

ME208: FUNDAMENTALS OF MACHINE DESIGN
CREDITS = 6 (L=4, T=0, P=2)

Course Objective:

To impart fundamentals required for the design and analysis of mechanical components subjected to various loading conditions leading to preparation of assembly and production drawings.

Teaching and Assessment Scheme:

Teaching Scheme			Credits	Assessment Scheme				
L	T	P		Theory		Practical		Total Marks
			ESE	CE	ESE	CE		
4	0	2	6	70	30	30	20	150

Course Contents:

Unit No.	Topics	Teaching Hours
1	<p><u>Design consideration of Machine Parts:</u> Definition and understanding of various types of design, Design procedure, Selection of materials, Properties and I.S. coding of various materials, Factor of safety, Types of stresses, Theory of bending, Theory of torsion, Theories of Failures: Distortion energy (Von Mises), Maximum shear stress, Maximum principal stress, Coulomb-Mohr theory, Selection and Use of theories of failures, Stress concentration and methods of relieving stresses, Application Problems: Eccentric loading, Design and analysis of levers: Cranked, Bell crank, Foot, Rocker arm.</p>	12
2	<p><u>Columns and Struts:</u> Compressive axial loading of columns and struts, Slenderness ratio, Compressive stress and buckling of members, Effect of end conditions; Euler's Formula, Applications, Validity and limitations; Rankine's formula, Johnson's equation; Eccentric loading of long columns.</p>	05

Unit No.	Topics	Teaching Hours
3	<p><u>Design Of Joints:</u> <u>Design of Riveted Joints:</u> Types of riveted joints, Rivet materials, Terminology, Types of failure, strength and efficiency of joint, Caulking and Fullering, Longitudinal and Circumferential lap joint, Eccentrically loaded riveted joint.</p> <p><u>Design of Welded Joints:</u> Types of welded joints, Stresses in welded joints, Design for various loading conditions in torsion, shear, or direct load, Eccentrically loaded welded joints.</p> <p><u>Design of Threaded Joints:</u> Basic types of screw fastening, Cap and Set screw, Bolt of Uniform strength, locking devices, Terminology of Screw thread, Designation of screw threads as per IS:4218, Bolted Joint: Simple and Eccentric loading, Torque requirement for bolt tightening, Elastic analysis of bolted joints.</p> <p><u>Miscellaneous Joints:</u> Design of Cotter joints, Knuckle joint and Turn buckle.</p>	18
4	<p><u>Power Screws:</u></p> <p>Types of power screw threads, Design of screw with different types of threads used in practice, Design of nuts, Design of C-clamp, Design of screw jack, Design of toggle jack.</p>	04
5	<p><u>Shafts, Keys and Couplings :</u></p> <p>Design of solid and hollow shaft for transmission of torque, bending moment and axial forces, Design of shaft for rigidity and stiffness. Design of different types of keys, Concept of rigid and flexible couplings, Design of Rigid couplings, Design of Flexible couplings.</p>	10
6	<p><u>Limits, Fits and Tolerances:</u></p> <p>Introduction, Basic definitions, Maximum Metal Condition, Least Metal Condition, Linear and angular tolerances, Tolerance grades, Fundamental deviations, Types of fits and its basis, Types of gauges.</p> <p><u>Introduction to GD & T:</u></p> <p>Basic terminology of GD & T, Different tolerance characteristics, symbols and tolerance modifiers, Different aspects of datum, Parameters of surface texture and qualifications, Roughness and Machining symbols indication on drawings, Surface Lay Indication.</p>	03
TOTAL		52

List of References:

1. V B Bhandari, "*Design of Machine Elements*", Tata McGraw Hill publishing Co.
2. Farazdak Haideri, "*Design of Machine Elements*", Nirali Prakashan.
3. P C Sharma and D K Agrawal, "*Machine Design*", S.K. Kataria & Sons.
4. S G Kulkarni, "*Machine Design - Solved Problems*", Tata McGraw Hill publishing Co.
5. William Orthein, "*Machine Component Design*" (Vol. I & II), M/s. Jaico publishing.
6. P C Gope, "*Machine Design: Fundamentals and Applications*", PHI.
7. R C Juvinall, "*Fundamentals of Machine Component Design*", Wiley.
8. Shigley, "*Machine Design*", Tata McGraw hill publishing Co.
9. R L Norton, "*Machine Design: An Integrated Approach*", Pearson
10. Sham Tickoo, "*AutoCAD*", and CENGAGE learning Indian Edition.
11. IS SP 46, 2003.

Course Outcomes (COs):

At the end of this course students will be able to ...

1. Apply the principles of strength of materials to design the components subjected to various mechanical loads.
2. Design columns and struts with different end conditions
3. Identify and design welded / riveted / threaded joints.
4. Design and analyze power screw for mechanical application.
5. Design and analyze shafts, keys and couplings.
6. Apply preliminary methods to generate and interpret assembly and production drawings.