

III Year I Semester

L T P C

Code: 20ME5643

3 1 0 4

ADVANCED MECHANISMS

Course Objectives:

The Students will acquire the knowledge

1. To interpret the advanced mechanisms from the basic concepts for kinematic pairs, joints and mechanisms
2. To illustrate advanced mechanisms for plane motion.
3. To illustrate synthesis graphical methods.
4. To illustrate synthesis graphical methods in detail.
5. To illustrate synthesis analytical methods in detail.

UNIT – I ADVANCED KINEMATICS OF PLANE MOTION- I:

Introduction to plane motion. The Inflection circle, Euler – Savary Equation, Analytical and graphical determination of di, Bobillier's Construction, Collineation axis, Hartmann's Construction, Inflection circle for the relative motion of two moving planes, Application of the Inflection circle to kinematic analysis.

UNIT – II ADVANCED KINEMATICS OF PLANE MOTION – II:

Polode curvature, Hall's Equation, Polode curvature in the four bar mechanism, coupler motion, relative motion of the output and input links, Determination of the output angular acceleration and its Rate of change, Freudenstein's collineation –axis theorem, Carter –Hall circle, The circling – point curve for the Coupler of a four bar mechanism.

UNIT – III INTRODUCTION TO SYNTHESIS-GRAPHICAL METHODS – I:

The Four bar linkage, Guiding a body through Two distinct positions, Guiding a body through Three distinct positions, The Roto center triangle, Guiding a body through Four distinct positions, Burmester's curve.

UNIT – IV INTRODUCTION TO SYNTHESIS-GRAPHICAL METHODS – II:

Function generation- General discussion, Function generation: Relative – Roto center method, Overlay's method, Function generation- Velocity – pole method, Path generation: Hrones's and Nelson's motion Atlas, Roberts's theorem.

UNIT – V INTRODUCTION TO SYNTHESIS – ANALYTICAL METHODS:

Function Generation: Freudenstien's equation, Precision point approximation, Precision – derivative approximation, Path Generation: Synthesis of Four-bar Mechanisms for specified instantaneous condition, Method of components, Synthesis of Four-bar Mechanisms for prescribed extreme values of the angular velocity of driven link, Method of components.

References:

1. Kinematics and Dynamics of plane mechanisms/ Jeremy Hirschhorn/McGraw-Hill, 1962.
2. Theory of Machines and Mechanisms/ J. E Shigley and J.J. Uicker Jr./ McGraw-Hill, 1995
3. Theory of Mechanisms and Machines/ Amitabh Ghosh and Ashok Kumar Mallik/ E.W.P. Publishers.
4. Kinematics and Linkage Design/ Allen S. Hall Jr./PHI, 1964.

5. Kinematics and Dynamics of Machinery/Charles E Wilson/Pearson/3rd Edition

Course outcomes:

Upon successful completion of this course, the students will be able to:

1. To illustrate the advanced mechanisms from the basic concepts for kinematic pairs, joints and mechanisms
2. To demonstrate advanced mechanisms for plane motion.
3. To explain synthesis graphical methods.
4. To illustrate synthesis graphical methods in detail.
5. To illustrate synthesis analytical methods in detail.