

B. E. MECHANICAL ENGINEERING			
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)			
SEMESTER – IV			
KINEMATICS OF MACHINES			
Course Code	18ME44	CIE Marks	40
Teaching Hours /Week (L:T:P)	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03
Course Learning Objectives:			
<ul style="list-style-type: none"> • To understand the concept of machines, mechanisms and related terminologies. • To expose the students to various mechanisms and motion transmission elements used in Mechanical Engineering. • To analyze a mechanism for displacement, velocity and acceleration at any point in a moving link. • To understand the theory of cams, gears and gear trains. 			
Module-1			
<p>Mechanisms: Definitions: Link , types of links, joint, types of joints kinematic pairs, Constrained motion, kinematic chain, mechanism and types , degrees of freedom of planar mechanisms, Equivalent mechanisms, Groshoff's criteria and types of four bar mechanisms, , inversions of of four bar chain, slider crank chain, Doubler slider crank chain and its inversions, Grashoff's chain. Mechanisms: Quick return motion mechanisms- Drag link mechanism, Whitworth mechanism and Crank and slotted lever Mechanism. Straight line motion mechanisms, Peaucellier's mechanism and Robert's mechanism. Intermittent Motion mechanisms: Geneva wheel mechanism, Ratchet and Pawl mechanism, toggle mechanism, pantograph, condition for correct steering, Ackerman steering gear mechanism.</p>			
Module-2			
<p>Velocity and Acceleration Analysis of Mechanisms (Graphical Method): Velocity and acceleration analysis of four bar mechanism, slider crank mechanism. Mechanism illustrating Corioli's component of acceleration. Angular velocity and angular acceleration of links, velocity of rubbing. Velocity Analysis by Instantaneous Center Method: Definition, Kennedy's theorem, Determination of linear and angular velocity using instantaneous center method</p>			
Module-3			
<p>Velocity and Acceleration Analysis of Mechanisms (Analytical Method): Velocity and acceleration analysis of four bar mechanism, slider crank mechanism using complex algebra method. Freudenstein's equation for four bar mechanism and slider crank mechanism. Function Generation for four bar mechanism.</p>			
Module-4			
<p>Cams: Classification of cams, Types of followers, Cam nomenclature, Follower motions and motion analysis, of SHM, Motion with uniform acceleration and deceleration, uniform velocity, cycloidal motion, Cam profile with offset knife edge follower, roller follower, flat faced follower.</p>			
Module-5			
<p>Spur Gears: Gear terminology, law of gearing, path of contact, arc of contact, contact ratio of spur gear. Interference in involute gears, methods of avoiding interference, condition and expressions for minimum number of teeth to avoid interference.</p> <p>Gear Trains: Simple gear trains, compound gear trains. Epicyclic gear trains: Algebraic and tabular methods of finding velocity ratio of epicyclic gear trains, torque calculation in epicyclic gear trains.</p>			
Course Outcomes: At the end of the course the student will be able to:			
CO1: Knowledge of mechanisms and their motion.			
CO2: Understand the inversions of four bar mechanisms.			
CO3: Analyse the velocity, acceleration of links and joints of mechanisms.			
CO4: Analysis of cam follower motion for the motion specifications.			

CO5: Understand the working of the spur gears.
CO6: Analyse the gear trains speed ratio and torque.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook/s				
1	Theory of Machines Kinematics and Dynamics	Sadhu Singh	Pearson	Third edition 2019
2	Mechanism and Machine Theory	G. Ambekar	PHI	2009
Reference Books				
1	Theory of Machines	Rattan S.S	Tata McGraw-Hill Publishing Company	2014
2	Mechanisms and Machines- Kinematics, Dynamics and Synthesis	Michael M Stanisic	Cengage Learning	2016