



# Analytical and Numerical Methods for Vibration Analyses

*Jong-Shyong Wu*

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**Analytical and Numerical Methods for Vibration Analyses** Jong-Shyong Wu

**Illustrates theories and associated mathematical expressions with numerical examples using various methods, leading to exact solutions, more accurate results, and more computationally efficient techniques**

This book presents the derivations of the equations of motion for all structure foundations using either the continuous model or the discrete model. This mathematical display is a strong feature of the book as it helps to explain in full detail how calculations are reached and interpreted. In addition to the simple 'uniform' and 'straight' beams, the book introduces solution techniques for the complicated 'non uniform' beams (including linear or non-linear tapered beams), and curved beams. Most of the beams are analyzed by taking account of the effects of shear deformation and rotary inertia of the beams themselves as well as the eccentricities and mass moments of inertia of the attachments.

- Demonstrates approaches which dramatically cut CPU times to a fraction of conventional FEM
- Presents "mode shapes" in addition to natural frequencies, which are critical for designers
- Gives detailed derivations for continuous and discrete model equations of motions
- Summarizes the analytical and numerical methods for the natural frequencies, mode shapes, and time histories of
  - straight structures
  - rods
  - shafts
  - Euler beams
  - strings
  - Timoshenko beams
  - membranes/thin plates
  - Conical rods and shafts
  - Tapered beams
  - Curved beams
- Has applications for students taking courses including vibration mechanics, dynamics of structures, and finite element analyses of structures, the transfer matrix method, and Jacobi method

This book is ideal for graduate students in mechanical, civil, marine, aeronautical engineering courses as well as advanced undergraduates with a background in General Physics, Calculus, and Mechanics of Material. The book is also a handy reference for researchers and professional engineers.

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