

1. Record Nr.	UNINA9911020228003321
Autore	Lee Usik
Titolo	Spectral element method in structural dynamics // Usik Lee
Pubbl/distr/stampa	Singapore ; ; Hoboken, NJ, : J. Wiley & Sons Asia, c2009
ISBN	9786612371424 9781282371422 1282371428 9780470823767 0470823763 9780470823750 0470823755
Descrizione fisica	1 online resource (470 p.)
Disciplina	624.171
Soggetti	Structural dynamics - Mathematics Structural frames - Mathematical models Spectral theory (Mathematics)
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Includes index.
Nota di contenuto	SPECTRAL ELEMENT METHOD IN STRUCTURAL DYNAMICS; Contents; Preface; Part One: Introduction to the Spectral Element Method and Spectral Analysis of Signals; 1 Introduction; 1.1 Theoretical Background; 1.1.1 Finite Element Method; 1.1.2 Dynamic Stiffness Method; 1.1.3 Spectral Analysis Method; 1.1.4 Spectral Element Method; 1.1.5 Advantages and Disadvantages of SEM; 1.2 Historical Background; 2 Spectral Analysis of Signals; 2.1 Fourier Series; 2.2 Discrete Fourier Transform and the FFT; 2.2.1 Discrete Fourier Transform (DFT); 2.2.2 Fast Fourier Transform (FFT); 2.3 Aliasing; 2.3.1 Aliasing Error; 2.3.2 Remedy for Aliasing; 2.4 Leakage; 2.4.1 Leakage Error; 2.4.2 Artificial Damping; 2.5 Picket-Fence Effect; 2.6 Zero Padding; 2.6.1 Improving Interpolation in the Transformed Domain; 2.6.2 Remedy for Wraparound Error; 2.7 Gibbs Phenomenon; 2.8 General Procedure of DFT Processing; 2.9 DFTs of Typical Functions; 2.9.1 Product of Two Functions; 2.9.2 Derivative of a Function; 2.9.3 Other Typical Functions;

Part Two: Theory of Spectral Element Method; 3 Methods of Spectral Element Formulation; 3.1 Force-Displacement Relation Method; 3.2 Variational Method; 3.3 State-Vector Equation Method  
 3.4 Reduction from the Finite Models  
 4 Spectral Element Analysis Method; 4.1 Formulation of Spectral Element Equation; 4.1.1 Computation of Wavenumbers and Wavemodes; 4.1.2 Computation of Spectral Nodal Forces; 4.2 Assembly and the Imposition of Boundary Conditions; 4.3 Eigenvalue Problem and Eigensolutions; 4.4 Dynamic Responses with Null Initial Conditions; 4.4.1 Frequency-Domain and Time-Domain Responses; 4.4.2 Equivalence between Spectral Element Equation and Convolution Integral; 4.5 Dynamic Responses with Arbitrary Initial Conditions  
 4.5.1 Discrete Systems with Arbitrary Initial Conditions  
 4.5.2 Continuous Systems with Arbitrary Initial Conditions; 4.6 Dynamic Responses of Nonlinear Systems; 4.6.1 Discrete Systems with Arbitrary Initial Conditions; 4.6.2 Continuous Systems with Arbitrary Initial Conditions; Part Three: Applications of Spectral Element Method; 5 Dynamics of Beams and Plates; 5.1 Beams; 5.1.1 Spectral Element Equation; 5.1.2 Two-Element Method; 5.2 Levy-Type Plates; 5.2.1 Equation of Motion; 5.2.2 Spectral Element Modeling; 5.2.3 Equivalent 1-D Structure Representation; 5.2.4 Computation of Dynamic Responses  
 Appendix 5.A: Finite Element Model of Bernoulli-Euler Beam  
 6 Flow-Induced Vibrations of Pipelines; 6.1 Theory of Pipe Dynamics; 6.1.1 Equations of Motion of the Pipeline; 6.1.2 Fluid-Dynamics Equations; 6.1.3 Governing Equations for Pipe Dynamics; 6.2 Pipelines Conveying Internal Steady Fluid; 6.2.1 Governing Equations; 6.2.2 Spectral Element Modeling; 6.2.3 Finite Element Model; 6.3 Pipelines Conveying Internal Unsteady Fluid; 6.3.1 Governing Equations; 6.3.2 Spectral Element Modeling; 6.3.3 Finite Element Model; Appendix 6.A: Finite Element Matrices: Steady Fluid  
 Appendix 6.B: Finite Element Matrices: Unsteady Fluid

## Sommario/riassunto

Spectral Element Method in Structural Dynamics is a concise and timely introduction to the spectral element method (SEM) as a means of solving problems in structural dynamics, wave propagations, and other related fields. The book consists of three key sections. In the first part, background knowledge is set up for the readers by reviewing previous work in the area and by providing the fundamentals for the spectral analysis of signals. In the second part, the theory of spectral element method is provided, focusing on how to formulate spectral element models and how to conduct spectral el