

I Year M.Tech. CAD/CAM/CAE Semester - II	L	T	P	Tot.	C
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(ME501) ADVANCED MECHANISMS
(Elective-II)

Objective of the Course:

The Design of a new machine for the performance of an operation, associated with industrial needs.

UNIT-I

Introduction: Elements of Mechanisms; Mobility Criterion for Planar mechanisms and manipulators; Mobility Criterion for spatial mechanisms and manipulators. Spherical mechanisms - spherical trigonometry.

UNIT-II

Advanced Kinematics of plane motion- I: The Inflection circle; Euler–Savary Equation; Analytical and graphical determination of di; Bobillier’s Construction; Collineation axis; Hartmann’s Construction; Polode curvature; Hall’s Equation; Polode curvature in the four bar mechanism; coupler motion; relative motion of the output and input links; Freudenstein’s collineation – axist heorem; Carter – Hall circle;

UNIT-III

Introduction to Synthesis-Graphical Methods: The Four bar linkage; Guiding a body through Three distinct positions; The Roto-center triangle ; Guiding a body through Four distinct positions; Burmester’s curve;

Function generation : Relative Rotocenter method, Overlay method, Velocity pole method. Path generation. Hornes’s and Nelson’s motion Atlas, Roberts’s theorem.

UNIT-IV

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.

UNIT-V

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.

TEXTBOOKS:

1. Jeremy Hirschhorn, "Kinematics and Dynamics of Plane Mechanisms", 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. Allen S. Hall Jr., "Kinematics and Linkage Design", 4th Edition, PHI, 1964.
2. J.E. Shigley and J.J. Uicker Jr., "Theory of Machines and Mechanisms", McGraw-Hill, 1995.
3. Mohsen Shahinpoor, "A Robot Engineering Text Book", 5th Edition, Harper & Row Publishers, New York, 1992.
4. Joseph Duffy, "Analysis of mechanisms and Robot Manipulators", 4th Edition, Edward Arnold, 1990.