7th Semester	RME7D004	Mechanical Vibration	L-T-P 3-0-0	3 Credits

Module I: **(12 Hours)**

INTRODUCTION & IMPORTANCE OF MECHANICAL VIBRATION:
Brief history of Mechanical Vibration, Types of Vibration, Simple Harmonic Motion (S.H.M.),Principle of superposition applied to S.H.M., Beats, Fourier Analysis, Concept of degree of freedomfor different vibrating systems.
UNDAMPED FREE VIBRATION OF SINGLE DEGREE FREEDOM SYSTEMS: Modeling of VibratingSystems, Evaluation of natural frequency – differential equation, Energy & Rayleigh's methods,Equivalent systems.
DAMPED FREE VIBRATION OF SINGLE DEGREE FREEDOM SYSTEMS: Different types of damping,Equivalent viscous damping, structural damping, Evaluation of damping using free and forcedVibration technique, Concept of critical damping and its importance, study of vibration response ofviscous damped systems for cases of under damping, critical damping and over damping,Logarithmic decrement.

Module II: **(12 Hours)**

FORCED VIBRATION OF SINGLE DEGREE FREEDOM SYSTEMS: Steady state solution with viscousdamping due to harmonic force, reciprocating and rotating unbalance mass, vibration isolation andtransmissibility due to harmonic force excitation and support motion. Vibration measuringinstruments – vibrometer and accelerometer. Whirling of shaft with single disc and without damping, Concept of critical speed and its effect on the rotating shaft.

UNDAMPED VIBRATION OF TWO DEGREE FREEDOM SYSTEMS: Free vibration of spring coupledand mass coupled systems, Longitudial, Torsional and transverse vibration of two degree freedomsystems, influence coefficient technique, Un-damped vibration Absorber.

Module III:

(12 Hours)

INTRODUCTION TO MULTI-DEGREE FREEDOM SYSTEMS: Normal mode vibration, Co-ordinate coupling-close coupled and far coupled systems, Orthogonality of mode shapes, Methods of matrix iteration, Holzer's method and Stodola method. Torsinal vibration of two, three and multi-rotor systems. Dunkerley's lower bound approximate method.

CONTINOUS SYSTEMS: Vibration of strings, longitudinal vibration of rods, torsional vibration of rods, transverse vibration of Euler-beams.

Books:

[1] Theory of vibration with Applications: W.T. Thomson and Marie Dillon Dahleh, Pearson
Education 5th ed. 2007.
[2] Introductory Course on theory and Practice of Mechanical Vibrations. J.S. Rao & K. Gupta,
New Age International Publication, New Delhi, 2007.
[3] Mechanical Vibrations: S.S. Rao, Prarson Education Inc, 4th ed. 2003.

[4] Mechanical Vibrations: S. Graham Kelly, Schaum's outline series, Tata McGraw Hill, Special Indian ed., 2007
[5] Mechanical Vibrations: V.P. Singh, Dhanpat Rai & company Pvt. Ltd. 3rd ed., 2006
[6] Elements of vibration Analysis: Leonard Meirovitch, Tata McGraw Hill, Special Indian ed.,2007