

MENG473 – MECHANICAL VIBRATIONS

Department:

Mechanical Engineering

Program Name:

Mechanical Engineering

Program Code: 23**Course Number:**

MENG473

Credits:4 Cr
(4 / 0 / 1) 4**Year/Semester:**

2015-2016 Fall

 Required Course Elective Course Service Course**Prerequisite(s):**

MENG331

Catalog Description:

Undamped and Damped Free Vibration; Forced Vibrations with Harmonic Excitation; Transient Vibrations; systems with Two Degrees of Freedom; Multidegree of Freedom Systems, Vibration of Continuous Systems and Modal Analysis, Vibration Measurement & Control, Finite Element Method, Random Vibrations

Course Web Page:<http://me.emu.edu.tr/zeeshan/courses.htm>**Textbook(s):**

Mechanical Vibrations 5th ed- S. S. Rao, Pearson Education, 2010

Indicative Basic Reading List :

Schaum's Outline of Theory and Problems of Mechanical Vibrations, S. Graham Kelly, McGraw Hill, 1996

Topics Covered and Class Schedule:**(4 hours of lectures per week, 1 hour tutorial)**

<i>WEEK</i>	<i>TOPIC</i>
1	Fundamentals of Vibration
2	Fundamentals of Vibration (Contd)
3	Free Vibration of Single-Degree-of-Freedom Systems
4	Harmonically Excited Vibration
5	Vibration Under General Forcing Conditions
6	Two-Degree-of-Freedom Systems
7	MID TERM EXAMINATION
8	MID TERM EXAMINATION
9	Multidegree-of-Freedom Systems
10	Multidegree-of-Freedom Systems
11	Determination of Natural Frequencies & Mode Shapes
12	Continuous Systems
13	Vibration Control, Measurement and Applications
14	Numerical Integration Methods in Vibration Analysis
15	Finite Element Method
15	Revision & Introduction to Non Linear & Random Vibrations, Aero-structural Optimization
16	FINAL EXAMINATION

Course Learning Outcomes:

At the end of the course, student must be able to

1. Complete basic system modeling tasks, and ability to identify, formulate, and solve engineering problems.
2. Understand of the modeling of vibratory motion of mechanical systems using both single and multiple degree of freedom concepts. Understand free and forced response of these systems with respective damping, and derive the equations of motion for these systems.
3. Perform free-vibration analysis of one, two, and infinite degree of freedom systems.
4. Perform forced-vibration analysis of one and two degree of freedom systems.
5. Explain the basic effects of vibration interaction.
6. Design simple vibration isolation systems.
7. Develop an understanding of the concepts of natural frequencies and mode shapes and their significance in the solution of multiple degrees of freedom problems.
8. Apply Laplace Transforms as a solution to differential equations of motion.
9. Use MATLAB & SIMULINK as a tool for vibration analysis.

	Method	No	Percentage
Assessment	Midterm Exam(s)	1	30 %
	Homework(s)	2	20 %
	Quiz	2	10 %
	Final Examination	1	40 %

Contribution of Course to Criterion 5

Credit Hours for:

Mathematics & Basic Science : 0

Engineering Sciences and Design : 7

General Education : 0

Relationship of Course to Program Outcomes

The course has been designed to contribute to the following program outcomes:

- (a) apply knowledge of mathematics, science, and engineering
- (e) identify, formulate, and solve engineering problems
- (j) a knowledge of contemporary issues
- (k) use the techniques, skills, and modern engineering tools necessary for engineering practice

Prepared by: Associate Prof. Dr. Qasim Zeeshan

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