MECHANICAL VIBRATIONS

Course Code	19 ME4601B	Year	III	Semester	II
Course Category	Program Elective-II	Branch	ME	Course Type	Theory
Credits	3	L – T – P	3 – 0 – 0	Prerequisites	Nil
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes		Levels
Upon successful completion of the course, the student will be able to		
CO1	Analyze single degree freedom system for its natural frequency and vibration response.	L3
CO2	Analyze single degree freedom system for its natural frequency and damped vibration response	L3
CO3	determine response of Single degree freedom systems under harmonic excitations	L3
CO4	Determine the response of Two-degree freedom systems under free and forced vibrations	L3
CO5	Derive the equation of motion and find the natural frequencies mode shapes of a multi degree of freedom system	L3

	Contribution of Course Outcomes towards achievement of Program Outcomes Strength of correlations (3: High, 2: Moderate, 1: Low)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1									3	1
CO2	3	3	1	1									3	1
CO3	3	3	1	1									3	1
CO4	3	3	1	1									3	1
CO5	3	3	1	1									3	1

Syllabus		
Unit No	Contents	Mapped CO s
I	**UNDAMPED FREE VIBRATIONS OF SDOF SYSTEMS** Introduction, basic concepts of vibration, importance of vibration study, elements of a vibrating system, types of vibration, methods of vibration analysis, harmonic motion, Equation of motion, free vibration of undamped translational system, free vibration of undamped torsional system, Raleigh's energy method.	CO1
II	**DAMPED FREE VIBRATIONS OF SDOF SYSTEMS** Introduction, types of damping, free vibration with viscous and coulomb damping, logarithmic decrement.	CO2
III	**HARMONICALLY EXITED VIBRATIONS** Introduction, equations of motion, response of undamped and damped systems under harmonic excitation, response of a damped system under harmonic motion of the base, response of a damped	CO3

	system under rotating unbalance, vibration, measuring instruments-vibrometer and accelerometer, critical speed	
IV	**TWO DEGREE OF FREEDOM SYSTEMS:** Introduction, equations of motion for forced vibration, free vibration analysis of an undamped system, torsional system, coordinate coupling and principal coordinates, forced vibration analysis. Dynamic vibration absorber	CO4
V	**MULTI-DEGREE OF FREEDOM SYSTEMS**: Introduction, modeling of continuous systems as multi degree of freedom systems, using Newton's second law to derive equations of motion, influence coefficients, Determination of natural frequencies and mode shapes.	CO5

Learning Recourse(s)
Text Book(s)
1. S.S.Rao,MechanicalVibrations,5/e,PearsonEducationInc.,2011. 2. G. K. Grover, Mechanical Vibrations, 8/e, Nem Chand & Bros
Reference Book(s)
1. L.Meirovich, Elements of Vibration Analysis,2/e.TataMcGrawHill,2007. 2. J.S.Raoand,K.Gupta,IntroductoryCourseonTheoryandPracticeofMechanicalVibrations,2/e, NewAge International,1999.
e-Resources & other digital material
1. https://nptel.ac.in/courses/112/103/112103112/ 2. https://nptel.ac.in/courses/112/103/112103111/