

2012-13

**PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY
(COURSE STRUCTURE FOR AUTONOMOUS SCHEME)**

I Year M. Tech. (Machine Design) M.E.

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MEMD1T1 - ADVANCED MECHANISMS

UNIT - I

Introduction: Elements of Mechanisms; Mobility Criterion for Planar mechanisms and manipulators; Mobility Criterion for spatial mechanisms and manipulators. Spherical mechanisms. Determination of instantaneous center for complex mechanisms

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 ; Inflection circle for the relative motion of two moving planes; Application of the Inflection circle to kinematic analysis.

UNIT - III

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 – IV

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 Rotocenter triangle ; Guiding a body through Four distinct positions; Burmester's curve.

UNIT - V

Introduction to Synthesis-Graphical Methods - II: Function generation- General discussion; Function generation: Relative – rotocenter method, Overlay's method, Function generation- Velocity – pole method; Path generation: Hrones's and Nelson's motion Atlas, Roberts's theorem.

UNIT – VI

Introduction to Synthesis - Analytical Methods: Function Generation: Freudenstein'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-VII

DYNAMICS OF MECHANISMS

Static force analysis with friction - Inertia force analysis - combined static and inertia force analysis. shaking force, Kinetostatic analysis. Introduction to force and moment balancing of linkages.

UNIT – VIII

Manipulator kinematics – I: 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: Articulated ,spherical & industrial robot manipulators- PUMA, SCARA, STANFORD ARM, MICROBOT

Text Books:

1. Jeremy Hirschhorn, Kinematics and Dynamics of plane mechanisms, McGraw-Hill, 1962.
2. L. Sciavicco and B. Siciliano, Modelling and control of Robot manipulators, Second edition , Springer -Verlag, London, 2000.
3. Amitabh Ghosh and Ashok Kumar Mallik, Theory of Mechanisms and Machines. E.W.P. Publishers.

Reference Books:

1. Allen S. Hall Jr., Kinematics and Linkage Design, 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, Harper & Row Publishers, New York, 1987.
4. Joseph Duffy, Analysis of mechanisms and Robot manipulators, Edward Arnold