DESIGN OF MACHINE MEMBERS - I

B.Tech. III Year I Sem.	**L**	**T/P/D**	**C**
Course Code: **ME501PC**	**4**	**1/0/0**	**4**

Note: Design Data books are not permitted in the Examinations. The design must not only satisfy strength criteria but also rigidity criteria.

Pre-requisites: Engineering mechanics, mechanics of solids, manufacturing processes, metallurgy and material science.

Course Objectives:

- To understand the general design procedures and principles in the design of machine elements.
- To study different materials of construction and their properties and factors determining the selection of material for various applications.
- To determine stresses under different loading conditions.
- To learn the design procedure of different fasteners, joints, shafts and couplings.

Course Outcomes:

- The student acquires the knowledge about the principles of design, material selection, component behavior subjected to loads, and criteria of failure.
- Understands the concepts of principal stresses, stress concentration in machine members and fatigue loading.
- Design on the basis of strength and rigidity and analyze the stresses and strains induced in a machine element.

UNIT – I

Introduction: General considerations in the design of Engineering Materials and their properties – selection –Manufacturing consideration in design. Tolerances and fits –BIS codes of steels.

Design for Static Strength: Simple stresses – Combined stresses – Torsional and Bending stresses – Impact stresses – Stress strain relation – Various theories of failure – Factor of safety – Design for strength and rigidity – preferred numbers. The concept of stiffness in tension, bending, torsion and combined situations.

UNIT – II

Design for Fatigue Strength: Stress concentration–Theoretical stress Concentration factor– Fatigue stress concentration factor- Notch Sensitivity – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Gerber's curve– Modified Goodman's line– Soderberg's line.

UNIT – III

Riveted, Welded and Bolted Joints: Riveted joints- methods of failure of riveted joints-strength equations-efficiency of riveted joints-eccentrically loaded riveted joints.

Welded joints-Design of fillet welds-axial loads-circular fillet welds under bending, torsion. Welded joints under eccentric loading.

Bolted joints – Design of bolts with pre-stresses – Design of joints under eccentric loading – locking devices – bolts of uniform strength.

UNIT – IV

Keys, Cotters and Knuckle Joints: Design of keys-stresses in keys-cottered joints-spigot and socket, sleeve and cotter, jib and cotter joints-Knuckle joints.

UNIT – V

Shafts: Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads – Shaft sizes – BIS code. Use of internal and external circlips, Gaskets and seals (stationary & rotary)

Shaft Couplings: Rigid couplings – Muff, Split muff and Flange couplings. Flexible couplings – Flange coupling (Modified).

TEXT BOOKS:

1. Design of Machine Elements / V. Bhandari / Mc Graw Hill
2. Machine Design / Jindal / Pearson

REFERENCE BOOKS:

1. Design of Machine Elements / V. M. Faires / Macmillan
2. Design of Machine Elements-I / Annaiah, M.H / New Age