Course code	Course Name	L-T-P-Credits	Year of Introduction
ME401	DESIGN OF MACHINE ELEMENTS - I	3-1-0-4	2016

Prerequisite: ME201 Mechanics of Solids

Course Objectives:

- To review concepts of statics and strength of materials.
- To introduce fundamental approaches to failure prevention of components.
- To provide knowledge in the design of common machine elements such as fasteners, shafts, springs cotter joints and couplings.

Syllabus

Introduction to Design, Materials and their properties, Theories of Failure, Shock and impact loads,Threaded Joints, Bolted joints, Design of riveted joints, Cotter and Knuckle joints, Design of welded joints, Helical springs, Leaf springs, Shafting, Design of Coupling.

Expected outcome:

The students will be able to

i. Find out various stresses induced in a machine element under different type of loading conditions.
ii. Devise machine components for its conceptual design.

Text Books:

1. Jalaludeen , Machine Design, Anuradha Publications, Chennai,2014
2. R. L. Norton, Machine Design – An Integrated Approach, Pearson Education, 2001
3. V.B.Bhandari, Design of Machine elements, McGraw Hill, 2010

Data books permitted for reference in the final examination:

1. K. Mahadevan, K.Balaveera Reddy, Design Data Hand Book, CBS Publishers & Distributors, 2013
2. NarayanaIyengar B.R & Lingaiah K, Machine Design Data Handbook, Tata McGraw Hill/Suma Publications, 1984
3. PSG Design Data, DPV Printers, Coimbatore, 2012

References Books:

1. J. E. Shigley, Mechanical Engineering Design, McGraw Hill,2003
2. Juvinall R.C & Marshek K.M., Fundamentals of Machine Component Design, John Wiley,2003
3. M. F. Spotts, T. E. Shoup, Design of Machine Elements, Pearson Education, 2006
4. Rajendra Karwa, Machine Design, Laxmi Publications,2006

Course Plan			
Module	**Contents**	**Hours**	**End Sem. Exam Marks**
I	Introduction to Design- Definition, steps in design process, preferred numbers, standards and codes in design	4	15%
	Materials and their properties- Elastic and plastic behaviour of metals, ductile and brittle behaviour, shear, bending and torsional stresses, combined stresses, stress concentration factor.	5	
II	Theories of Failure- Guest's Theory, Rankine's Theory, St. Venant's Theory, Haigh's Theory, and Von Mises and Hencky Theory.	5	15%
	Shock and impact loads, fatigue loading, endurance limit stress, factors affecting endurance limit, factor of safety	6	
FIRST INTERNAL EXAM			
III	Threaded Joints- Terminology, thread standards, types of threads, stresses in screw threads	3	15%
	Bolted joints- effect of initial tension, eccentric loading, design of bolts for static and fatigue loading, gasketed joints, power screws	4	
IV	Design of riveted joints- Material for rivets, modes of failure, efficiency of joint, design of boiler and tank joints, structural joints	4	15%
	Cotter and Knuckle joints- Gib and Cotter Joint, analysis of knuckle joint.	4	
	Design of welded joints- welding symbols, stresses in fillet and butt welds, Butt joint in tension, fillet weld in tension, fillet joint under torsion, fillet wed under bending, eccentrically loaded welds.	4	
SECOND INTERNAL EXAM			
V	Springs- classification, spring materials, stresses and deflection of helical springs, axial loading, curvature effect, resilience, static and fatigue loading, surging, critical frequency, concentric springs, end construction.	5	20%
	Leaf springs- Flat springs, semi elliptical laminated leaf springs, design of leaf springs, nipping	4	
VI	Shafting- material, design considerations, causes of failure in shafts, design based on strength, rigidity and critical speed, design for static and fatigue loads, repeated loading, reversed bending	5	20%
	Design of Coupling- selection, classification, rigid and flexible coupling, design of keys and pins	3	
END SEMESTER EXAM			

Question paper pattern

Use of approved data book permitted

Maximum marks: 100 **Time: 3 hrs**

The question paper should consist of three parts

Part A
There should be 3 questions from module I and II and at least 1 question from each module
Each question carries 15 marks
Students will have to answer any 2 questions out of 3 (2X15 marks =30 marks)

Part B
There should be 3 questions from module III and IV and at least 1 question from each module
Each question carries 15 marks
Students will have to answer any 2 questions out of 3 (2X15 marks =30 marks)

Part C
There should be 3 questions from module V and VI and at least 1 question from each module
Each question carries 20 marks
Students will have to answer any 2 questions out of 3 (2X20 marks =40 marks)

Note: Each question can have a maximum of four sub questions, if needed.