

25UAGT401	THEORY OF MACHINES	Category	L	T	P	R	Credit	Year of Introduction
		PCC	3	1	0	0	4	2025

Preamble: This course introduces the fundamentals of kinematics and dynamics of machinery, focusing on mechanisms, gears, power transmission, governors, and balancing. It aims to develop the ability to understand mechanical motion and machine elements and apply analytical methods to solve practical engineering problems encountered in mechanical systems.

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to:

CO	Course Outcomes	Knowledge Level
CO1	Explain the kinematics of mechanisms & velocity and acceleration analysis	K2 Understand
CO2	Explain the fundamentals of gears and motion transmission in gear trains.	K2 Understand
CO3	Apply the principles of flywheels, belt drives, and chain drives in turning moment diagrams	K3 Apply
CO4	Apply concepts of friction, clutches, governors in force transmission problems	K3 Apply

Mapping of course outcomes with program outcomes and program specific outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	3	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3	3
CO3	3	2	-	-	-	-	-	-	-	-	-	3	3
CO4	3	3	2	-	2	-	-	-	-	-	-	3	3
Avg	3	2.5	2	-	2	-	-	-	-	-	-	3	3

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Mapping of Course Outcomes with Knowledge and Attitude Profile (WK)

CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*					
CO2	*	*	*	*					
CO3	*	*	*	*					
CO4	*	*	*	*	*	*			

Wks Mapped with the Course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*			

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	40	60	2.5 hrs

Continuous Internal Evaluation Pattern

Attendance	: 5 marks
Continuous Assessment Test	: 20 marks
Continuous Assessment Assignment/Field visit Report	: 15 marks

SYLLABUS

Module 1 (14hrs)

Kinematics of Mechanisms: Simple mechanisms: elements of mechanisms, kinematic chains and mechanisms and their inversions, classification of kinematic pairs and mechanisms, Velocity and acceleration analysis of mechanisms.

Module 2 (14 Hrs)

Gears and Gear Trains: Types of gears; law of gearing; velocity of sliding between two teeth in mesh. Gear tooth profiles, advantages and comparison. Spur gears: nomenclature and applications. Introduction to different types of gears, Type of gear trains, determination of velocity ratio of all gear trains by tabular method, sliding velocity between gear teeth.

Module 3 (14 Hrs)

Flywheel, Belt and Chain Drives: Turning moment diagrams, coefficient of fluctuation of speed and energy; determination of weight of flywheel. Flywheel applications, Belt drives: types, materials, length, velocity ratio; power transmitted; belt size for flat and V-belts; effect of centrifugal tension, creep and slip on power transmission. Chain drives: classification, terminology and applications.

Module 4 (14 Hrs)

Friction, Governors and Balancing: Friction: types of friction; laws of dry friction; friction of pivots and collars; rolling friction. Clutches: single disc, multiple disc and cone clutches; torque transmitting capacity. Clutch mechanisms in farm machinery, Governors: types of governors; constructional details of Watt, Porter and Proell governors; Balancing of masses Precision agriculture equipment mechanisms. Sustainable material selection in machine elements,

Field Visits

Field Visits to Tractor manufacturing / service centre/Agro-processing unit (rice mill / oil mill)/ Farm machinery testing centre/ Agricultural equipment fabrication workshop/ Rural mechanization centre.

Text Books

1. Ballaney, P. L. (2016). *A text book of theory of machines*. Khanna Publishers, New Delhi.
2. Khurmi, R. S., & Gupta, J. K. (2010). *A text book of theory of machines*. Euresia Publishing House (P) Ltd, New Delhi.
3. Ratan, S. S. (2010). *A text book of theory of machines*. Tata McGraw Hill Publishing Company Ltd, New Delhi.

Reference Books

1. Bansal, R. K. (2009). *A text book of theory of machines*. Laxmi Publications (P) Ltd., New Delhi.
2. Bevan, T. (2010). *Theory of machines*. Pearson Education India, New Delhi.
3. Shigley, J. E., & Uicker, J. J. (2014). *Theory of machines and mechanisms*. Oxford University Press, New York.

**END SEMESTER EXAMINATION - MODEL QUESTION PAPER
(STC 2025 SCHEME)**

Course Code	25UAGT401
Course Name	THEORY OF MACHINES
Max. Marks: 60	Duration: 2.5 Hours

Part A				
<i>(Answer all questions. Each question carries 3 marks)</i>				
Qn No.	Question	Marks	CO	BL
1.	Define a kinematic chain and a mechanism.	3	CO1	L2
2.	Explain the term inversion of a mechanism with an example.	3	CO1	L2
3.	State the law of gearing.	3	CO2	L2
4.	Explain the term velocity ratio of a gear train.	3	CO2	L2
5.	Apply the concept of coefficient of fluctuation of energy to a flywheel.	3	CO3	L2
6.	For a flat belt drive, apply the relation for power transmitted.	3	CO3	L2
7.	Apply the laws of dry friction to a pivot and collar.	3	CO4	L2
8.	Explain the torque transmitting capacity of a single plate clutch.	3	CO4	L2
Part B				
<i>(Answer any one full question from each Module. Each question carries 9 marks)</i>				
Module I				
Qn No.	Question	Marks	CO	BL
9	Explain the classification of kinematic pairs and mechanisms with suitable examples.	9	CO1	L2
OR				
10	Explain the procedure for velocity and acceleration analysis of a four-bar mechanism.	9	CO1	L2
Module II				
Qn No.	Question	Marks	CO	BL
11	Explain the nomenclature of spur gears and the comparison of different gear tooth profiles.	9	CO2	L2
OR				
12	Explain the determination of velocity ratio of a compound gear train by the tabular method.	9	CO2	L2
Module III				
Qn No.	Question	Marks	CO	BL
13	Apply the turning moment diagram to explain the determination of the weight of a flywheel.	9	CO3	L3
OR				
14	Apply the principles of belt drives to explain the effect of centrifugal tension, creep and slip on power transmission.	9	CO3	L3
Module IV				
Qn No.	Question	Marks	CO	BL

15	Apply the principles of friction to explain the working and torque capacity of a multiple disc clutch in farm machinery.	9	CO4	L3
OR				
16	Apply the working principles of Watt and Porter governors to explain speed control in machines.	9	CO4	L3
