

COURSE CODE	KINEMATICS OF MACHINERY	L	T	P	C
1151ME105		2	2	0	3

1. Preamble

This course provides adequate knowledge on the basic components and layout of linkages with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism. It enables design of cam mechanisms for specified output motions and solving of problems in toothed gear trains and the effects of friction in machine components.

2. Pre requisite

Engineering Mechanics 1151ME101

3. Links to other courses

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| 1 | Dynamics of Machinery | 1151ME110 |
| 2 | Design Of Machine Elements | 1151ME111 |

4. Course Educational Objectives

Students undergoing this course are expected to:

- Gain knowledge on the basic concepts of mechanisms, cam, gear train and their kinematics.
- Understand the effects of friction in machine components

5. Course Outcomes

Upon the successful completion of the course, learners will be able to

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
CO1	Discuss the fundamentals of various mechanisms.	K2
CO2	Construct the velocity and acceleration diagrams for a given mechanism.	K3
CO3	Construct the cam profile for a given follower motion.	K3
CO4	Analyze various types of gear and gear trains.	K3
CO5	Apply the effect of friction in clutches, brakes, and belt and rope drives.	K3

(K3-Apply)

6. Correlation of COs with Programme Outcomes:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	M										L	M	L
CO2	H	M										L	M	L
CO3	H	M										L	M	L
CO4	H	M										L	M	L
CO5	H	M										L	M	L

H- High; M-Medium; L-Low

7. Course Content

UNIT I BASICS OF MECHANISMS

L-6 T-6

Definitions-Degree of Freedom, Mobility-Kutzbach criterion-Grashoff's law-Kinematic Inversions of 4-bar chain, single and double slider crank chains-Mechanical Advantage-Transmission angle. Description of common Mechanisms: Single, double and offset slider mechanisms - Quick return mechanisms - Ratchets and escapements - Indexing Mechanisms.

UNIT II KINEMATICS OF MECHANISMS

L-6 T-6

Displacement, velocity and acceleration - analysis in simple mechanisms - Graphical Method: velocity and acceleration polygons - Vector Approach - Coincident points- Coriolis Acceleration.

UNIT III KINEMATICS OF CAM

L-6 T-6

Classifications - Derivatives of Follower motions, Displacement diagram and cam profile: Uniform velocity, Simple harmonic, uniform acceleration and retardation and Cycloid motions. Pressure angle and undercutting.

UNIT IV GEARS

L-6 T-6

Spur gear Terminology and definitions - Fundamental Law of toothed gearing and involute gearing - Interference and undercutting - Helical, Bevel, Worm, Rack and Pinion gears (Basics only) - Gear-Motion Analysis - Parallel axis gear trains - Epicyclic gear trains

UNIT V FRICTION

L-6 T-6

Surface contacts-Sliding friction - Friction in screw threads - Friction clutches - Belt and rope drives, Friction aspects in Brakes –Band Brake - Block Brake - Friction in vehicle propulsion and braking - Elementary treatment

Total: 30 + 30 = 60 Periods

8. Text Books

1. Shigley J.E and Uicker J.J "Theory of Machines and Mechanisms," McGraw Hill ISE, 2011
2. Rattan. S.S, "Theory of Machines", Tata McGraw Hill, 2014

9. References

1. Thomas Bevan, "Theory of Machines", Pearson education, Noida, 5 th Edition, 2013.
2. Khurmi R.S. "Theory of Machines" S.Chand & Co.,, Delhi, 2013
3. B.L. Balleney, "Theory of Machines", Khanna Pub. Delhi, 2012
4. Rao J.S and Dukkupati R.V, "Mechanism and Machine Theory", New Age Intl., New Delhi, 2nd Edition, 2012.