SCHEME OF COURSE WORK

Course Title	Mechanical Vibrations		
Course Code	19ME2103	L T P C	3 0 0 3
Program	M.Tech.		
Specialization	CAD/CAM		
Semester	I		

Course Outcomes (COs):

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

CO1	Determine the natural frequency of transverse vibrations of the shaft and torsional vibrations of rotor systems.
CO2	Analyze the mathematical modelling of the two degrees of freedom systems and explain about the working principle of vibration absorber
CO3	Calculate the natural frequencies and mode shapes of a multi degree of freedom system and explain the modal analysis of a vibrating system.
CO4	Apply the numerical methods to determine natural frequencies of the beam and rotor systems.
CO5	Compute the natural frequencies and mode shapes of continuous systems and calculate the critical speed of the shaft.

Program Outcomes (POs):

PO Code	Program Outcome (PO)
PO1	acquire fundamentals in the areas of computer aided design and manufacturing
PO2	apply innovative skills and analyze computer aided design and manufacturing problems critically
PO3	identify, formulate and solve design and manufacturing problems
PO4	carry out research related to design and manufacturing
PO5	use existing and recent CAD/CAM software
PO6	collaborate with educational institutions, industry and R&D organizations in multidisciplinary teams
PO7	apply project and finance management principles in engineering projects
PO8	prepare technical reports and communicate effectively
PO9	engage in independent and life-long learning and pursue professional practice in their specialized areas of CAD/CAM
PO10	exhibit accountability to society while adhering to ethical practices
PO11	act independently and take corrective measures where necessary

Course Outcome versus **Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	S	M									
CO-2		S	M								
CO-3			S	M							
CO-4				S	M						
CO-5				M	S						

S - Strongly correlated, M - Moderately correlated, Blank - No correlation

Teaching - Learning and Evaluation

WEEK	TOPIC / CONTENTS	COURSE OUTCOMES	SAMPLE QUESTIONS	TEACHING - LEARNING STRATE	ASSESSMENT METHOD & SCHEDULE
1.	Basics of vibrations-Free and forced vibrations	CO1	1. Determine the natural frequencies of transverse vibrations of the shaft. (L3) 2. Determine the torsional natural frequencies of single rotor, two-rotor, three-rotor systems. (L3) 3. Explain geared system. (L2)	Lecture and PPT	Assignment
2.	Vibration isolation; Transverse vibrations-single concentrated load	CO1			
3.	Uniformly distributed load, several loads, Dunkerley‘s method.	CO1			
4.	Two degree of freedom systems, Principal modes of vibration, Two masses fixed on tightly stretched string	CO1			
5.	Two degree of freedom systems – Principal modes of vibration	CO2	1. Compute the natural frequencies and mode shapes of a multi degree of freedom system. (L3) 2. Explain the influence coefficients and generalized co-ordinates. (L3) 3. Determine eigenvalues and eigenvectors of three degrees of freedom systems. (L3)	Lecture and PPT	Seminar
6.	Two masses fixed on tightly stretched string – double pendulum	CO2			
7.	Torsional system with damping – forced vibration with harmonic excitation	CO3			
8.	Undamped dynamic vibration absorber – untuned viscous damper. Learning outcomes	CO4			
9.	**Mid - Test 1 on CO1 and CO2**				
10.	Multi degree of freedom systems – numerical methods – Rayleigh`s method – Dunkerley`s method – Stodola’s method – Rayleigh Ritz method	CO3	1. Calculate the natural frequencies and mode shapes of a multi degree of freedom system using Rayleigh`s method. (L3) 2. Determine the natural frequencies and mode shapes of a multi degree of freedom system using Dunkerley`s method. (L3) 3. Evaluate the natural frequencies and mode shapes of a multi degree of freedom system using Holzer’s method. (L5)	Lecture and PPT	Assignment
11.	Method of matrix iteration – Holzer’s method for natural frequencies of multi rotor systems	CO3			
12.	Continuous systems – vibration of strings – longitudinal vibrations of bars – torsional vibrations of circular shafts	CO4	1. Calculate the natural frequencies and mode shapes of a multi degree of freedom system using Rayleigh`s method. (L3) 2. Determine the natural frequencies and mode shapes of a multi degree of freedom system using Dunkerley`s method. (L3) 3. Evaluate the natural frequencies and mode shapes of a multi degree of freedom system using Holzer’s method. (L5)	Lecture and PPT	Seminar
13.	Lateral vibration of beams critical speeds of shafts – critical speed of a light shaft having a single disc	CO4			
14.	Without damping and with damping. critical speed of a shaft having multiple discs – secondary critical speed	CO4			

15.	Continuous systems – vibration of strings – longitudinal vibrations of bars – torsional vibrations of circular shafts	CO5	1. Analyze the mathematical modeling of continuous systems. (L4) 2. Determine natural frequencies and mode shapes of bars and strings. (L3) 3. Calculate the critical speed of shaft. (L3)	Lecture and PPT	Open Book Exam
16.	Lateral vibration of beams critical speeds of shafts – critical speed of a light shaft having a single disc	CO5			
17.	Without damping and with damping. critical speed of a shaft having multiple discs – secondary critical speed.	CO5			
18.	**Mid - Test 1I on CO3, CO4 and CO5**				
19/ 20	**END EXAM on All COs**				