

DESIGN OF MACHINE ELEMENTS -II

Course Code:13ME1126

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Pre requisites:

Engineering Mechanics, Mechanics of Solids, Material Science, Kinematics of Machines, Dynamics of Machinery and Design of Machine Elements-I

Course Outcomes:

At the end of the course, the student will be able to

- CO 1** Explain basic concepts, application and design of threaded fasteners and devices
- CO 2** Design shafts, keys, couplings and welded joints for static and fluctuating loads
- CO 3** Explain the theory and design sliding and rolling contact bearings for static and dynamic loads
- CO 4** Explain the theory and design springs, chain and rope drives
- CO 5** Design spur and helical gears.

UNIT-I

(12 Lectures)

THREADED FASTENERS:

Introduction, threaded forms, terminology, standards, threaded fastener types, materials, bolt tightening, initial tension, thread locking, bolt design for static loads, axial and eccentric and fatigue loads.

POWER SCREWS:

Introduction, comparison of types of power screw threads, differential and compound power screws, derivations for torque for lifting, lowering, self locking conditions , efficiency, effect of collar friction, design of power screws, applications, screw jack, C- clamp.

UNIT-II**(12 Lectures)****SHAFT, KEYS AND COUPLINGS:**

Introduction, terminology, overall shaft design, axial bending and torsional loading design for torsional rigidity, keys, pins and splines, types of couplings, concept of shaft alignment.

WELDED JOINTS:

Introduction, types of welded joints, static, axial, direct shear, torsion, bending loads, fatigue considerations

UNIT-III**(12 Lectures)****BEARINGS:**

Introduction, sliding bearings, basic concepts of hydrostatic and hydrodynamic lubrication, Petroff, Steinbeck, Mc Kee's equations, bearing design, design charts, heat dissipation and equilibrium oil film temperature, rolling contact bearings – Introduction, types, comparison with sliding element bearings, design and selection of rolling bearings – static loads dynamic load, life, reliability, influence of axial load, variable loads.

UNIT-IV**(12 Lectures)****SPRINGS:**

Introduction, types and terminology, design of helical springs – static and fluctuating loads, shear stress, deflection, spring rate, initial compression, types of ends, buckling, surging, helical torsion springs, leaf springs – bending stress, deflection.

Chain drives, wire ropes: Introduction to chain drives, roller chains, inverted – tooth chains, geometric relationships, polygon effect, power rating, design of chain drives. Wire rope types – construction, breaking strength, selection of wire ropes

UNIT-V**(12 Lectures)**

Spur and helical gears: Spur Gears, gear tooth strength, basic analysis of gear tooth bending stress (Lewis equation), velocity factor, service factor, overload correction factor, Buckingham equation for incremental dynamic load, gear tooth surface durability and fatigue

analysis, helical gears – geometry, force analysis, tooth bending, surface fatigue strength.

TEXT BOOKS:

1. RC Juvinall & K M Marshek, “*Fundamental of Machine Components Design*”, John Wiley&Sons, 5th Edition, 2011.
2. Design Data Hand Book, PSG College of Technology, Coimbatore, 1992.

REFERENCE:

V. B. Bhandari, “*Design of Machine Elements*”, 3rd Edition, Tata McGraw-Hill, 2010.

Note: Design Data Book to be permitted during the examination

