

SYLLABUS :-

Prerequisite Kinematics of Machines
Basic concepts: Generalized coordinates, constraints and their types, degrees-of-freedom, discrete and continuous systems, conservative and non-conservative forces. Discrete systems: Equations of motion: Hamiltons principle and Lagranges equation, considerations for constraints and non-conservative forces. Theory of small oscillations: Equation of motion, free response using complex vector representation of solution and transform methods, eigenvalue problem, characteristic equation, properties of inertia and stiffness matrices, concept of normal modes, their properties and expansion theorem, initial value problem, beat phenomenon, classical and non-classical viscous damping, other types of damping, forced vibration (undamped and damped) under harmonic and general forcing, frequency response function, resonance and Q-factor, logarithmic decrement, base excited vibration, tuned mass absorber and damper, critical speeds and whirling of shafts, field balancing of rigid rotors, Single cylinder engine balancing, Raleighs method. Continuous systems: Equation of motion for transverse vibration of strings, axial vibration of bars, torsional vibration of shafts using Newtonian approach, transverse vibration of beams. Free vibrations and eigenvalue problem, normal modes, orthogonality and expansion theorem.