

PAU5I103 MECHANISMS AND MACHINES

Module – I (8 hours)

- 1. Mechanisms with lower pairs :** Motor Vehicle Steering Gears - Davis Steering Gear & Ackermann Steering Gear, Hooke's Joint.
- 2. Cams Design:** Fundamental law of Cam, Cam Terminology, Classification of Cams and followers, Analysis of follower motions (Displacement, velocity, Acceleration and jerk) – Simple Harmonic, Uniform Velocity and Constant Acceleration & Retardation Types, Generation of Cam Profiles by Graphical Method, Introduction on Cams with specified contours.

Module – II (8 hours)

- 3. Turning Moment Diagram and Flywheel:** Turning moment diagram. Turning moment diagrams for different types of engines, Fluctuation of energy and fluctuation of speed. Dynamic Theory of Flywheel, Flywheel of an internal combustion engine and for a punch machine. Determination of flywheel size from Turning Moment Diagram.
- 4. Gears :** Theory of shape and action of tooth properties and methods of generation of standard tooth profiles, Standard proportions, Force analysis, Path of contact, Arc of contact, Contact ratio, Interference and Undercutting, Methods for eliminating Interference, Minimum number of teeth to avoid interference.

Module III (8 hours)

- 5. Mechanism for Control (Governors):** Governors - Watt, Porter, Proell, Hartnell, Wilson-Hartnell Governor. Performance parameters: Sensitiveness, Stability, Hunting, Isochronism. Governor-Effort and Power, Controlling Force & Controlling Force Curve, Friction & insensitiveness, Comparison between governor and flywheel.
- 6. Mechanism for Control (Gyroscope):** Introduction to Gyroscopes. Gyroscopic forces and Couple. Effect of Gyroscopic Couple on Aeroplanes, Gyroscopic stabilization of ship, Stability of Two Wheelers and Four Wheelers. Rigid disc at an angle fixed to rotating shaft.

Module IV (8 hours)

- 7. Balancing of rotating components and linkages:** 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. Balancing of locomotive: variation of tractive force, swaying couple, hammer blow. Direct and Reverse Crank method of balancing for radial engines. Balancing of V-engine. Balancing machines: Pivoted-Cradle Balancing Machine.
- 8. Vibrations:** Introduction to Mechanical Vibration – Definitions, elements of vibratory system, Longitudinal, Torsional & Transverse Systems. Differential equations and solutions of motion for a coupled spring mass system. Determination of natural frequency of vibratory systems using energy method, equilibrium method and Rayleigh's method, Free and Forced Vibration of Un-damped and Damped Single Degree Freedom Systems, Logarithmic

decrement, Magnification factor, Vibration isolation and transmissibility, whirling of shafts and Evaluation of Critical Speeds of shafts.

Text Books

1. Theory of Machines by S.S.Rattan, Tata MacGraw Hill
2. Mechanism and Machine Theory by J.S.Rao and R.V.Dukipatti, New Age International.
3. Theory of Mechanisms and Machines by A. Ghosh & A. K. Mallick, East West Press.

Reference Books

1. Theory of Machines by Thomas Bevan, CBS Publications.
2. Kinematics and Dynamics of Machinery by R.L.Norton, Tata MacGraw Hill
3. Theory of Machines and Mechanisms (India Edition) by John J. Uicker Jr., Gordon R. Pennock and Joseph E. Shigley, Oxford University Press
4. Kinematics & Dynamics of Machinery-Charles E. Wilson & J.Peter Saddler, Pearson Ed.
5. Theory of Mechanisms and Machines by C.S.Sharma and K.Purohit, PHI
6. Theory of Machines by Shah Jadwani, Dhanpat Rai
7. Theory of Machines by Abdulla Shariff, Dhanpat Rai
8. Theory of Machines by Sadhu Singh, Pearson Education.