II B. Tech – II Semester

(20ME4006) DESIGN OF MACHINE MEMBERS-I

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

Pre-Requisites: Engineering mechanics, Mechanics of solids
Course Objectives:

- The student shall gain appreciation and understanding of the design function in mechanical engineering, the steps involved in designing and the relation of design activity with manufacturing activity, select proper materials to different machine elements based on their physical and mechanical properties.
- The student shall learn and understand of the different types of failure modes and criteria, Procedure for designing the different machine elements and understand the standards of design.

UNIT – I:
Introduction: Stages in design, Standardization, Interchangeability, Preferred numbers, Engineering materials, Ferrous, Non-ferrous, Non-metals, Indian standard specifications for ferrous materials
Design for static strength:
Fundamentals of Machine Design, Allowable stress, Factor of safety, Static loads – Types of loads, Members under combined loads, theories of failure.

UNIT – II:
Stress concentration – explanation and examples, Reduction of stress concentration, Determination of stress concentration factor, combined stress concentration factor, Problems.

Design for fatigue strength: S-N diagram, low cycle fatigue, high cycle fatigue, Endurance limit. Modifying factors– size effect, surface effect, stress concentration effects; Fluctuating stresses, Fatigue strength under fluctuating stresses, goodman's line – soderberg's line, modified goodman's line, Gerber's parabola.

UNIT – III:
Mechanical joints: Riveted Joints – Types, rivet materials, Failures of Riveted joints, Efficiency, Boiler Joints, Tank and Structural Joints, riveted brackets.
Welded joints – Types, strength of butt and fillet welds, Eccentrically loaded welds.
Fasteners - Design of keys-stresses in keys-cotter joints-socket and spigot, sleeve and cotter, Gib and cotter joint- knuckle joint.

UNIT – IV:
Design of Shafts- Torsion of shafts, design for strength and rigidity, with steady loading, ASME and BIS codes for design of transmission shafting, shafts under fluctuating and combined loads.
Shaft Coupling: Rigid couplings – muff, split muff and flanged coupling, protected flanged coupling, bushed pin type flexible coupling.

UNIT – V:
Springs: Types of springs - stresses in Helical coil springs of circular and non-circular cross sections. Tension and compression springs, springs under fluctuating loads, Leaf Springs: Stresses in leaf springs. Equalized stresses, – Energy stored in springs.

Note: Design data book is NOT Permitted for examination

Course Outcomes:

A student who successfully fulfills this course requirement will be able to:

S. No	Course Outcome	BTL
CO1	Calculate different stresses in the machine components subjected to various static loads, failures and suitability of a material for an engineering application.	L2
CO2	Calculate dynamic stresses in the machine components subjected to variable loads.	L2
CO3	Design riveted, welded, bolted joints, keys, cotters and knuckle joints subjected to static loads and their failure modes	L2
CO4	Design the machine shafts and suggest suitable coupling for a given application.	L4
CO5	Calculate stresses in different types of springs subjected to static loads and dynamic loads	L4

Correlation of Cos with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	2	1	0	3	2	1	1	3	2
CO2	3	3	2	3	1	1	3	1	2	1	0	1	2	2
CO3	3	3	3	3	1	3	1	1	2	3	2	0	3	2
CO4	3	3	2	2	2	3	2	0	3	1	1	1	3	1
CO5	3	3	3	3	2	2	1	3	1	3	1	0	3	2

Text Books:

1. Machine Design/ Shigley, J.E/McGraw Hill
2. Machine Design/V.B.Bhandari/ McGrawHill Education

References:

1. Machine design / Schaum Series/McGrawHill Professional
2. Machine Design / Norton/ Pearson publishers
3. Machine design / NC Pandya & CS Shah/Charotar Publishing House Pvt. Limited