstructural Changes; 3.2 Dynamic Models for Damage; 3.2.1 Phenomenological Models; 3.2.2 Generalized Damage Growth Models
3.3 Failure Models
3.4 Performance Models; 3.5 Summary; References; Problems; 4 Measurements; 4.1 Measurement Needs; 4.2 Data Environment; 4.2.1 Amplitude and Frequency Ranges; 4.2.2 Nature of Data; 4.2.3 Environmental Factors; 4.3 Transducer Attachment Methods; 4.3.1 Durability; 4.3.2 Stability; 4.3.3 Directionality; 4.3.4 Frequency Range (Wavelength); 4.4 Transducers; 4.4.1 Overview of Sensors and Actuators; 4.4.2 Passive Sensors; 4.4.2.1 Resistance Strain Gauge Model; 4.4.2.2 Piezoelectric Accelerometer Model; 4.4.2.3 Transmission Models (Cable, Amplifier and Power Supply)
4.4.3 Active Piezoelectric Transducers (Actuators)

Sommario/riassunto

The first complete introduction to health monitoring, encapsulating both technical information and practical case studies spanning the breadth of the subject. Written by a highly-respected figure in structural health monitoring, this book provides readers with the technical skills and practical understanding required to solve new problems encountered in the emerging field of health monitoring. The book presents a suite of methods and applications in loads identification (usage monitoring), in-situ damage identification (diagnostics), and damage and performance prediction (prognostics)

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