

Subject Code: 01ME2401
Subject Name: Machine Design & Industrial Drafting
B. Tech. Year - II (Semester - 4)

Type of course : Core

Prerequisite : Engineering Graphics, Fundamentals of Machine Design.

Rationale : The objective of this course is to introduce design concepts and procedures necessary to design and select a machine element.

Course Outcome :

After completion of this course, student will be able to

1. Understand the stresses in machine elements due to various types of loads.
2. Understand different theories of failure and its application for design of machine elements.
3. Design and analyze various joints and fasteners.
4. Design and analyze shaft, key and coupling.
5. Design and analyze lever and column for stresses and deflection.

Teaching and Examination Scheme :

Teaching Scheme			Credits	Examination Marks					Total Marks
THEORY	TUTORIAL	PRACTICAL		Theory Marks			Practical Marks		
			ESE(E)	IA	CSE	Viva (V)	Term Work (TW)		
4	--	--	4	50	30	20	--	--	100

Content :

Sr. No.	Content	Total Hrs.
1	<p>Principal Stresses: Introduction: Two-dimensional stress system. Evaluation of stresses in an inclined plane for members subjected to orthogonal stresses. Definition of principal plane, principal stresses, angle of obliquity, and resultant stress. Principal Stress and Strain: Evaluation of Principal plane and principal stresses using analytical method. Analysis of Principal stresses and principal planes for two-dimensional stress system. Application of Mohr's circle and ellipse of stress.</p>	05
2	<p>Design concepts of Mechanical Components: Different theories of Failures and its limitation and application for Different theories i.e., Distortion energy, Maximum Shear stress, Maximum Principal stress, Coulomb-Mohr Theory, Factor of safety and its different parameters for selection, Selection of theories of failures and Use of theories of failures; Contact stresses, Crushing and</p>	06

	Bearing pressure.	
3	<p>Design of mechanical joints: Temporary joints: Cotter and Knuckle joints: Design of Cotter and Knuckle Joints. Screw and nut: Different types of thread for Single as well as Multiple threaded screw, screw fastening and its types, Cap and Set screw, concept of uniform strength in bolt, locking devices, Different Terms of Screw thread. Torque calculation for bolt tightening. Design of power screw: Different terms used to describe power screw, Calculation of torque required for lifting and lowering of Load, Efficiency of threads, Self-locking phenomenon, Co-efficient of friction.</p>	10
4	<p>Design of mechanical joints: Permanent joints: Welded joints: Different types of welded joints and stress relieving methods in weld joints, Strength of butt and fillet joint, Eccentric loading in the plane of weld, welded joint subjected to bending and torsion. Riveted joints: material selection and criteria for rivet joints and types of its failure, riveted joints efficiency and strength calculation, strengthen method for riveted joints like Caulking and Fullering, Longitudinal lap joint and Circumferential lap joint, Eccentric loading condition in riveted joint.</p>	10
5	<p>Design of shaft: Design of solid and hollow circular shaft subjected to torque as well combined loading; Design of shaft based on rigidity and stiffness.</p>	10
6	<p>Design of machine component: Design of key: Saddle, Sunk, Woodruff, Square, and Flat. Design of coupling: Design and Concept of Couplings, Rigid coupling, Flexible coupling.</p>	06
7	<p>Design of lever: Cranked, Bell crank, Foot, Rocker arm. Design of column: Type of loading compressive axial loading of columns and struts.</p>	08
8	<p>Limit, Fit, Tolerance & Surface Roughness: Basic terminology of GD & T, Allowance, Clearance, Maximum Metal Condition, Least Metal Condition, Types of Fits with application, Basis of Limit System, BIS system of fits and tolerances, Geometric tolerance, symbols and tolerance modifiers, Different aspects of datums, Parameters of surface texture and qualifications, Relation of surface roughness and various manufacturing processes, Surface Lay Indication.</p>	--

Distribution of Theory Marks

R Level	U Level	A Level	N Level	E` Level	C Level
20	30	25	15	10	--

Legends: R: Remember; **U:** Understand; **A:** Apply; **N:** Analyze; **E:** Evaluate; **C:** Create

Reference books :

1. Design of Machine Elements, V B Bhandari, 5/e, McGraw Hill.
2. Machine Design: Fundamentals and Applications, P C Gope, 1/e PHI Learning.
3. Fundamentals of Machine Component Design, R C Juvinall, 5/e, Wiley.
4. Machine Design: An Integrated Approach, R L Norton, 6/e, Pearson.
5. Shigley's Mechanical Engineering Design, Richard Budynas, Keith Nisbett, 11/e, McGraw Hill.
6. Design of Machine Elements, Sadhu Singh, 5/e Khanna Publishers.
7. Design of Machine Elements, C. S. Sharma, Kamlesh Purohit, 1/e, PHI Learning.
8. Machine Design, Abdul Mubeen, 5/e, Khanna Publishers.

List of Open Base Software / learning website :

1. <https://nptel.ac.in/courses/112/105/112105124/>
2. <https://swayam.gov.in/>
3. <https://www.coursera.org>