ADVANCED MECHANISM DESIGN
(Elective - I)

Subject Code: 13ME2109 **L P C**
4 0 3

Course Outcomes :

At the end of the course, the student will be able to

CO1: Compute mobility and motion parameters

CO2: Apply Hall and Ault's method, Goodman's indirect method and Chase solution, explain instant center of acceleration; apply Euler-Savory equation and Bobillier construction

CO3: Design two- , and three- position synthesis; apply Chebychev spacing; describe cognate linkages

CO4: Analyze forces on static and dynamic mechanisms

CO5: Analyze RSSR mechanism; apply D–H notation; contrast forward and inverse kinematics

UNIT– I

Introduction – review of fundamentals of kinematics - analysis and synthesis – terminology, definitions and assumptions – planar, spherical and spatial mechanisms' mobility – classification of mechanisms – kinematic Inversion – Grashoff`s law

Position and displacement – complex algebra solutions of planar vector equations – coupler curve generation velocity – analytical methods - vector method – complex algebra methods – Freudenstein's theorem

UNIT– II

Planar complex mechanisms - kinematic analysis - low degree complexity and high degree complexity, Hall and Ault`s auxiliary point method – Goodman's indirect method for low degree of complexity mechanisms

Acceleration – analytical methods – Chase solution - Instant centre of acceleration. Euler-Savory equation - Bobillier construction

UNIT – III

Synthesis of mechanisms: Type, number and dimensional synthesis – function generation – two position synthesis of slider crank and crank-rocker mechanisms with optimum transmission angle – three position synthesis – structural error – Chebychev spacing - Cognate linkages – Robert-Chebychev theorem – Block's method of synthesis, Freudenstein's equation

UNIT – IV

Static force analysis of planar mechanism – static force analysis of planar mechanism with friction – method of virtual work

Dynamic force analysis of planar mechanisms - Combined static and inertia force analysis

UNIT – V

Kinematic analysis of spatial revolute-Spherical-Spherical-Revolute mechanism – Denavit-Hartenberg parameters – forward and inverse kinematics of robotic manipulators

TEXT BOOK:

1. Amitabh Ghosh and Ashok Kumar Mallik, "*Theory of Mechanisms and Machines*,",3e,EWP, 1999

REFERENCES:

1. Shighley Joseph Edwards and Uicker John Joseph, "*Theory of Machines and Mechanism*", 2e, McGraw Hill,1985.

2. Arthur G. Erdman and G.N. Sandor, "*Advanced Mechanism Design: Analysis and Synthesis*", Vol. I, PHI, 1984.

3. Arthur G. Erdman and G.N. Sandor, "*Advanced Mechanism Design: Analysis and Synthesis*", Vol. II, PHI, 1984.