Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NMEC508	Mechanical Vibration	3	1	0	4

Course Objective

- The primary objective of this course is to impart necessary fundamental knowledge to a student so that he/she can confidently cater to the needs of industry or R & D organizations.
- This course would empower students to build and solve mathematical models of vibrating systems. The emphasis is on linear systems subjected to sinusoidal or periodic excitations in general.

Learning Outcomes

Upon successful completion of this course, students will be able to:
- Apply the concepts of vibration to solve practical problems in this field.
- Analyze a vibration problem for a possible solution.
- Get exposure to measuring sensors and its utility.
- Understand modes in connection to multi-degree of freedom system

Unit No.	Topics to be Covered	Lecture Hours (L+T)	Learning Outcome
1	Free vibration of SDF system with and without damping, concept of phase plane, logarithmic decrement, quality factor.	5+2	Basics of vibration
2	Response of single degree of freedom system to periodic and non-periodic excitation, rotating unbalance, whirling of rotating shafts	7+3	How a vibrating system respond to imposed external excitation
3	Vibration isolation, support motion, absorption and isolation, Measuring instruments. Fourier analysis of signals, Presentation of the results of frequency analysis.	7+3	Methods to isolate something from vibrating platform, exposure to measuring instruments
4	Transient analysis and impulse response, arbitrary excitation, Laplace Transform formulation, response spectrum.	5+1	Response of a single DOF system due to arbitrary excitation
5	Multi degree of freedom system, normal mode vibration, co-ordinate coupling, modal analysis, orthogonal properties, modal matrix, Lagrange's equation.	6+2	Free and forced response of a multi-degree of freedom system
6	Multi degree of freedom system – exact analysis and numerical methods, classical methods like Rayleigh, Dunkerley, Rayleigh-Ritz, Holzer etc.	6+2	Exposure to various numerical method to tackle vibration problem

7	Vibration in continuous system like sting, shaft, bar, beam and membrane. Vibration of thin plate.	6+1	Free vibration analysis of continuous systems, frequency domain analysis
	Total	42+14	

Text Books:
1. Theory of vibrations with applications – W. T. Thomson, M.D. Dahleh, C Padmanabhan, Pearson, 5th Edition. (2008)

References Books:
1. Vibration: Fundamentals and practices, Clarence W.de Silva; CRC press, 2nd Ed.2006.
2. Vibration and noise for engineers – K. Pujara; DhanpatRai and Co,2013.