2PT06: KINEMATICS OF MACHINES
CREDITS - 3 (LTP: 3, 0, 0)

Course Objective:

To analyze mechanisms and machines for desired motions.

Teaching and Assessment Scheme:

Teaching Scheme (Hours per Week)			Credits	Assessment Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	CE	ESE	CE	
3	0	0	3	60	40	00	00	100

Course Contents:

Unit No.	Topics	Teaching Hours
1	**Introduction of Mechanisms and Machines:** Concepts of Kinematics and Dynamics, Classification of mechanisms, Basic kinematic concepts and definitions, Degree of freedom, Mobility, Kutzbach criterion, Gruebler's criterion, Grashof's Law, Kinematic inversions of four-bar chain and slider-crank chains.	05
2	**Kinematics of Mechanisms:** Displacement, Velocity and Acceleration analysis of simple mechanisms, Graphical method – velocity and acceleration analysis of simple mechanisms, Coriolis component of acceleration.	07
3	**Belt, Rope and Chain Drives:** Introduction, belt and ropes drives, Selection of belt drive, Types of belt drives, Materials used for belts and ropes, Slip and creep of belt, Tensions for flat belt drive, Angle of contact, Centrifugal tension, Maximum tension of belt, Classification of chain drives, Types of chains.	08
4	**Gears and Gear Trains:** Gears: Law gearing, Characteristics of involute and cycloid action, Spur gear terminology and definitions, Interference and undercutting, Center distance variation, Minimum number of teeth, Contact ratio, Helical, Bevel, Worm, Rack and Pinion gears. Gear Trains: Simple, Compound, Reverted and Epicyclic.	08
5	**Cams and Followers:** Classification of cams and followers, Nomenclature, Displacement diagrams of follower motion, Different cam profiles. Introduction to cams with specified contours: tangent and circular arc cams.	07

Unit No.	Topics	Teaching Hours
6	**Friction in Machine Elements:** Classification of clutches, Torque transmission capacity, Considerations for uniform wear and uniform pressure theory, Analysis of clutches: single plate, multi-plate, cone and centrifugal clutches. Classification of brakes, Braking effect, Analysis of mechanical brakes: Block brake, Band brake, Band and block brake, Internal expanding shoe brake.	07
	Total	**42**

List of References:

1. Ratan S. S., "*Theory of Machines*", McGraw-Hill publishing Co.
2. Singh V. P., "*Theory of Machines*", Dhanpat Rai & Co. (P) Ltd.
3. Singh Sadhu, "*Theory of Machines*", Pearson Education, Inc.
4. Ambekar A. G., "*Mechanism and Machine Theory*", Prentice-Hall of India Pvt. Ltd.
5. Jagdishlal, "*Theory of Machines*", Metropolitan Book.
6. Norton R. L., "*Kinematics and Dynamics of Machinery*", Tata McGraw-Hill Publishing Co. Ltd.

Course Outcomes (COs):

At the end of this course students will be able to …

1. Identify different types of motions and determine degrees of freedom.
2. Analyze the position, velocity, and acceleration of mechanisms
3. Analyze belts, ropes and chain drives.
4. Evaluate kinematics of gears and gear trains.
5. Analyze cam-follower mechanisms.
6. Analyze friction devices such as different types of clutches and brakes.