University of Hormozgan

Name of Faculty	Department of Mechanical Engineering	
Teacher	Dr. Mohammad Hosseini	
Web Page	https://nasim.hormozgan.ac.ir/ostad/resualtfni?m=397121	
Theory/Sessional	Theory	
Reference	Mechanical Vibrations in SI Units, Global Edition [6th ed.] SI Units, Global Edition-Pearson (2017) By Singiresu S. Rao	
Complementary	Theory of Vibration with Applications by W. T. Thomson and Marie Dillon Dahleh, S. Graham Kelly; Fundamentals of mechanical vibrations. ISBN: 0-07-911533-0 Ambekar, A. G., 2006, Mechanical Vibrations and Noise Engineering, Prentice Hall of India, New Delhi. Grover, G. K., 2009, Mechanical Vibrations, Nem Chand and Bros, Roorkee Timoshenko, S.; Vibration problems in engineering. ISBN: 0-471-87315-2 Hartog, J. P. den; Mechanical vibrations Meirovitch, Leonard; Elements of vibration analysis. ISBN: 0-07-041342-8	
Lesson Plan Duration	16 Weeks	
Working method	Presencial	
Pre-requirements (prior knowledge) and co-requirements (common knowledge)	•Students should be acquainted with vector calculus and ordinary differential equations. •Students should have attended and completed the courses on Mechanics I (equilibrium of rigid bodies, centroids and moments of inertia), Mechanics II (kinematics and dynamics of rigid bodies, work and energy), Solid Mechanics (tension-compression, torsion, bending and boundary conditions). •Students should be acquainted with Matlab/Octave software.	
Study level/ semester at which this course is offered:	Second Year- first or Second Semester	
Location of teaching the course	Department of mechanical Engineering	
Assessment Components	Designation	Weight (%)
	Midterm Exam	30%

	Final Exam	50%
	Exercises and Homework (Assignments)	10%
	Quiz	10%
	Class Attendance & Participation.	10% Extra

Week	Lecture Day	Topic	Homework (Problems)
Chapter 1: Fundamentals of Vibration			
1	1	Official holiday	
	2	1.1 Preliminary Remarks 1.2 Brief History of the Study of Vibration 1.3 Importance of the Study of Vibration 1.4 Basic Concepts of Vibration 1.5 Classification of Vibration 1.6 Vibration Analysis Procedure 1.7 Spring Elements 1.8 Mass or Inertia Elements 1.9 Damping Elements	1.7-1.12 1.18-1.28 1.30, 1.31 1.40, 1.41 1.49 1.53 1.55
2	3	1.10 Harmonic Motion 1.11 Harmonic Analysis	
Chapter 2: Free Vibration of Single-Degree-of-Freedom Systems			
3	4 (Official holiday)	2.1 Introduction 2.2 Free Vibration of an Undamped Translational System 2.3 Free Vibration of an Undamped Torsional System 2.4 Response of First-Order Systems and Time Constant	2.7 2.9 2.12, 2.13 2.17 2.21 2.24, 2.25 2.37 2.38, 2.39 2.44- 2.60 2.91-2.101 2.140-2.147 2.160
	5	2.5 Rayleigh’s Energy Method 2.6 Free Vibration with Viscous Damping 2.7 Graphical Representation of haracteristic Roots and Corresponding Solutions 2.8 Parameter Variations and Root Locus Representations	
4	6	2.9 Free Vibration with Coulomb Damping 2.10 Free Vibration with Hysteretic Damping 2.11 Stability of Systems Examples and Chapter Summary	
Chapter 3: Harmonically Excited Vibration			
5	7	3.1 Introduction 3.2 Equation of Motion 3.3 Response of an Undamped System Under Harmonic Force	3.16, 3.17 3.20 3.24, 3.25 3.38 3.44 3.46 3.48-3.50 3.55
	8	3.4 Response of a Damped System Under Harmonic Force 3.5 Response of a Damped System Under F(t)= $F_0 e^{i\omega t}$	

6	9	3.6 Response of a Damped System Under the Harmonic Motion of the Base	3.61-3.63 3.71 3.74, 3.75 3.82 3.90
7	10 (Official holiday)	3.7 Response of a Damped System Under Rotating Unbalance 3.8 Forced Vibration with Coulomb Damping	
	11 (Official holiday)	3.9 Forced Vibration with Hysteresis Damping 3.10 Forced Motion with Other Types of Damping 3.11 Self-Excitation and Stability Analysis	
8	12	3.12 Transfer-Function Approach 3.13 Solutions Using Laplace Transforms	
9	13	3.13 Solutions Using Laplace Transforms (Continue) 3.14 Frequency Transfer Functions	
	14	Chapter Summary and Review	
Chapter 4: Vibration Under General Forcing Conditions			
10	15	4.1 Introduction 4.2 Response Under a General Periodic Force	4.7-4-11 4.16 4.27 4.32-4.35 4.39
11	16	4.3 Response Under a Periodic Force of Irregular Form 4.4 Response Under a Nonperiodic Force 4.5 Convolution Integral	
	17	4.5 Convolution Integral (continue) 4.6 Response Spectrum	
12	18	4.7 Laplace Transforms	
13	19	4.8 Numerical Methods 4.9 Response to Irregular Forcing Conditions Using Numerical Methods	
	20	4.10 Chapter Summary and Review	
Chapter 5: two-Degree-of-Freedom Systems			
14	21	5.1 Introduction 5.2 Equations of Motion for Forced Vibration 5.3 Free-Vibration Analysis of an Undamped System 5.4 Torsional System 5.5 Coordinate Coupling and Principal Coordinates	5.1, 5.10 5.21 5.22-5.24 5.41-5.43 5.50-5.56
15	22	5.6 Forced-Vibration Analysis 5.7 Semidefinite Systems	
	23	5.10 Solutions Using Laplace Transform 5.11 Solutions Using Frequency Transfer Functions	
16	24	Review	