

EGN 4323 – VIBRATION SYNTHESIS AND ANALYSIS
Common Course Syllabus

Catalog Data: 3 Credits, Free and forced vibration of mechanical systems; damping; periodic and transient excitations; vibration control; multiple degree of freedom and continuous systems.

Goals: To introduce the students to basic theory and applications of mechanical vibration analysis and vibration control design techniques. Emphasis is on developing sound modeling and analysis techniques as well as engineering insights in treating practical mechanical vibration problems.

Prerequisites:

1. MAP 3305 Engineering Mathematics I or MAP 2302 Differential Equations I
2. EGN 3321 Dynamics

Topics:

1. Introduction: fundamental concepts, definitions, and basic elements of Vibrations.
2. Free vibration – single degree of freedom system.
3. Harmonically excited undamped vibrations – single degree of freedom system.
4. Harmonically excited damped vibrations – single degree of freedom system.
5. Transient vibration under general forcing conditions.
6. Vibrations of uniform and homogeneous beams.
7. Determination of natural frequencies and mode shapes of beams simply supported at both ends.
8. Effect of boundary conditions on beam vibrations.
9. Effect of axial load on beam vibrations.
10. Computer simulation (MAPLE) of vibration systems.

Student Learning Outcomes: (numbers in parentheses indicate correlation of the outcome with the appropriate ABET program outcomes 1-7)

1. The students will be well aware of the notion of free vibration in the context of the single degree of freedom system. (1)
2. The students will be familiar with harmonically excited vibrations for the single degree of freedom system. (1)
3. The students will be familiar with transient vibration under step loading conditions. (1)
4. The students will learn the damped vibrations of a single degree of freedom system.(1)
5. The students will learn flexural vibrations of beams and effect of boundary conditions. (1)
6. The students will be able to effectively communicate by writing a report. (3)

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