

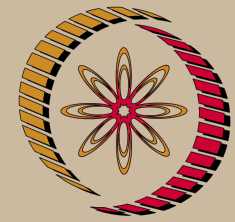
# NOC: Vibrations of Structures - Video course

## COURSE OUTLINE

All mechanical structures have flexibility, which becomes apparent under loading, more prominently under dynamic loading. It is of fundamental importance to understand the vibration characteristics of a structure in order to appropriately design systems subjected to dynamic loading in order to avoid/enhance resonance, sound generation and transmission, and fatigue failure. This course will expose the different modeling and analysis techniques for continuous systems such as strings, bars, beams and plates. Special emphasis is given to variational and approximate methods, which are useful for handling complex systems. The course is expected to be useful for both academic research and industrial applications, and will provide a stepping stone for more specialized and advanced courses.

## COURSE DETAIL

Week .No	Topic
1	<b>(Vibrations of strings and bars)</b> <ul style="list-style-type: none"> <li>• Transverse Vibrations of Strings – I</li> <li>• Transverse Vibrations of Strings – II</li> <li>• Axial and Torsional Vibrations of Bars</li> <li>• Variational Formulation – I</li> <li>• Variational Formulation – II</li> <li>• Modal Analysis - I</li> <li>• Modal Analysis - II</li> <li>• Properties of Eigenvalue Problem</li> <li>• Modal Analysis: Approximate Methods - I</li> <li>• Modal Analysis: Approximate Methods - II</li> <li>• The Initial Value Problem</li> <li>• Forced Vibration Analysis – I</li> <li>• Forced Vibration Analysis – II</li> <li>• Forced Vibration Analysis – III</li> <li>• Damping in Structures</li> <li>• Tutorial video - I</li> </ul>
2	<b>(Vibrations of beams)</b> <ul style="list-style-type: none"> <li>• Beam Models - I</li> <li>• Beam Models - II</li> <li>• Modal Analysis of Beams</li> <li>• Applications of Modal Solution</li> <li>• Approximate Methods</li> <li>• Topic in Beam Vibration - I</li> <li>• Topic in Beam Vibration - II</li> <li>• Dynamics of Curved Beams</li> <li>• Vibrations of Rings and Arches</li> <li>• Tutorial video - II</li> </ul>
3	<b>(Vibrations of membranes)</b> <ul style="list-style-type: none"> <li>• Dynamics of Membranes</li> <li>• Vibrations of Rectangular Membrane</li> <li>• Vibrations of Circular Membrane</li> <li>• Tutorial video - III</li> </ul>
4	<b>(Vibrations of plates)</b> <ul style="list-style-type: none"> <li>• Dynamics of Plates</li> <li>• Vibrations of Rectangular Plates</li> </ul>



NP-TEL

# NPTEL

<http://nptel.ac.in>

## Mechanical Engineering

### Pre-requisites:

Engineering Mathematics, Dynamics of Machines

### Additional Reading:

1. Vibrations and waves in continuous mechanical systems, P. Hagedorn and A. DasGupta, John Wiley, Chichester, 2007
2. NPTEL web course Vibrations of Structures, A. DasGupta

### Coordinators:

**Prof. A. Dasgupta**  
Department of Mechanical Engineering IIT Kharagpur

- Vibrations of Circular Plates
- Special Problems in Plate Vibrations
- Tutorial video - IV