JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF MECHANICAL ENGINEERING

II Year - II Semester		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
DESIGN OF MACHINE MEMBERS – I					

Course Objectives:

1. 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
2. Able to select proper materials to different machine elements based on their physical and mechanical properties.
3. Learn and understand of the different types of failure modes and criteria.
4. Procedure for the different machine elements such as fasteners, shafts, couplings, keys, axially know loaded joints etc.
5. To be able to know standards in design.

UNIT – I

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

STRESSES IN MACHINE MEMBERS: 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 – static strength design based on fracture toughness.

UNIT – II

STRENGTH OF MACHINE ELEMENTS: Stress concentration – theoretical stress concentration factor – fatigue stress concentration factor notch sensitivity – design for fluctuating stresses – endurance limit – estimation of endurance strength – goodman's line – soderberg's line – modified goodman's line, Gerber's parabola.

UNIT – III

RIVETED AND WELDED JOINTS – design of joints with initial stresses – eccentric loading.

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

KEYS, COTTERS AND KNUCKLE JOINTS: Design of keys-stresses in keys-cotter joints-spigot and socket, sleeve and cotter, jib and cotter joints- knuckle joints.

UNIT – IV

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 COUPLING: Rigid couplings – muff, split muff and flange couplings: rigid flanged coupling, protected rigid flanged coupling, Bushed pin type flexible coupling.

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UNIT – V
MECHANICAL SPRINGS:
Stresses and deflections of helical springs – extension -compression springs – springs for fatigue loading, energy storage capacity – helical torsion springs – co-axial springs, leaf springs.
Note: Design data book is NOT Permitted for examination

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

COURSE OUTCOMES:
Students must be able to
1. Calculate different stresses in the machine components subjected to various static loads, failures and suitability of a material for an engineering application.
2. Calculate dynamic stresses in the machine components subjected to variable loads.
3. Design riveted, welded, bolted joints, keys, cotters and knuckle joints subjected to static loads and their failure modes
4. Design the machine shafts and suggest suitable coupling for a given application.
5. Calculate stresses in different types of springs subjected to static loads and dynamic loads.