Course code	Course Name	L-T-P – Credits	Year of Introduction
ME307	MACHINE DESIGN - I	3-1-0-4	2016

Prerequisite : Nil

Course Objectives

- To understand the basic components and layout of linkages in the assembly of a system/machine.

Syllabus

Introduction to design of riveted, threaded, and welded joints – springs and design –Design laws – stresses in components and machines.

Expected outcome.

- The students will become aware of the machine components, forces, stresses affecting them and the aspects of designing them.

Text Books:

1. R L Norton, Kinematics and Dynamics of Machinery, 1st ed., Tata McGraw Hill Education Private Limited, Delhi, 2004
2. S .S Rattan Theory of Machines, 3rd ed., Tata McGraw Hill Education Private Limited, Delhi, 2009

References:

1. J. E. Shigley, J. J. Uicker, Theory of Machines and Mechanisms, Oxford University Press, 2016
2. A. Ghosh, A. K. Malik, Theory of Mechanisms and Machines, Affiliated East West Press, 3e, 2006
3. C. E. Wilson, P. Sadler, Kinematics and Dynamics of Machinery, 3rd edition, Pearson Education, 2003
4. Holowenko, Dynamics of Machinery, John Wiley & Sons, 1995

Course Plan

Module	Contents	Hours	End Sem. Exam Marks
I	Classification of mechanisms – Basic kinematic concepts and definitions – Degree of freedom, Mobility – Kutzbach criterion, Gruebler's criterion – Grashof's Law –Kinematic inversions of four-bar chain, slider crank chains and double slider crank chains – Limit positions –Mechanical advantage – Transmission Angle -Coupler curves – Description of some common Mechanisms – Quick return mechanisms, Straight line generators	10	15%
II	Displacement, velocity and acceleration analysis of simple mechanisms – Graphical method – Velocity and acceleration polygons **Force analysis of machinery** - static and dynamic force analysis of plane motion mechanisms - graphical method - principle of superposition –matrix methods - method of virtual work.	10	15%
	FIRST INTERNAL EXAMINATION		
III	Governors: - terminology and classification ; Watt, Porter, Proel, Hartnell, Hartung, quality of governors,inertia governors- governor speed control Gyroscope: - Principle-Angular acceleration-Effect of gyroscopic	8	15%

	couple airplanes, and ships, stability of automobile and two wheel vehicles, Rigid disc at an angle fixed to a rotating shaft		
IV	Turning moment diagram and Flywheel: - coefficient of fluctuation of energy and speed- energy saved in a flywheel- force analysis, piston effort-crankpin effort- crank effort-turning moment diagrams for I.C. engines.	8	15%
SECOND INTERNAL EXAMINATION			
V	Cams and Followers: - types-follower motion-SHM-uniform velocity and acceleration- Cycloidal - displacement, velocity and acceleration curves-Cam profile-Reciprocating and oscillating followers-Tangent cams-Convex and concave cams with footed followers. Introduction to Polynomial cams. (Numerical problems)	10	20%
VI	Law of toothed gearing – Involutes and cycloidal tooth profiles –Spur Gear terminology and definitions –Gear tooth action – contact ratio – Interference and undercutting Gear trains – Speed ratio, train value – Parallel axis gear trains– Epicyclic Gear Trains (Numerical problems)	10	20%
END SEMESTER EXAM			

QUESTION PAPER PATTERN

Maximum Marks :100 Exam Duration: 3 Hours

PART A

4 Questions uniformly covering modules 1 and 2. Each question carries 10 marks. Students will have to answer any three questions out of four. (3X10=30 marks)

PART B

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

PART C

6 Questions uniformly covering modules 5 and 6. Each question carries 10 marks. Students will have to answer any four questions out of six. (4X10=40 marks)

Note: Each question can have maximum of 4 sub questions (a, b, c, d)