

Course code	Course Name	L-T-P -Credits	Year of Introduction
ME213	THEORY OF MACHINES	3-0-0-3	2016

Prerequisite : Nil

Course Objectives

- To understand the layout of linkages in the assembly of a system/machine.
- To study the principles involved in assessing the displacement, velocity and acceleration at any point in a link of a mechanism.
- To analyse the motion resulting from a specified set of linkages in a mechanism.
- To study the application of friction in different devices.
- To study the power transmission devices.
- To study the use of gyroscopic couples.
- To understand the principles in mechanisms used for governing of machines.

Syllabus

Kinematics – velocity and acceleration- Friction – Brakes – Gear – Cams- Gyroscope - Flywheel Governors- Static and dynamic balancing - Vibration

Expected outcome.

- After this programme, students are expected to have a thorough understanding of different mechanisms and theories which will help in optimising design of machines and equipments and also to solve practical problems in the area of machines and mechanisms.

Text Book:

1. P L Ballaney, Theory of Machines and Mechanisms, Khanna Publishers
2. S S. Rattan-Theory of machines, McGraw Hill

References:

1. Bevan, Theory of Machines, Pearson Education, 1986
2. Rao J S and Dukupati R V, Mechanism and Machine Theory, Wiley EasternLtd.
3. Malhotra, D.R and Gupta, H C, Theory of Machines, Satya Prakasam Tech. India Publications Ltd.
4. Gosh A and Mallick A K, Theory of Machines and Mechanisms, Affiliated East West Press .
5. Shigley J E. and Uicker J J, Theory of Machines and Mechanisms, McGraw–Hill.

Course Plan

Module	Contents	Hours	Sem.ExamMarks
I	Kinematics - links, mechanism, Degrees of freedom, Grashoff's law, four-bar chain, Slider crank chain, inversions and practical applications. Velocity and acceleration diagrams of simple mechanisms. Coriolis acceleration (Theory only). Friction - Pressure and wear theories, pivot and collar friction, Single and multiple disc clutches.	7	15%
II	Brakes - block and band brakes, self energizing and self-locking in braking. Gear – Different types of gears- Nomenclature of spur and helical gears, Law of gearing, Gear trains - Simple, compound gear trains and epicyclic gear	7	15%

	trains.		
FIRST INTERNAL EXAMINATION			
III	Cams - types of cams, cam profiles for knife edged and roller followers with and without offsets for SHM, constant acceleration-deceleration, constant velocity and cycloidal motion	7	15%
IV	Gyroscope –Gyroscopic torque, gyroscopic stabilization of ships and aeroplanes. Flywheel - Turning moment diagrams, fluctuation of energy.	7	15%
SECOND INTERNAL EXAMINATION			
V	Governors - types of governors, simple watt governor - Porter, Proell governors-. Isochronisms, hunting, sensitivity and stability. Hartnell governor(Theory only). Static and dynamic balancing of rotating mass- Single and several masses in different planes, balancing of reciprocating mass, Dynamic analysis of slider crank mechanism(Theory only).	7	20%
VI	Vibration - kinematics of vibrating motion, vibration systems having single degree of freedom, free and force vibration, damped vibration. Torsional vibrations -Transverse vibration. whirling of shaft (Theory only).	7	20%
END SEMESTER EXAM			

Question Paper Pattern

Maximum marks: 100

Time: 3 hours

The question paper should consist of three parts

Part A

4 questions uniformly covering modules I and II. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B

4 questions uniformly covering modules III and IV. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C

6 questions uniformly covering modules V and VI. Each question carries 10 marks
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed.