IV Year I Semester	L	T	P	C
17ME733	3	1	0	3

ADVANCED MECHANISMS
(Professional Elective-III)

UNIT I:

Introduction: Introduction to kinematics and mechanisms, Kinematics diagram, Degrees of freedom, Formation of one D.O.F, multi loop kinematic chains, Mechanism design philosophy, design categories and mechanism parameters, Network formula, Gross motion concepts.

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 theoutput 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 - 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-VI

Kinematics of Spatial Mechanisms and Robotics: Introduction, topology arrangements of robotics arms, Kinematic analysis of spatial RSSR mechanism, Denavit - Hartenberg parameters, Forward and inverse kinematics of robotic manipulators. Study and use of Mechanism using Simulation Soft-ware packages.

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.

References Books:

1. Theory of Machines and Mechanisms, J. J.Uicker, G. R. Pennock and J.E.Shigley, Oxford University Press.
2. Kinematics and Dynamics of Machines, R. L. Nortron , McGraw Hill.
3. Advanced Mechanism Design, Vol. 2, N. G. Sandor and G. A. Erdman, Prentice Hall.
4. Advanced Mechanism Design, Vol. 1, N.G. Sandor, G.A. Erdman, and S. Kota, Prentice Hall.
5. Theory of Mechanism and Machines, A Ghosh and A K Mallik, EWLP, Delhi.
6. Kinematics and Dynamics of Machinery, C E Wilson, Pearson.
7. Kinematics, Dynamics and Design of Machinery, K. J. Waldron, & G.L. Kinzel, John Wiley.
8. Kinematic Analysis and Synthesis of Mechanisms, A. K. Mallik, A Ghosh, G. Dittrich, CRC.

Course Outcome:

After learning the course the students should be able to:

1. Gain a theoretical background in kinematics and in the analysis and synthesis of mechanisms.
2. Become familiar with basic and advanced tools for the analysis and design of linkages.
3. Apply theory and the use of engineering tools in a substantial mechanism design project.