ME 308 – INTRODUCTION TO VIBRATIONS

Designation as a 'Required' or 'Elective' course
TYPE OF COURSE: Required for BSME Major

Course (catalog) description
COURSE DESCRIPTION: ME 308 Introduction to Vibrations. 3 Hours. Free and forced vibrations of damped linear single and multiple degree of freedom systems. Approximate methods, instrumentation, and applications.

Prerequisite(s)
PREREQUISITE(S): ME 210 Engineering Dynamics, 3 Hours. Math 220 Differential Equations, 3 Hours.

Textbook(s) and/or other required material

Course objectives
COURSE OBJECTIVES: This course introduces students to basic concepts in mechanical vibrations and associated mathematics, and theoretical and computational analysis tools. Most of the course is devoted to the single-degree-of-freedom vibration problem (70%). Multi-degree-of-freedom discrete systems (30%) are introduced. Both analysis and design problems are presented in all of these topics.

Topics covered
MAJOR TOPICS: Hrs
1. Overview of applications & Course Introduction 4
2. Solution of the vibration equations 9
3. Free vibration of single degree of freedom systems 9
4. Forced vibration of single degree of freedom systems 9
5. Discrete systems with more than one degree of freedom 9
Examinations & Review for examinations 5

Total 45

Class/laboratory schedule, i.e., number of sessions each week and duration of each session
CREDIT HOURS: 3 Hours
TYPE OF INSTRUCTION:
<table>
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<th>Type of Instruction</th>
<th>Contact Hours/Week</th>
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<tbody>
<tr>
<td>Lecture-Discussion</td>
<td>3</td>
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Contribution of course to meeting the professional component
This course introduces students to basic concepts in mechanical vibrations and associated mathematics, and theoretical and computational analysis tools. Both analysis and open-ended design problems are presented in all of these topics. The following fundamental concepts and techniques are also a part of this required course: linear algebra, matrix algebra, numerical and analytical calculations for the equation of motion, solutions to ordinary differential equations.
**Relationship of course to program outcomes**

As shown in the BSME Course Outcomes Matrix:

a. Ability to apply knowledge of mathematics, science and engineering  
c. Ability to design a system, component, or process to meet desired needs  
e. Ability to identify, formulate, and solve engineering problems  
k. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

**Person(s) who prepared this description and date of preparation**

Thomas J. Royston, Associate Professor of Mechanical Engineering, February 12, 2002  
*Updated by:* Thomas J. Royston, Professor of Mechanical Engineering, September 12, 2006  
*Updated by:* Thomas J. Royston, Professor of Mechanical Engineering, August 9, 2007  
*Updated by:* Carmen M. Lilley, Assistant Professor of Mechanical Engineering, April 28, 2008

**Comments on outcomes**

a. Use of complex numbers, linear algebra; principles of dynamic systems, differential equations, graphical constructions, analytical formulations, and computer software.  
c. Several homeworks and computer projects require the design of simple vibration isolation systems. Evaluation criteria for designs are also discussed.  
e. Through homework and computer problems, students learn to formulate and solve vibration analysis and design problems  
k. Course includes several homework problems that require use of a modern engineering computer language, such as Matlab®. Course also includes exposure to practical applications of vibration theory to experiments and mechanical design.