PCME4301 **MACHINE DYNAMICS** (3-0-0)

Module – I (12 hours)

1. Mechanisms with lower pairs : Motor Vehicle Steering Gears - Davis Steering Gear & Ackermann Steering Gear, Hooke's Joint.
2. Gyroscope : Concept on Gyroscopic Couple for Plane Disc & Two-bladed airscrew, Effect of Gyroscopic Couple on Ships & Aeroplanes, Stability of Two Wheelers and Four Wheelers. Analysis on bearing reactions due to Forced Precession of Rotating Disc mounted on Shafts, Introduction on Gyroscopic Stabilisation.
3. Toothed gears : **:** Gear terminology, law of gearing , Theory of shape and action of tooth properties and methods of generation of standard tooth profiles, Standard proportions, Path of contact, Arc of contact, Contact ratio, Interference and Under – Cutting, Methods for eliminating Interference, Minimum number of teeth to avoid interference.

Module II (12 hours)

4. Cams : Types of cams, Types of followers, Types of follower motions - Simple Harmonic, Uniform Velocity and Constant Acceleration & Retardation Types, Analysis for Displacement, velocity and Acceleration of Follower, Generation of Cam Profiles by Graphical Method, Introduction on Cams with specified contours.
5. Governors : Centrifugal Governors - Watt, Porter, Proell and Spring Loaded Governor of Hartnell type, Controlling Force & Controlling Force Curve, Sensitiveness, Stability, Isochronism, Hunting, Governor Effort and Power, Effect of Friction & Coefficient of insensitiveness.
6. Dynamics of Machines : Dynamic Force Analysis of Four-Bar Mechanism and Slider Crank Mechanism. using D'Alemberts Principle, Flywheel and Determination of its size from Turning Moment Diagram & Maximum Fluctuation of Energy.

Module III (12 hours)

7. Balancing : Static and Dynamic Balancing, Balancing of Single Rotating Mass by Balancing Masses in Same plane and in Different planes. Balancing of Several Rotating Masses rotating in Same plane and in Different planes. Effect of Inertia Force due to Reciprocating Mass on Engine Frame, Partial balance of single cylinder engines. Primary and Secondary Balance of Multi-cylinder In-line Engines. Direct and Reverse Crank method of balancing for radial engines.
8. Vibrations: Introduction to Mechanical Vibration – Longitudinal, Torsional & Transverse Systems, Concept on Degrees of Freedom. Free and Forced Vibration of Un-damped and Damped Single Degree Freedom Systems, Vibration isolation and transmissibility, Whirling of shafts and Evaluation of Critical Speeds of shafts..

Text Books

1. Theory of Machines by Thomas Bevan, CBS Publications
2. Theory of Machines by S.S.Rattan, Tata MacGraw Hill
3. Theory of Mechanisms and Machines by A.. Ghosh and A.. K.. Mallik, EWP

Reference

1. Kinematics & Dynamics of Machinery-Charles E. Wilson & J.Peter Saddler,Pearson Ed.
2. Theory of Machines and Mechanisms (India Edition) by John J. Uicker Jr., Gordon R. Pennock and Joseph E. Shigley, Oxford University Press
3. Kinematics and Dynamics of Machinery by R.L.Norton, Tata MacGraw Hill
4. Theory of Machines and Mechanisms by P.L.Ballaney, Khanna Publishers
5. Mechanism and Machine Theory by J.S.Rao and R.V.Dukipatti, New Age International
6. Theory of Mechanisms and Machines by C.S.Sharma and K.Purohit, PHI
6. Theory of Machines by R.S.Khurmi and J.K.Gupta, S.Chand Publication
7. Theory of Machines by Shah Jadwani, Dhanpat Rai
8. A Textbook of Theory of Machines by R. K. Bansal, Laxmi Publication
9. Theory of Machines by Abdulla Shariff, Dhanpat Rai Publishers
10. Theory of Machines by Sadhu Singh, Pearson Education.