Vibration of Structures - Video course

COURSE OUTLINE

Vibrations of strings and bars: equations of motion, modal analysis, approximate methods, initial value problem, forced vibrations, damped vibrations
Wave propagation and scattering: d'Alembert solution, harmonic waves, scattering, applications of wave solution
Vibrations of beams: equation of motion, modal analysis, approximate methods, initial value problem, forced vibrations, special problems, wave propagation
Vibrations of membranes: equations of motion, modal analysis, approximate methods
Vibrations of plates: equations of motion, modal analysis, approximate methods

Session Plan

Module No.	Topic	No of Sessions
I	Vibrations of Strings and Bars	16
II	Wave Propagation and Scattering	6
III	Vibrations of Beams	10
IV	Vibrations of Membranes	4
V	Vibrations of Plates	4
	TOTAL HOURS	**40**

Lecture Plan

1. Transverse Vibrations of Strings – I
2. Transverse Vibrations of Strings – II
3. Axial and Torsional Vibrations of Bars
4. Variational Formulation – I
5. Variational Formulation – II
6. Modal Analysis – I
7. Modal Analysis – II
8. Properties of Eigenvalue Problem
9. Modal Analysis: Approximate Methods – I
10. Modal Analysis: Approximate Methods – II
11. Initial Value Problem
12. Forced Vibration Analysis – I
13. Forced Vibration Analysis – II
14. Forced Vibration Analysis – III
15. Damping in Structures
16. Axially Translating Strings
17. d' Alembert's Solution – I
18. d' Alembert's Solution – II

NP-TEL

NPTEL

http://nptel.iitm.ac.in

Mechanical Engineering

Pre-requisites:

Engineering Mathematics, Mechanics, Dynamics, Vibrations of discrete systems

Hyperlinks:

NPTEL web course on Vibrations of Structures

Coordinators:

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Department of Mechanical EngineeringIIT Kharagpur

19. Harmonic Waves and Energetics of Wave Motion
20. Scattering of Waves
21. Applications of Wave Solution – I
22. Applications of Wave Solution – II
23. Beam Models – I
24. Beam Models – II
25. Modal Analysis of Beams
26. Application of Modal Solution
27. Approximate Methods
28. Topics in Beam Vibrations – I
29. Topics in Beam Vibrations – II
30. Wave Propagation in Beams
31. Dynamics of Curved Beams
32. Vibrations of Rings and Arches
33. Dynamics of Membranes
34. Vibrations of Rectangular Membrane
35. Vibrations of Circular Membrane
36. Special Problems in Membrane Vibrations
37. Dynamics of Plates
38. Vibrations of Rectangular Plates
39. Vibrations of Circular Plates
40. Special Problems in Plate Vibrations

References:

1. Peter Hagedorn and Anirvan DasGupta: Vibrations and Waves in Continuous Mechanical Systems, Wiley, 2007
2. Leonard Meirovitch: Analytical Methods in Vibrations, The Macmillan Co., 1967
3. S.S. Rao: Vibration of Continuous Systems, Wiley, 2007