

Course Handout: Kinematics of Machines

Course In charge: Vikas Gupta

Course Code: PCC-ME301-T, Course Credits: 3.0, Contact Hours: 3 hours/week

Suggested Books:

Text Books	Reference Books
1. Theory of Machines – Joshef S. Shigley. 2. Theory of Mechanism and Machines- Ghosh A. and Malik A.K. 3. Theory of Machines – S.S. Rattan.	1. Mechanism and Machine Theory- J.S. Rao and R.V. Dukkupati. 2. Theory of Mechanism and Machines- Beven 3. Theory of Machine -R S Khurmi.

Syllabus:

UNIT	CONTENTS	NO. OF LECTURES
1.	Introduction: Mechanism and Machines, Kinematic Links, Kinematic Pairs, Kinematic Chains, Degree of Freedom, Kinematic Inversion, Inversions of Four Bar Kinematic Chain, Inversions of Single Slider Kinematic Chain, Inversions of Double Slider Kinematic Chain, Problems Mechanism with Lower Pairs: Pantograph, Straight Line Mechanisms, Exact Straight Line Motion Mechanisms, Approximate Straight Line Motion Mechanisms, Steering Gear Mechanisms, Davis Steering Gear, Ackerman Steering Gear, Problems	7
2.	Velocity in Mechanisms: Relative Velocity Method: Motion of a Link, Velocity of a Point on a Link by Relative Velocity Method, Velocities in a Slider Crank Mechanism, Instantaneous Centre Method: Space and Body Centroides, Velocity of a Point on a Link by Instantaneous Centre Method, Aronhold Kennedy Theorem, Methods of Locating Instantaneous Centres in a Mechanism, Problems Acceleration in Mechanisms: Acceleration diagram for a link, Acceleration of a point on a link. Acceleration in the Slider Crank Mechanism, Coriolis Component of Acceleration, Problems	7
3.	Cams: Classification of Cams and Followers, Disc Cam Nomenclature, Construction of Displacement, Velocity and Acceleration Diagrams for Different Types of Follower Motions, Determination of Basic Dimension, Synthesis of Cam Profile by Graphical Approaches, Problems Kinematic Synthesis: Kinematic Synthesis: Dimensional synthesis, function generation, path generation and motion generation, Synthesis of Four Bar linkage for specified Instantaneous conditions, Problems	7
4.	Gears: Fundamental Law of Gearing, Forms of Gear Teeth, Path of Contact, Arc of Contact, Interference and Undercutting, Non Standard Gear Teeth, Helical, Spiral, Bevel and Worm Gears, Problems Gear Trains: Synthesis of Simple, Compound and Reverted Gear Trains, Analysis of Epicyclic Gear Trains, Problems	7

Internal Marks Distribution: 4 for Attendance + 20 for Term Exam. + 6 for Assignments / Class work

Course Assessment Methods (internal: 30; external: 70) Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.