

Devi Ahilya University, Indore, India Institute of Engineering & Technology			III Year B.E. (Mechanical Engg.) (Full Time)				
Subject Code & Name	Instructions Hours per Week			Credits			
5MERC2 DYNAMICS OF MACHINE	L	T	P	L	T	P	Total
Duration of Theory Paper: 3 Hrs	3	1	2	3	1	1	5

Course Objective:

The course is designed

- To make students to understand the concept of development of forces in various machines/mechanisms.
- To develop the understanding of the effects and their consequences on mechanism / machines.
- To make them able to determine this forces and to develop the various methods to counter this forces.

Prerequisite(s): Theory of Machines, Strength of Materials, Applied Mathematics.

COURSE CONTENTS

UNIT-I

Friction in Screw threads: Screw Frictions and Screw jack.

Friction in Bearings: Pivot and Collar Bearings, Journal Bearings, Thrust Bearings, Ball and Roller Bearings.

Friction in Clutches: Single & Multi-plate Clutch, Cone clutch, Centrifugal Clutch.

Friction Drives: Belt, Rope and Chain Drives

UNIT-II

Brakes: Introduction, Classification and Types of Brakes, Shoe/Block Brake, Band Brake, Band and Block Brake, Internal Expanding Shoe Brake, Disc Brake.

Dynamometer: Introduction, Classification and Types of Dynamometers.

Propulsions and Breaking of Vehicles.

UNIT-III

Dynamic Force Analysis: Inertia Force and Inertia Torque, D. Alembert's Principle.

Dynamic Analysis in Reciprocating Engines: Gas Forces, Equivalent masses, Piston Efforts, Crank shaft Torque, Turning moment diagrams, Fly wheels, fluctuation of energy and speed.

UNIT-IV

Governors: - Introduction, Types and Classifications, Centrifugal Governors, Gravity Controlled and Spring Controlled Governors, Inertia Governors, Governor Characteristics and Effect of friction.

UNIT-V

Balancing of Rotating Masses: Static and Dynamic Balancing, Balancing a Single Cylinder Engine, Balancing Multi-Cylinder Engines

Balancing of Reciprocating Masses: Primary and Secondary Balancing, Locomotive Balancing, Hammer Blow, Pitching and Swaying Couples, Conditions of Balance in V-Engine, Radial Engine and Multi-Cylinder in line Engines.

Course Outcome:

Students earned credits will develop ability to

CO1 Determine the Forces and Torques due to Friction in Bearings, Clutches and Belt Drives.

CO2 Determine the Forces and Torques due to Friction in Brakes and Vehicle Propulsion.

CO3 Determine the Forces and Torques in Reciprocating Engines.

CO4 Determine the Forces and Torques in Governor Mechanisms.

CO5 Determine the unbalancing Forces / Torques in Engines and Machines and to balance this Forces/Torques.

BOOKS RECOMMENDED:

- [1]. Rattan S.S., *Theory of Machines*, Tata McGraw Hill Publishing Company Ltd., New Delhi, Second Reprint 2005.

- [2]. Shigley J.E. and Uicker J.J., *Theory of Machines and Mechanisms*, McGraw Hill, Inc., 1995.
- [3]. Thomas Bevan, *Theory of Machines*, CBS Publishers and Distributors, 1984.
- [4]. Ghosh A. and Mallick A.K., *Theory of Mechanisms and Machines*, Affiliated East-West Press Pvt.Ltd., New Delhi, 1988.
- [5]. Rao J.S. and Dukkipati R.V., *Mechanism and Machine Theory*, Wiley-Eastern Limited, New Delhi, 1992.
- [6]. John Hannah and Stephens R.C., *Mechanics of Machines*, Viva low-Priced Student Edition, 1999.

LIST OF PRACTICAL ASSIGNMENTS

- 1. To determine the coefficient of friction between the surfaces of different materials by inclined plane method.
- 2. To determine coefficient of friction between leather belt and CI pulley by Simple & differential band brake method.
- 3. To determination the coefficient of friction between leather belt and wooden pulley by belt and pulley apparatus.
- 4. To determine the pressure distribution in the oil film of the journal bearing for various speeds and plot the curves, determine total load and traccional torque.
- 5. To determine the moment of inertia of objects using trifilar suspension method.
- 6. To determine the moment of inertia of connecting rod by compound pendulum method.
- 7. To determine characteristic curves of
 - a) Speed v/s sleeve displacement.
 - b) Controlling force v/s radius of rotation of the ball center, for Watt, Porter, Proell and Hartnell type governors.
- 8. To Perform balancing
 - a) Static balancing of given weights by balancing apparatus.
 - b) Dynamic balancing of given weights by balancing apparatus.
- 9. To determine the Brake Power using Rope Brake Dynamometer.
- 10. To determine the Slip and Creep in belt drive and to plot the various curves.

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2. To develop the understanding of the effects and their consequences on mechanism / machines.
3. To make them able to determine this forces and to develop the various methods to counter this forces

Course Outcome:

Students earned credits will develop ability to

CO.No.	CO	PO
CO1	Determine the Forces and Torques due to Friction in Bearings, Clutches and Belt Drives.	PO1,PO2,PO3,PO4
CO2	Determine the Forces and Torques due to Friction in Brakes and Vehicle Propulsion.	PO1,PO2,PO3,PO5
CO3	Determine the Forces and Torques in Reciprocating Engines.	PO1,PO4,PO5
CO4	Determine the Forces and Torques in Governor Mechanisms.	PO1,PO4,PO5
CO5	Determine the unbalancing Forces / Torques in Engines and Machines and to balance this Forces/Torques.	PO1,PO2,PO3,PO12

CO-PO Relationship

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	3	3	3	3								
CO2	3	3	3		3							
CO3	3			3	3							
CO4	3			3	3							
CO5	3	3	3									2

* CO (rows) mention nil/very small/insignificant contribution to the PO(column)

1 → relevant and small significance 2 → medium or moderate and 3 →strong