MECHANICAL VIBRATION

Module – I   **[12]**
1. 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 freedom for different vibrating systems.
2. UNDAMPED FREE VIBRATION OF SINGLE DEGREE FREEDOM SYSTEMS: Modeling of Vibrating Systems, Evaluation of natural frequency – differential equation, Energy & Rayleigh's methods, Equivalent systems.
3. DAMPED FREE VIBRATION OF SINGLE DEGREE FREEDOM SYSTEMS: Different types of damping, Equivalent viscous damping, structural damping, Evaluation of damping using free and forced Vibration technique, Concept of critical damping and its importance, study of vibration response of viscous damped systems for cases of under damping, critical damping and over damping, Logarithmic decrement.

Module – II   **[15]**
4. FORCED VIBRATION OF SINGLE DEGREE FREEDOM SYSTEMS: Steady state solution with viscous damping due to harmonic force, reciprocating and rotating unbalance mass, vibration isolation and transmissibility due to harmonic force excitation and support motion. Vibration measuring instruments – vibrometer and accelerometer. Whirling of shaft with single disc and withour damping, Concept of critical speed and its effect on the rotating shaft.
5. UNDAMPED VIBRATION OF TWO DEGREE FREEDOM SYSTEMS: Free vibration of spring coupled and mass coupled systems, Longitudial, Torsional and transverse vibration of two degree freedom systems, influence coefficient technique, Un-damped vibration Absorber.

Module – III   **[13]**
6. 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.
7. CONTINOUS SYSTEMS: Vibration of strings, longitudinal vibration of rods, torsional vibration of rods, transverse vibration of Euler-beams.

Text 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.

Deference Books:
1. Mechanical Vibrations: S.S. Rao, Prarson Education Inc, 4th ed. 2003
2. Mechanical Vibrations: S. Graham Kelly, Schaum's outline series, Tata McGraw Hill, Special Indian ed., 2007
3. Mechanical Vibrations: V.P. Singh, Dhanpat Rai & company Pvt. Ltd. 3rd ed., 2006
4. Elements of vibration Analysis: Leonard Meirovitch, Tata McGraw Hill, Special Indian ed., 2007