



CVM
UNIVERSITY

Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: Bachelor of Technology (Mechanical Engineering)

Semester: III

Course Code: 202090305

Course Title: Kinematics Of Machines

Course Group: Professional Core Course - II

Course Objectives: To study and analyze the different motions of planar mechanisms and synthesis the mechanisms for given desired motions.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				Total
Lecture	Tutorial	Practical		Theory		J/V/P*		
				Internal	External	Internal	External	
3	0	2	4	50 / 18	50 / 17	25 / 9	25 / 9	150/53

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Basics of Mechanisms and Machines: Concepts of Kinematics and Dynamics, Mechanisms and Machines, Planar and Spatial Mechanisms, Kinematic Pairs, Kinematic Chains, Kinematic Diagrams, Kinematic Inversion, Four Bar Chain and Slider Crank Mechanisms, Double Slider Mechanism and their Inversions, Degrees of Freedom, Kutzbach and Grubler's Criterion, Grashof's Criterion. Special Purpose Mechanisms: Straight Line Mechanisms, Hooke's Joint, Steering Mechanisms.	10
2	Velocity and Acceleration Analysis: Velocity and Acceleration Diagrams for Planar Mechanisms Using Instantaneous Centre and Relative Velocity Method, Rubbing Velocity, Coriolis's Component of Acceleration.	9
3	Kinematics Synthesis of Mechanisms: Introduction to Type, Number and Dimensional Synthesis, Definitions of Motion, Path and Function Generation, Precision Position, Chebyshev Spacing, Structural Error, Freudenstein's Equation, Two and Three Position Synthesis (Function Generation Only) of Four Bar and Slider Crank Mechanisms by Graphical and Analytical Methods, Transmission Angle, Mechanical Advantage.	8



4	Gears and Gear Trains: Gears: Terminology, Law of Gearing, Characteristics of Involute and Cycloid Profile, Interference and Undercutting, Centre Distance Variation, Minimum Number of Teeth, Contact Ratio, Motion Analysis of Spur, Helical, Bevel and Worm Gears. Gear Trains: Simple, Compound and Reverted Gear Trains, Analysis of Epicyclic Gear Trains.	10
5	Cams and Followers: Classification of Cams and Followers & Terminology, Displacement Diagrams – Uniform Velocity, Uniform Acceleration and Retardation, Simple Harmonic and Cycloidal Motions & Derivatives of Follower Motions, Cam Profiles Layout.	8
	Total	45

List of Practicals / Tutorials:

1	Introduction to Mechanism & Machine
2	Inversions of Four Bar Mechanism, Single Slider Crank Chain Mechanism and Double Slider Crank Chain Mechanism
3	Design analysis of different special purpose mechanisms
4	Velocity analysis of the planner mechanisms
5	Acceleration analysis for the planner mechanisms
6	Two position & three position synthesis for four bar and slider crank mechanism using graphical method
7	Synthesize the planner mechanism based on given desired motion using analytical method
8	Fundamental analysis of gears
9	Motion analysis of Gears
10	Analyze different gear train mechanism

Reference Books:

1	Theory of Mechanisms and Machines by A Ghose and A K Malik, East West Press Pvt Ltd.
2	Kinematics and dynamics of machinery by C E Wilson and J E Sadler, PEARSON
3	Kinematics and dynamics of machinery by R L Norton, McGraw Hill
4	Theory of Machines by S S Rattan, McGraw Hill
5	Theory of Machines, by Sadhu Sigh, Pearson Education
6	Kinematics and Dynamics of Machinery, by Robert L. Norton, Tata McGraw-Hill
7	Theory of Machines by Thomas Bevan, 3rd Edition, CBS Publishers and Distributor
8	Mechanism and Machine Theory by Ambekar, Prentice Hall.
9	Theory of Machines by V P Singh, Dhanpat Rai & Co.

Supplementary learning Material:

1	NPTEL resources
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Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations



- Assignments/Quiz
- Continuous assessment
- Interactive methods

Internal Evaluation:

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
15%	15%	15%	25%	25%	5%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understand the basic motions and principles of all mechanisms and its possible inversions.	15
CO-2	Analyze the planar mechanisms for position, velocity and acceleration.	25
CO-3	Synthesize planar four bar and slider crank mechanisms for given desired motion.	25
CO-4	Understand the basic concepts, terminologies and kinematics of gears and gear trains.	20
CO-5	Design cams and followers for specified output motion profiles	15

Curriculum Revision:

Version:	2
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	--
Next Review on (Month-Year):	June-2025