GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. SEMESTER : IV

MANUFACTURING ENGINEERING

Subject Name: **MACHINES AND MECHANISMS**

Sr. No.	Course Contents
1.	**Mechanisms** Introduction – Links – Pairs – Chain – Mechanism – Machine structure – Degrees of freedom – Four bar chains – Terminology and definition – Planer, Spherical and Spatial Mechanisms – Grashoff's law – Kutzback criterion – Grubler's criterion for plane mechanism. Inversion of mechanisms – Four bar, single slider crank and double slider crank mechanisms – Simple problems – Instantaneous centre – Kennedy's theorem. Velocity and Acceleration of Four bar and single slider crank mechanisms by relative velocity Method.
2.	**Advanced Mechanisms** Pantograph – Steering gear mechanism – Davis Steering gear – Ackerman steering gear – Hooke's joint – Double Hooke's joint. **Other Mechanisms:** Geneva Mechanism, Ratchet & Pawl Mechanism.
3.	**Cams:** Types of cams and followers – Follower motion – Uniform, SHM and cycloidal. Cam terminology – Cam profiles construction for roller, flat faced and knife edge follower types – pressure angle.
4.	**Friction:** Applications – Screw friction – Effort calculations – Efficiency – Self locking and overhauling of screws. Friction clutches – disc, cone clutches – Working principle – Torque, Power transmitted derivations and calculations. **Gears and Gear Trains** Spur gear terminology and definition – Law of Gearing – Min. number of teeth Gear trains: simple, compound, reverted and epicyclic – Velocity ratio and torque calculation in gear trains – Automobile differential. **Gyroscopes:** Gyroscopic forces and couple – Forces on bearing due to gyroscopic action – Gyroscopic effect in ship, motor cycle, car and aircraft.
5.	**Turning moment diagrams:** Fly wheels – Application of flywheel in different Planes – Punching presses. **Static and dynamic Balancing**: Balancing of rotating masses, Balancing of Reciprocating masses – Balancing of single cylinder engine – Balancing of multi cylinder engine – Balancing machines. **Force Analysis** Applied and Constrained Forces – Free body diagrams – static Equilibrium conditions – Two, Three and four members – Static Force analysis in simple machine members – Dynamic Force Analysis – Inertia Forces and Inertia Torque – D'Alembert's principle – superposition principle – dynamic Force Analysis in simple machine members.

Text Books:

1. Ratan, S.S., *Theory of Machines*, Tata McGraw Hill Publishing company Ltd., 2nd Edition , 2005
2. Thomas Bevan, *Theory of Machines*, CBS Publishers and Distributors, 3rd Edition, 1984.
3. Ambekar A.G., "Mechanism and Machine Theory" Prentice Hall of India, New Delhi, 2007
4. Shigley J.E., Pennock G.R and Uicker J.J., "Theory of Machines and Mechanisms", Oxford University Press, 2003

Reference Books:

1. Shigley, J. E., and Uicker, J. J., *Theory of Machines and Mechanisms,* McGraw Hill, 1995.
2. Ghosh, A., and Mallick, A. K., *Theory of Mechanisms and Machines*, Affiliated East-West Pvt Ltd., New Delhi, 1988.
3. Rao, J. S., and Dukkipati, R.V., *Mechanism and Machine Theory*, Wiley–Eastern Ltd., New Delhi, 1995.
4. Robert L.Norton, Design of Machinery, McGraw-Hill, 2004.
5. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 1984
6. John Hannah and Stephens R.C., "Mechanics of Machines", Viva Low Prices Student Edition, 1999
7. V.Ramamurthi, Mechanisms of Machine, Narosa Publishing House, 2002.

Standards:

1. IS 2458:2001, Vocabulary of Gear Terms – Definitions related to Geometry.
2. IS 3756 : 2002, Method of Gear Correction – Addendum modification for External cylindrical gears with parallel axes.
3. IS 5267 : 2002 Vocabulary of Gear Terms – Definitions Related to Worm Gear Geometry.
4. IS 12328 : Part 1 : 1988 Bevel Gear Systems Part -1 Straight Bevel Gears.
5. IS12328 : 1988 Bevel Systems Part – 2 Spiral Bevel Gears.