3. Syllabus

NR23 B.Tech ME Syllabus **NRCM**

23ME502: DESIGN OF MACHINE ELEMENT

B.Tech III Year I Sem

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Note: Design Data Book is permitted. Design of rivets, welded joints, knuckle joint, cotter joint and shaft coupling components should include design for strength and rigidity apart from engineering performance requirements.

Prerequisites: 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- 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-cotter joints-spigot and socket, sleeve and cotter, Gib 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. - 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 / Kannaiah, M.H / New Age