

## **ME650207-Theory of Machines (Common to MECH & MAE)**

### **COURSE OBJECTIVES:**

- To understand the concept of machines, mechanisms and related terminologies, to analyze a mechanism for displacement, velocity and acceleration at any point in a moving link.
- To acquire the knowledge in force analysis, energy stored in flywheel, balancing of machines, vibration and control mechanisms.

### **UNIT 1: MECHANISMS AND VELOCITY & ACCELERATION ANALYSIS**

**6**

Definitions – Link, Kinematic pair, Kinematic chain, Mechanism, and Machine. Analysis of simple mechanisms (Single slider crank mechanism and four bar mechanism) - Graphical Methods for displacement, velocity and acceleration: Shaping machine mechanism - Instantaneous Centre & Kennedy's theorem (Problems).

### **UNIT 2: UNIT II KINEMATICS OF CAMS**

**6**

Classifications - Cam Nomenclature –Types of follower-Displacement diagrams - Parabolic, Simple harmonic and cycloidal motions – Graphical construction of displacement diagrams and layout of plate Cam profiles - Circular arc with Flat faced follower.

### **UNIT 3: FLYWHEELS AND BALANCING OF MASSES**

**6**

Static force analysis of mechanisms –Turning moment diagrams –Fluctuation of energy, speed - Flywheels of engines and punching press. Static and dynamic balancing –Balancing of rotating masses - Balancing of reciprocating masses in a single cylinder engine –Primary and secondary unbalanced forces.

### **UNIT 4: FREE AND FORCED VIBRATIONS**

**6**

Free vibration - Equations of motion - Natural frequency - Whirling of shafts and critical speed - Torsional vibration of two and three rotor systems, torsionally equivalent shaft.

### **UNIT 5: MECHANISMS FOR CONTROL**

**6**

Governors - Types - Centrifugal governors –Porter &Proell governor, Hartnell & Hartung governor –Characteristics - Effect of friction - Controlling Force Gyroscopes - Gyroscopic couple - Gyroscopic stabilization

**TOTAL: 45 PERIODS**

### **LIST OF EXPERIMENTS**

**15**

Study of Ackerman's Steering Gear Mechanism.

To study various types of gears.

To study various types of gear trains.

To draw velocity diagram of slider crank mechanism.

To draw acceleration diagram of four bar mechanism.

To draw displacement diagram, velocity diagram & acceleration diagram of cam follower.