



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Introduction to Vibrations of Deformable Solids

MECHENG 5134

Credit Hours:

3.00

Course Levels:

Undergraduate (1000-5000 level)

Graduate

Course Components:

Lecture

Course Description:

Introduction to the analysis of the free and forced transverse vibrations of strings, beams, membranes and plates and the longitudinal and torsional vibrations of prismatic bars.

Prerequisites and Co-requisites:

Prereq: 2020 (420) or 2040, and Math 2174, 2177, or 2415 (415), and enrollment in MechEng major; or Grad standing in MechEng.

Course Goals / Objectives:

- Obtain an understanding of Newtonian and energy methods for deriving the governing equations of motion of structural elements made of deformable elastic solids
 - Obtain an understanding of the direct method for the determination of the fundamental frequencies (eigenvalues) and mode shapes (eigenfunctions) of freely vibrating structural elements and their dependence on the element boundary conditions
 - Obtain an understanding of the use of energy methods for the approximate determination of the fundamental frequencies and mode shapes of freely vibrating structural elements
 - Obtain an understanding of the method of eigenfunction expansion for determining the forced vibration response of elastic structural elements and the dependence of that response on the type and frequency of the external forcing
 - Obtain a more thorough understanding of the mechanical models used to represent the internal stress and deformation of the basic structural elements
 - Obtain a brief overview of computational methods in vibrations of elastic solids
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Course Topics:

- Transverse Vibrations of a Taut Flexible String
 - Longitudinal Vibrations of an Elastic Rod
 - Torsional Vibrations of an Elastic Rod
 - Transverse Vibrations of an Elastic Beam
 - Transverse Vibrations of a Taut Flexible Membrane
 - Transverse Vibrations of an Elastic Plate
 - Introduction to Computational Methods in Vibrations
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Designation:

Elective