

EML 6233 - MECHANICAL VIBRATIONS
Common Course Syllabus

Catalog Description: 3 CREDITS. Prerequisite: Graduate Standing. Step and impulse loads, multiple degrees of freedom, influence coefficients, matrix methods, vibration of continuous systems, Lagrange's equations. This course serves as an introduction to nonlinear and random vibrations.

Goals: This course is designed to provide students with the working knowledge of methods and procedures to analyze vibrations of continuous systems.

Topics:

1. Review of free and forced vibrations of single degree-of-freedom linear systems; frequency response, impulse response and transform relationships.
2. Review of multi-degree-of-freedom linear systems; general approach to system response analysis.
3. Longitudinal and transverse vibrations of beams, effects of boundary conditions, effects of the axial force, Bresse-Timoshenko beam theory.
4. Vibration of multi-span beams.
5. Vibrations of plates, classical and Mindlin's refined theories.
6. Bolotin's dynamic edge effect method and its generalization.
7. Rayleigh, Rayleigh-Ritz and Galerkin methods.
8. Parametric vibrations.
9. Effects of imperfection on vibrations of structures.
10. Small vibrations around the non-linear states.
11. Non-linear vibrations; basic concepts, some exact and approximate solutions.
12. Selected modern problems in vibrations of continuous structures.
13. Mini-research project on vibrations of continuous structures.

Course Outcomes:

1. Students will understand both the theoretical and numerical aspects of the vibrations of continuous structures.
2. Students will be able to analyze simple structures that have not yet been analyzed in the literature. These original problems will demonstrate the application of the acquired knowledge in vibrations of structures.

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