

ME-402
Mechanisms
Contact: 3L
Credit: 3

Module 1.A

Introduction to mechanisms, Difference between Machine and Mechanism; Classification of Pairs of Elements, Kinematic chain, types of joints in a chain; Four-bar linkage: motions of links, Grashof's criterion of movability. [2L]

Module 1.B

Degrees of freedom for plane Mechanisms, Gruebler's criterion for plane mechanism, Kinematic inversions –four Inversions of a Slider-Crank Chain. [3L]

Module 2

Velocity analysis in Mechanisms: Relative velocity method –slider crank mechanism, four bar mechanism, Crank and slotted lever mechanism; Instantaneous centre method –ennedy's theorem; Acceleration analysis: Acceleration Images, Klein's construction, analytical expression of velocity & acceleration. [7L]

Module 3

Belt-drive –introduction; Law of belting, Length of flat belt for open and cross belt connections; Stepped pulley for open flat belt; Tension in flat belt and V-belts; Power transmitted in belt drive [4L]

Module 4

Gear terminology, Laws of gearing, types of gears –Spur, Bevel, Helical, Worm; tooth profile, interference; Gear trains –simple, compound, epicyclic gear train; Speed-torque analysis of gear trains. [6L]

Module 5

Classification of Cams and followers; Radial Cam, Analysis of knife-edge, roller and flat face follower motion –constant velocity, simple harmonic, constant acceleration & deceleration; Offset follower. [6L]

Module 6A

Kinematic Synthesis: Introduction to problems of function generation, path generation and rigid body guidance; Type, Number and Dimensional Synthesis; Two and three position synthesis of four bar mechanism and slider –rank mechanism : Graphical – pole, Relative pole and Inversion method; Analytical solution - Freudenstein's Method. [5L]

Module 6B

Study of lower pair Mechanisms- Pantograph, Parallel linkage mechanisms, Straight line mechanism, Automobile steering mechanism, Hooks joint. [3L]

Books Recommended :

1. Elements of Mechanism –Daughy and James, McGraw Hill
2. Theory of Machines –S S Rattan, Tata McGraw Hill
3. Theory of Mechanisms & Machines –A.Ghosh & A.K.Mallik, AEWP
4. Design of Machinery –R.L.Norton, Tata McGraw Hill
5. Mechanism & Machine Theory –Rao, R.V. Duggipati, Wiley
6. Theory of Machines, V.P.Singh, Dhanpat Rai & Co