SEMESTER - I

17MD001ADVANCED MECHANISIMS

COURSE CODE	COURSE TITLE	L	T	P	C
17MD001	ADVANCEDMECHANISIM				

Course Description and Objectives:

The study of Kinematics of mechanisms and the machines, which are composed of one or more mechanisms, involves analysis of geometry of motion. Different components of any mechanism move relative to the each other following certain constraints to produce the desired motion. Kinematic analysis is of prime importance in design of mechanisms and machines.

For kinematic design of a mechanism analysis is done for positions of points on a solid body and the time derivatives of the position. The first derivative of position with respect to time is velocity, the second derivative is acceleration and further derivatives can be analyzed according to the design requirements. Similarly for angular position there is angular velocity and angular acceleration.

Course Outcomes:

Upon successful completion of this course student should be able to:

- Understand common mechanisms that are used in machines in everyday life.
- Understand MobilityCriterionforPlanarmechanismsandmanipulators
- Understand various function generation methods like Rotocenter method, Overlaymethod, Velocity polemethod
- Understand Synthesis ofFour-barMechanisms forprescribedextremevaluesoftheangular velocity ofdrivenlink.
- Understand Analytical andgraphicaldetermination ofBobillier'sConstruction

SKILLS ACQUIRED:

Compute degrees of freedom in different types of mechanisms
Determine velocity and acceleration at different points on links in a mechanism.
Determine the D-H parameters which are indispensible in design of Industrial robots like PUMA
Compute Jacobian matrix for plan srial manipulator

UNIT - 1

Cams: Definitions, Types of cams and followers, types of follower motion, generation of cam profiles for uniform velocity, uniform acceleration and simple harmonic motion. Maximum velocity and maximum acceleration, analysis of roller follower and circular cam with straight flanks.

UNIT - 2

Gears: Friction wheels and toothed gears- types-law of gearing, condition of constant velocity ratio for transmission of motion- cycloidal and involute teeth profiles, velocity of sliding-interference - condition for minimum number of teeth to avoid interference- expressions for arc of contact and path of contact.

UNIT – 3

Laws of kinematic friction , friction of a body lying on a rough inclined plane, efficiency of inclined plane , screw friction , screw jack , torque required to lift and lower the load by screw jack , efficiency of screw jack, over hauling and self-locking screws , efficiency of self-locking screws.

UNIT-4

Introduction to control system , types of control system , block diagrams , lag in response , transfer function, overall transfer function , transfer function with viscous damped output , open and closed transfer function

Unit-5

Manipulator kinematics: D-H notation, D-H convention of assignment of co-ordinate frames and link parameters table; D-H transformation matrix ; Direct and Inverse kinematic analysis of Serial manipulators: Formulation of Jacobian series for planar serial manipulator

Activities:

1. Guiding abodythrough threedistinctpositionsand four distinct positions.
2. Construction of Bobiller curve graphically
3. Construction of Hartmann'sConstruction graphically

TEXTBOOKS:

1. JeremyHirschhorn, "Kinematics andDynamics ofPlaneMechanisms", 3rd Edition, McGraw- Hill,1962.
2. L. Sciavicco and B. Siciliano, "Modelling and control of Robot manipulators", 2nd Edition, Springer–Verlag,London,2000.

3. Amitabh Ghosh and Ashok Kumar Mallik, "Theory of Mechanisms and Machines", E.W.P.Publishers.

REFERENCEBOOKS:

1. AllenS.HallJr.,"KinematicsandLinkageDesign",4th Edition,PHI,1964.

2. J.E.ShigleyandJ.J.UickerJr.,"TheoryofMachinesandMechanisms",McGraw-Hill,1995.

3. MohsenShahinpoor, "ARobotEngineering TextBook",5th Edition,Harper&RowPublishers, NewYork,1992.

4. JosephDuffy,"Analysisofmechanisms andRobotManipulators", 4th Edition,EdwardArnold,1990.