

## **MEPC2004 KINEMATICS & DYNAMICS OF MACHINES (3-0-0)**

### **Module I (6hrs)**

Kinematic Fundamental: Mechanisms: Basic kinematic concepts & definitions, mechanisms, link, kinematic pair, degrees of freedom, Kinematic chain, degrees of freedom for plane mechanism, Gruebler's equation, Inversion of mechanism, Four bar chain & their inversions, Single slider crank chain, Double slider crank chain & their inversion.

Kinematic Analysis: Graphical analysis of position, Velocity and acceleration of four bar and Slider crank mechanisms. Instantaneous centre method, Aronhold-Kennedy Theorem, Rubbing velocity at a Pin-joint. Coriolis component of acceleration.

### **Module II (6 hrs)**

Gear and Gear Trains: Gear terminology, Types of Gear, Tooth properties and methods of generation of standard tooth profiles, Force analysis. Types of gear trains: Simple, Compound, Reverted and Epicyclic gear trains, Train value, Methods of finding train value/velocity ratio: Tabular method and analytical method for Epicyclic gear trains.

### **Module III (6hrs)**

Turning Moment Diagram and Flywheel: Turning moment diagram, Turning moment diagrams for different types of engines, Fluctuation of energy and fluctuation of speed, Theory of Flywheel.

Mechanism for Control (Governors): Governors-Watt, Porter, Proell, Hartnell. Performance parameters: Sensitiveness, Stability, Hunting, Isochronism. Governor Effort and Power.

### **Module IV (6hrs)**

Friction Effects: Screwjack, Friction between pivot and collars, Single, Multi-plate and cone clutches, anti-friction bearing.

Flexible Mechanical Elements: Belt, Rope and chain drives, Initial tension, Effect of centrifugal tension on power transmission, Maximum power transmission capacity, Belt creep and slip.

Brakes: Classification of brakes, Types of brakes, Analysis of different brakes, Braking of a vehicle.

### **Module V (6hrs)**

Balancing of rotating components and linkages: Static and Dynamic Balancing, Balancing of Single Rotating Mass by Balancing Masses in Same plane and in Different planes. Balancing of Several Rotating Masses rotating in same plane and in Different planes.

### **TEXT BOOKS:**

1. Theory of Machines by S.S.Rattan, Tata MacGraw Hill
2. Theory of Machines by Thomas Bevan, CBS Publications
3. Kinematics and Dynamics of Machinery by Charles E. Wilson and J.Peter Sessler, Pearson Education.

### **REFERENCE BOOKS:**

1. Theory of Machines and Mechanisms: By Joseph Edward Shigley
2. Mechanism & Machine Theory by J. S. Rao and R. V. Dukipatti, New Age International.
3. Theory of Mechanisms and Machines by A. Ghosh & A. K. Mallick, East West Press.
4. Kinematics and Dynamics of Machines by G.H. Martin, Mc Graw-Hill.
5. Theory of Machines and Mechanisms by P.L. Ballaney, Khanna Publishers .