

**III B.TECH- I SEMESTER
DYNAMICS OF MACHINERY**

Course Code:ME5T1

Lecture: 4 periods/week

Tutorial: 1 period/week

Credits: 3

Internal assessment: 30 marks

Semester end examination: 70 marks

COURSE OBJECTIVES:

1. Develop understanding of dynamic analysis like gyroscopic forces and moments, friction of fixed axis rotation of rigid bodies.
2. Determine the dynamic behavior principles and operations of clutches, breaks, flywheels and governors.
3. Relate static and dynamic balancing analysis as applied to machines.

COURSE OUTCOMES:

At the end of course the students will be able to:

1. Apply friction principles to clutches & brakes
2. Determine the gyroscopic effects on rotating elements and compute inertia forces in reciprocating parts.
3. Describe the operation and analysis of flywheel and governors.
4. Calculate static and dynamic balancing for rotating and reciprocating machinery.
5. Analyze the natural frequencies & vibration analysis for single degree of freedom systems

Pre-Requisites:

Kinematics of Machinery

UNIT I

FRICITION CLUTCHES

Introduction, uniform pressure, uniform wear theory, Pivot and Collar bearings. Single Disc or plate clutch, Multiple Disc Clutch, Cone Clutch, Centrifugal Clutch.

Brakes: Radial Brakes-Simple block brakes, band brakes, Band and Block Brakes, Internal expanding brake, braking of a Vehicle

UNIT II

GYROSCOPE

Introduction to Precession, Gyroscopic Couple and its effect on an aero planes and Naval Ships

DYNAMIC FORCE ANALYSIS:

Introduction, D-Alembert's Principle, Angular velocity and Angular acceleration of the Piston and Connecting rod, Forces on the Reciprocating parts of an Engine, Equivalent Dynamical system, Inertia force and Inertia Torque in a reciprocating Engine

UNIT III

TURNING MOMENT DIAGRAM: Introduction, Turning moment diagram for Multi cylinder Engine, Fluctuation of energy. Coefficient of fluctuation of Speed, Energy Stored in

a Flywheel, Flywheel in Punching Press

GOVERNORS

Introduction, Watt, Porter, Proell Governors, Hartnell, Hartung Governors, Sensitiveness of a Governor, Hunting, Isochronisms, Stability, Controlling Force Diagrams

UNIT IV

BALANCING OF ROTATING MASSES:

Introduction, Static balancing, Dynamic balancing, Balancing of single unbalanced rotating mass, Balancing of Several Masses in the same planes, Balancing of Several Masses in Different planes.

BALANCING OF RECIPROCATING MASSES

Introduction to Primary and Secondary balancing. Balancing of Multi cylinder in-line and radial engines

UNIT V

FREE VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS:

Introduction, Definitions, types of vibrations and causes of vibrations, Basic features of Vibrating system, Degree of freedom, D Alembert's Principle, Energy method, Un damped free longitudinal, transverse and torsional vibrations of single degree of freedom systems, equivalent stiffness

Learning Resources

Text Books:

1. Theory of Machines, (3rd Edition) by S.S.Rattan ,Tata Mc.Graw Hill, New Delhi, 2012

Reference Books:

- 1 Theory of Machines: Kinematics & Dynamics, by P.L. Ballaney, I.K.International Pvt. Ltd., New Delhi,2010
2. Theory of Machines, by B.V.R. Guptha, Khanna Publications, New Delhi,11th Edition,1980
3. Theory of Machines, (5th Edition) by R.K.Bansal, Laxmi Publications(p) ltd. New Delhi, ,2010