Course Syllabus
Gyanmanjari Diploma Engineering College
Semester-4(Diploma)

Subject: Theory of Machine- DETME14209

Type of course: Major

Prerequisite: Physics, Engineering Drawing, Applied Mechanics

Rationale: The subject of "Theory of Machine" is central to mechanical engineering, particularly in understanding the motion of machines and mechanical systems. Theory of machine focuses on the motion of machine components without considering the forces causing the motion. It allows engineers to analyze mechanisms like gears, cams, and linkages that form the building blocks of many machines. Engineers need to design systems that perform specific tasks, such as moving objects or transmitting power. Studying theory of machine helps in creating efficient designs that achieve desired motion, velocity, and acceleration. Theory of machine lays the groundwork for studying dynamics, control systems, and more advanced mechanical systems. It is a core component of mechanical and mechatronics engineering education.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
3	-	2	4	60	30	10	20	30	150

Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Sr. No	Course content	Hrs	% Weightage
1	**Introduction of Mechanisms and Machines:** Concepts of Kinematics and Dynamics, Mechanisms and Machines, Kinematic Pairs, Kinematic Chains, Kinematic Diagrams, Kinematic Inversions **Velocity and Acceleration Analysis:** Graphical and analytical velocity analysis of four bar pin jointed linkages and four bar slider crank linkages, Graphical and analytical acceleration analysis of four bar pin jointed linkages and four bar slider crank linkages	13	25
2	**Cams:** Types of cams, Types of followers, Layout of cam profiles **Friction:** Introduction to friction Explain laws of friction Describe the working of different types of clutches and brakes	12	25
3	**Power transmission:** Introduction, need and modes of power transmission, Types of power transmission, Gear trains-types and applications **Flywheel and governor:** Flywheel functions & types, Governors: terminology types & functions	12	25
4	**Balancing and vibrations:** Concepts and types of balancing, Terminology, Effects, Causes, Remedies.	8	25

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Identify and draw** Draw inversion of four bar mechanism and slider and crank mechanism and upload photographs on a GMIU web portal.	10
2	**Prepare pair** Prepare any one kinematic pair prototype and upload its photographs on a GMIU web portal.	10
3	**Case study** Identify any industrial vibration or balancing problem and do case study on it. Submit report on GMIU web portal	10
	Total	30

Suggested Specification table with Marks (Theory): 60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20%	35%	30%	10%	0%	5%

Course Outcome:

After learning the course, the students should be able to	
CO1	Study Mechanisms, Machines, Kinematics, Dynamics, and Velocity/Acceleration Analysis.
CO2	Understand Cams, Followers, Cam Profiles, and Friction, including Clutches and Brakes.
CO3	Learn Power Transmission, Gear Trains, Flywheel Functions, and Governors.
CO4	Understand basics related to friction, Vibration and balancing and its practical concepts

List of Practical:

Sr. No	Descriptions	Unit No	Hrs
1	**Study of Kinematic Links, Pairs, Chains, and Mechanisms**: Explore the types and functions of various kinematic elements and mechanisms.	1	2
2	**Study of Single Slider Crank Mechanism Inversions**: Examine the inversions of single slider crank mechanisms and their applications.	1	4
3	**Study of Double Slider Crank Mechanism Inversions**: Analyze the inversions of double slider crank mechanisms and their working principles.	1	4
4	**Drawing Velocity Diagrams**: Perform drawing work related to velocity diagrams for various mechanisms.	1	4
5	**Drawing Acceleration Diagrams**: Create acceleration diagrams for different mechanisms to study their motion.	1	4
6	**Drawing Cam Profiles**: Develop cam profiles for specific follower motions using drawing techniques.	2	4
7	**Demonstration of Different Clutches**: Showcase the construction and working of various types of clutches.	2	2

8	**Demonstration of Different Brakes**: Study the design and functionality of different braking systems.	2	2
9	**Demonstration on Universal Vibration Machine**: Observe and analyze vibration characteristics using a universal vibration machine.	4	2
10	**Balancing of Rotating Masses**: Demonstrate the process of balancing rotating masses to ensure smooth operation.	4	2
	Total		30

Instructional Method:

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment.
Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.

Reference Books:

[1] Theory of Machines, Rattan S S, Tata McGraw-Hill

[2] Theory of Machines and Mechanisms, Uicker J J Jr., Pennock G R, Shigley J E, Oxford Press

[3] Kinematics and Dynamics of Machinery, Norton R L, McGraw-Hill.

[4] Mechanism and Machine Theory, Ambekar, A G, Prentice Hall