MME206: Kinematics and Dynamics

Programme: B. Tech **Year :** Second **Semester :** IV
Course : Core **Credits :**3 **Hours :** 40

Course Overview and Context:
The course objective is to highlight the fundamental concepts in Engineering Mechanics and their applications for the determination of the motion and interaction of machine elements as well as forces acting on machines and mechanisms. Specific applications will be made to mechanisms such as rotating machinery, cams, gears, and flywheels. The final objectives will be able to synthesize mechanisms and machine elements for specified performance, and then analyze the given mechanism for position, velocity, accelerations, static loads, and dynamic loads.

Prerequisite Courses: Engineering Mechanics.

Text Books:

1. Wilson, CE, Sadler, JP,*Kinematics and Dynamics of Machinery,* Prentice Hall Publication, 3rd Edition, 2001
2. Uicker J J Jr., Pennock G R, Shigley J E, *Theory of Machines and Mechanisms*, 8/eMc Oxford Press, 3rd Edition, 2013
3. Norton R L, *Kinematics and Dynamics of Machinery*, McGraw Hill, 1st Edition,1995

Reference books:
[1] Ambekar, A G, *Mechanism and Machine Theorys*, Prentice Hall, 2013
[2] Singh Sadhu, *Theory of Machines*, Pearson Education, 2007

Course Outcomes (COs):

The Outcomes of this Course are Student will be	
CO1: Acquire the knowledge of degree of freedom, joints, pairs and couplings of machinery components of system.	Unit 1 & 2
CO2: Able to analyze the relative velocities and accelerations of various links of different mechanisms such four bar, crank-rocker, quick return, mechanisms through graphical and analytical methods.	Unit 3
CO3: Acquire knowledge of static and dynamic forces acting on the different link of machineries. Able to understand the gyroscopic forces and principles of governor, vibrations in engineering application.	Unit 3
CO4: Acquire the knowledge to deal with Kinematic Analysis of Spatial Mechanisms.	Unit 4
CO5: Able to perform the analysis on different types of gears and their characteristics.	Unit 5
CO6: Able to analyze the kinematics of Cams and Followers motions.	Unit 6

Course Topics:

Kinematics and Dynamics				Student achievement
S. No.	**Topics**	**L**	**Hrs**	
1	**The Components of Mechanism:** Review of classical mechanics, Joints, Pairs and Couplings, Mobility, Grashof's Law	3	3	Employability & Skill development
2	**Linkage Design:** Four-Bar Mechanism and Crank-Rocker Mechanism, Drag-Link Mechanics, Designing for prescribed Velocity or Torque	7	7	Employability & Skill development
3	**Dynamics of Planar Systems:** Static Force Analysis, Planar Dynamic Force Analysis, Methods of Linkage Force Analysis, Force Calculations for Flywheel, Gyroscopic Forces, Dynamic Modeling and Analysis Techniques Velocity and Acceleration Diagrams, Instantaneous Centre of Velocity, Rubbing Velocity, Velocity and Acceleration Images, Corioli's component of acceleration. Working principle of governor. Introduction to vibration	12	12	Employability & Skill development
4	**Spatial Mechanisms:** Mobility, Describing Spatial Motions, Kinematic Analysis of Spatial Mechanisms	6	6	Employability & Skill development
5	**Gears and Gear Trains:** Terminology, Law of Gearing, Characteristics of involute and cycloidal action, Interference and undercutting, Centre distance variation, Minimum number of teeth, Contact ratio, Spur, Helical, Spiral bevel and Worm gears, Problems. Gear Trains: Synthesis of simple, compound and reverted gear trains, Analysis of Epicyclic gear trains	6	6	Employability & Skill development
6	**Cams and Followers:** Introduction, Classification of Cams and Followers, nomenclature, Displacement diagrams of follower motion, Kinematic coefficients of follower motion. Synthesis and analysis: Determination of basic dimensions and synthesis of cam profiles using graphical methods, cams with specified contours	6	6	Employability & Skill development
	Total	**40**	**40**	