SCHEME OF COURSE WORK

Course Title	Mechanical Vibrations		
Course Code	13ME2201	L T P C	4 0 0 3
Program	M.Tech.		
Specialization	CAAD		
Semester	I		

Course Outcomes (COs):

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

1	Explore the need and importance of vibration analysis in mechanicaldesign of machine parts
2	Derive the governing differential equations of different vibratorysystems
3	Analyze the mathematical model of a linear vibratory system todetermine its response
4	Analyze free and forced, undamped and damped vibratory systems
5	Determine the frequencies and response of vibratory systems todifferent kinds of excitation
6	Predict and avoid the occurrence of resonance

Program Outcomes (POs):

To make the student learn

1. Acquire knowledge in latest computer-aided design and analysis tools.
2. Create 3D models of real-time components using latest CAD software.
3. Acquire technical skills to formulate and solve engineering and industrial problems.
4. Carry out analysis for the design of new products.
5. Have proficiency to solve problems using modern engineering design tools.
6. Have capability to work in multidisciplinary streams.
7. Apply project and finance management skills to organise engineering projects.
8. Prepare technical reports and present them effectively.
9. Engage in lifelong learning.
10. Realize professional and ethical responsibilities.
11. Conduct surveys, analyse data, plan, design and implement new ideas into action.

Course Outcome versus **Program Outcomes:**

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO-1	S										
CO-2		S									
CO-3				S							
CO-4				S							
CO-5			S								
CO-6						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	Transverse vibration, single concentrated load, uniformly distributed load, several loads	CO1	1. Calculation of natural frequencies for several loads by using Dunkerley's method 2. Explain about the Rayleigh's energy method 3. Find the natural frequencies of torsional systems	Lectures	Assignments
2	Dunkerley's method, energy method, Torsional vibrations	CO1, CO2			
3	Single, multiple-rotor systems, torsionally equivalent shaft, geared system	CO3		Lectures	
4	Two degree of freedom systems, Principal modes of vibration, two masses fixed on tightly stretched string	CO4	1. Find the natural frequencies and mode shapes for a given double pendulum 2. Explain about the principle of dynamic vibration absorber		
5	double pendulum, torsional system with damping	CO5		Lectures	
6	forced vibration with harmonic excitation, undamped dynamic vibration absorber, untuned viscous damper	CO5			
7	Mid - Test 1	CO1, CO4, CO5			
8	Multi degree of freedom systems, exact analysis, free vibrations, equations of motion	CO5	1. Find out the natural frequencies and mode shapes for a given systems 2. Derive the equations of the orthogonal properties of normal modes	Lectures	Assignments
9	influence coefficients, generalized	CO3			

	coordinates, Co-ordinate coupling, natural frequencies				
10	Eigen values and eigenvectors, orthogonal properties of normal modes, modal analysis.	CO3	1. Determination of natural frequencies by using Stodala's method for a given system 2. Determination of natural frequencies by using Holzer's method 3. Derive the frequency expressions for the torsional vibration of circular shafts	Lectures	Assignments
11	Multi degree of freedom systems, Numerical methods	CO3			
12	Rayleigh`s Method, Dunkerley`s method, Stodola'smethod	CO5			
13	Rayleigh Ritz Method, Method of matrix iteration	CO5			
14	Holzer's method for natural frequencies of multi rotor systems.	CO5	1. Derive the frequency expression for the lateral vibration of beams 2. Explain about the critical speeds of a shaft of a single disc with damping and without damping 3. Explain about the critical speed of a shaft	Lectures	
15	Continuous systems, vibration of strings, longitudinal vibrations of bars	CO5			
16	torsional vibrations of circular shafts, lateral vibration of beams Critical speeds of shafts, Critical speed of a light shaft having a singledisc	CO5			
17	without damping and with damping. Critical speed of a shaft having multiple discs, secondary critical speed	CO5			
18	Mid - Test 2	CO3, CO5			
19/20	END EXAM	All COs			