1.	Title of the course	Modal Analysis: Theory and Practice
2.	Course number	ME536M
3.	Structure of credits (L-T-P-C)	2-0-2-3
4.	New course/modification to	New
5.	To be offered by	Mechanical Engineering
6.	Prerequisite	CoT
7.	**Course Objective(s):** To discuss the basics of the theory and practice of modal analysis. To conduct experimental modal analysis, extract the modal parameters and create mathematical models for structural dynamics.	
8.	**Course Content:** Overview of modal analysis; vibration of single and multiple degrees of freedom (SDOF and MDOF) systems; Frequency response functions (FRF) for SDOF and MDOF systems; Orthogonality of modes; Theory of undamped, proportionally damped, and non-proportionally damped systems; Analyses of complex modes and sensitivity of modal models; FRF measurement considerations: introduction to test planning, excitation of structures, transducers and amplifiers for measurements, actuator and sensor placement considerations, signal processing; Modal parameter extraction and derivation of mathematical models for structural dynamics: mode indicator functions, SDOF modal analysis methods, treatment of residuals, MDOF modal analysis in the frequency domain, extraction of natural frequencies, damping ratios and mode shapes; Applications and advanced topics: concepts of modal assurance criterion, dynamic substructuring, model updating, testing of weakly nonlinear structures, vision based modal analysis of structures. Experiments: modal analysis of a cantilever beam and miniaturised aircraft prototype; Calibration of accelerometer and impact hammer.	
9.	**Textbook(s):** 1. Ewins D J, Modal Testing: Theory, Practice and Application, 2nd Edition, Wiley (2000). 2. Maia N and Silva J, Theoretical and Experimental Modal Analysis, Wiley (1997).	
10.	**Reference(s):** 1. Oppenheim A, Willsky A and Nawab S H, Signals and Systems, 2nd Edition, Prentice-Hall (1996). 2. Rao S S, Mechanical Vibrations, 4th Edition, Pearson Education India (2003).	