

MEEM 3700 Mechanical Vibrations**Fall 2007****0-3-0**<http://www.me.mtu.edu/courses/meem3700/index.htm>

Course Learning Objectives: Students who successfully complete this course will have a good understanding of the modeling of vibratory motion of mechanical systems using both single and multiple degree of freedom concepts. They will have studied free and forced response of these systems. Students will be able to design simple vibration isolation systems. They will understand the concepts of natural frequencies and mode shapes and their significance in the solution of multiple degrees of freedom problems. Students will have an introduction to the use of Laplace Transforms as a solution to differential equations of motion. They will be able to complete basic system modeling tasks.

Textbook: William J. Palm III, *Mechanical Vibration*, John Wiley & Sons, Inc. 2007.

Additional course notes are available on the course web-site

<http://www.me.mtu.edu/courses/meem3700/index.htm>

Grading:	Quizzes/Homework	20%	
	Exams (2)	50%	(25% each)
	Final	30%	
	Total	100%	

Wk	Date	Topic/Activity	Textbook	Web Site Lecture Notes #
1	Sept. 3	<i>No Class: Labor Day</i>		
	Sept. 5	Introduction to Dynamic Systems and Mechanical Vibrations	1.1	1
	Sept. 7	<i>No Class: K-Day recess</i>		
2	Sept. 10	Lumped Parameter Modeling, Degrees-of-freedom Harmonic Motion, Review of Differential Equations	1.2, 1.5-1.7,	1,2
	Sept. 12	Free Undamped Vibration, Newton's Method, Natural Frequency, Initial Conditions	3.2	3
	Sept. 14	Equivalent Mass, Equivalent Stiffness	2.5, 2.6	4
3	Sept. 17	Problems from Set 1		
	Sept. 19	Problems, Intro to MATLAB, QUIZ		
	Sept. 21	Rayleigh's Method	3.3	5
4	Sept. 24	Free Vibration with Viscous Damping	3.4-3.7	6
	Sept. 26	Free vibration with Viscous Damping, Log Decrement	3.4-3.7	7
	Sept. 28	Damped Free Vibration - MATLAB	3.9, App.A	
5	Oct. 1	Problems		
	Oct. 3	SDOF Forced Vibration-Harmonic Force, Undamped	4.1	8
	Oct. 5	SDOF Forced Vibration with damping- Harmonic Force, QUIZ	4.2	9
6	Oct. 8	Forced Vibration- Base Excitation, Displacement Transmissibility	4.3, 7.4	10
	Oct. 10	Rotating Unbalance & Force Transmissibility	4.4, 7.3	11
	Oct. 12	Frequency Response with MATLAB	4.9	

7	Oct. 15	Problems		
	Oct. 17	Exam 1		
	Oct. 19	Review & Problems		
8	Oct. 22	Response to Periodic Inputs	5.1	12
	Oct. 24	The Laplace Transform	5.2	13
	Oct. 26	Forced Response from Laplace Transforms	5.3-5.5	14
9	Oct. 29	MATLAB and the Laplace Transform - Simulink	5.6-5.8	
	Oct. 31	Matrices, 2 Degree-of-freedom Systems	6.1	15,16
	Nov. 2	Lagrange's Equations	6.2	
10	Nov. 5	Modes of 2-degree-of-freedom Systems	6.3	17,18
	Nov. 7	Problems, QUIZ		
	Nov. 9	Forced Response	6.4-6.5	19
11	Nov. 12	MATLAB and Simulink Applications	6.7-6.10	
	Nov. 14	Problems		
	Nov. 16	Sources of Vibration/Isolator Design for Fixed-base Systems	7.1-7.3	
	Nov. 19-23 <i>Thanksgiving recess</i>			
12	Nov. 26	Review & Problems		
	Nov. 28	Exam 2		
	Nov. 30	Dynamic Vibration Absorbers/MATLAB Applications	7.5	20
13	Dec. 3	Matrix Equations / Eigenvalue Problems	8.1-8.2	21
	Dec. 5	Mode Shapes and Modal Analysis	8.3	22
	Dec. 7	MATLAB Applications for Multi-degree-of-freedom Systems	8.4-8.5	
14	Dec. 10	Simulink Applications for Multi-degree-of-freedom Systems	8.6-8.7	
	Dec. 12	Problems, QUIZ		
	Dec. 14	Final Review		

Exam Dates:

Exam 1 – Wednesday, October 17, 2007, 6:00-7:00PM, Room MEEM 112

Exam 2 – Wednesday, November 28, 2007, 6:00-7:00PM, Room MEEM 112

Final: As scheduled

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