

Subject Code: 01ME0302

Subject Name: Kinematics of Machines

B.Tech. II Year (Sem-III) Mechanical & Automobile Engineering.

Type of course: Engineering Science

Prerequisite: NIL

Rationale: Kinematics of machines is intended to impart the fundamental knowledge of mechanism and machines so as to understand their functional aspects and perform the kinematic analysis of machine elements like linkages, gears and cams.

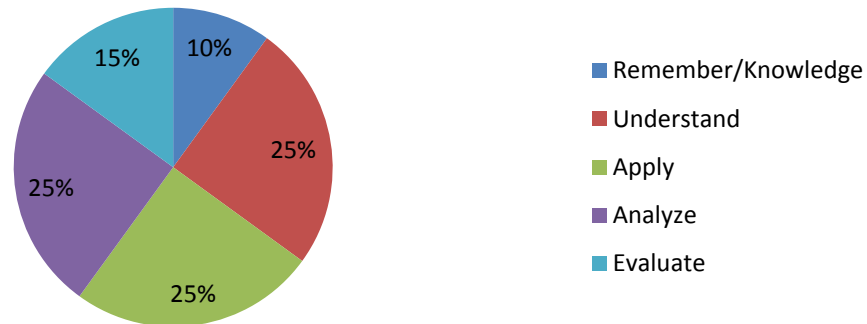
Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Evaluation Scheme					Total Marks
Theory	Tutorial	Practical		Theory Marks			Tutorial/Practical Marks		
				ESE (E)	IA	CSE	Viva (V)	Term Work (TW)	
4	2	0	5	50	30	20	25	25	150

Content:

No	Module	Sub Module	Topics	Weight age %	Duration
1	Mechanisms & Machines	Introduction	Various mechanisms & machines	10	1
			various types of links, kinematic pairs & kinematic chain		
			Types of motion, mobility of a mechanism - Kutzbach and Grubler's criterion		
		Classification	Classification of Mechanisms		
		Inversion	Concept of inversion, Kinematic inversion of four bar, single slider, & double slider crank chain		3
2	Synthesis & Analysis of	Introduction	Concept of synthesis & its classification	15	3
			Various types of synthesis problems		

	mechanisms	Graphical synthesis & analysis	Accuracy points for function generation, Analysis of four bar mechanism using Freudenstein's equation, synthesis of four bar & slider crank chain mechanism using graphical techniques		5
3	Kinematic Analysis	Velocity analysis	Analysis of Velocity diagrams, Relative velocity method, Instantaneous centre method, rubbing velocity	15	4
		Acceleration analysis	analysis of acceleration diagram, Klien's construction, Corioli's component of acceleration.		4
4	Special Mechanisms	Functional aspects	Various types of lower pair mechanisms such as Straight line mechanism, Indicator diagrams, universal Joint, Steering gear Mechanism	10	6
5	Gears	Introduction	Introduction & various types of toothed wheels, Terminology of gear, fundamental condition for constant velocity ratio, sliding velocity	15	2
		Forms of gears teeth	Cycloidal profile teeth, Involute profile Teeth , Relative benefits and drawbacks of cycloidal and involute tooth forms,		2
		Interference	Contact ratio, Interference & undercutting in involute gears, Minimum number of teeth to avoid interference		3
		Functional aspects	Basic concepts of Worm, Bevel, helical & spiral gears		2
6	Gear Trains	Introduction	Basic concepts of Simple, compound & reverted gear trains,	10	2
		Analysis	Motion Analysis of Epicyclic gear trains by different methods		4
7	Cam & Follower	Introduction	Introduction to various classification of cam & follower, terminology of cam various types of displacement, velocity & acceleration diagrams for various follower motions,	25	1
					2
		Cam profile construction	Determination of basic dimensions of profile of cam and its construction using Graphical techniques		7

**References:**

1. Theory of Machines and Mechanisms (3/e 2009, 2013 Impression) Uicker J J Jr., Pennock G R, Shigley J E, Oxford Press.
2. Kinematics and Dynamics of Machinery (1/e 2009, 2013 Reprint) Norton R L, McGraw-Hill
3. Mechanism and Machine Theory (2013 Reprint), Ambekar, A G, Prentice Hall
4. Theory of Machines, Singh Sadhu, Pearson Education
5. Theory of Machines, Rattan S S, Tata McGraw-Hill

Web Resources

<http://kmoddl.library.cornell.edu/>

Course Outcomes:

- Identify the functional characteristics of various machine elements
- Synthesize and analysis the motion parameters of mechanisms
- Understand the functional characteristics of various gears
- Analyse the motion of gear trains
- Analyse the motion of cam and follower

List of Open Source Software/learning website:

1. <http://nptel.iitm.ac.in>,
2. <http://vlab.co.in/>