

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Mechanical Engg.) (Full Time)			
Subject Code & Name	Instructions Hours per Week			Credits			
MER4C2 THEORY OF MACHINES	L	T	P	L	T	P	Total
	3	1	2	3	1	1	5
<b>Duration of Theory Paper:</b> <b>3 Hours</b>							

**Learning Objectives:**

1. To provide the knowledge of basics of mechanisms(Gears, cams,etc), degrees of freedom.
2. To give basic concepts of velocity and acceleration of mechanisms.
3. To develop skill to analyze the behavior and applications of gear trains.
4. To know the concept and effect of gyroscope.

**Pre requisites:** Engineering Mechanics, Engineering Physics, Engineering Mathematics.

**COURSE CONTENTS**

**UNIT-I**

**Basics of Theory of Machines:** Degree of Freedom (Grubler’s criterion), Concept of mechanism, Inversions of Quadric cycle chain, single and double slider crank mechanism. Grashof’s criterion, Types of kinematic synthesis, Synthesis of four bar function generator, Study of Straight line mechanisms(Paucellier, Tchebicheff’s mechanisms), Steering Mechanisms (Ackerman’s mechanism, Devi’s Steering Gear mechanism). Hooke’s joint and engine indicators.

**UNIT-II**

**Velocity and Acceleration Analysis:** Determination of velocity and acceleration by analytical and/or graphical methods of various mechanisms. , Study of Coriolis components, Klein’s construction.

**UNIT-III**

**Cams and Followers :**Types of Cams and followers, Cam profiles with specified follower motion e.g. simple harmonic, constant velocity and acceleration and deceleration, cycloidal types, Cams with specified contours. Tangent Cams, Displacement, Velocity and Acceleration of followers.

**UNIT-IV**

**Gears and Gear Trains :**Types of gears, Terminologies of various gears (Spur. Bevel gear, Helical gear, Worm and Worm wheel), Condition for correct gearing, Basics of gear meshing, Tooth profiles (cycloidal and involute). Gear trains, Epicyclic gear trains and their analysis.

**UNIT-V**

**Gyroscopes:** Product of Inertia, Principle Axis, Gyroscopic Motion, Gyroscopic Torque, Gyrostabilizer, Gyrocompass. Application to Ships and Aero planes. Stability of Two & Four Wheelers.

**Learning Outcomes:**

Upon Completing the Course, Student will be able to:

1. Understand the concept of mechanisms and their applications
2. Analyze the motion aspects of mechanisms.
3. Understand the Gears and their uses.
4. Learn basic fundamentals associated with Gyroscopic effect.

**BOOKS RECOMMENDED:**

- [1] Thomas, B., Theory of Machines, CBS Publications & Distributions, 2000
- [2] Shigley, J., Theory of Machines and mechanisms, Oxford University, 2006.
- [3] Ambekar, A.G., Mechanism and Machine Theory, Jain Brothers, 2005
- [4] Singh Sadhu, Theory of Machines, Pearson’s Education, 2006.
- [5] Rattan, S.S., Theory of Machines, Tata McGraw Hill Education (P) Ltd., 2011

**LIST OF PRACTICAL ASSIGNMENT**

1. Study of cam and follower and finding velocity and acceleration of follower.
2. Study of slider crank mechanism.
3. Study of different kinematic pairs.
4. Generation of involute teeth profile for different gears.
5. Performance of interference and undercutting of tooth (by plotting).
6. Study of gyroscopic effect using gyroscope .
7. Reducing and enlarging drawings using pantograph ,study of straight line mechanisms.
8. Study of Double Hooks joint.
9. Study of Oldham's coupling .
10. Verification of Grashof's law.
11. Study of automobile steering gears.

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