

Subject Code: 1ET1010403	Subject Title: Machine Design & Industrial Drafting
Pre-requisite Subject	Mechanics of Solids, Engineering Drawing

Course Objective:

This course will help student to

1. To present a problem oriented in depth knowledge of Machine Design and Industrial Drafting
2. To address the underlying concepts and methods behind Machine Design and Industrial Drafting
3. To impart basic skills for analysis of mechanical component designed.
4. To communicate assembly and production drawings for the components designed.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total (T+P)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
4	-	2	5	70	30	30	20	150

Subject Contents				
Sr. No.	Topic	Total Hours	Weight (%)	
01	Design Consideration of Machine Parts: Introduction to machine design, Theories of failures (Distortion energy (Von Mises), Maximum shear stress, Maximum principal stress, Coulomb – Mohr theory, Selection & Use of theories of failures.	07	08	
02	Cotter and Knuckle Joint: Design of simple cotter joint, Sleeve and Cotter joint, Gib and Cotter joint, Design of knuckle joint.	08	12	
03	Levers: Types of levers, Design of hand lever, Design of foot lever, Design of cranked lever, Design of lever of a safety valve, Design of bell-crank lever, Design of rocker-arm lever.	06	10	
04	Beams and Columns: Different types of supports/end conditions, types of loading, slenderness ratio, Euler's formula, applications, Rankine's formula, Johnson's equation, Eccentric loading of long columns.	05	08	
05	Shafts: Design of solid and hollow circular shaft subjected to torque and combined loading, Design of shaft for rigidity and stiffness.	06	12	
06	Key and Couplings: Design of key: Saddle, Sunk, Woodruff, Square, Flat, Kennedy key & Splines, Design of couplings: Concept of rigidity and flexible couplings, Design of Clamp, Rigid, Flange & Flexible couplings.	07	14	
07	Power Screws: Terminology of power screw, Types of threads, Torque requirement of lifting/lowering, Self-locking and Over hauling, Design of nuts, Design of c-clamp, Design of screw jack, Design of toggle jack, Design of	09	14	

	turnbuckle.		
08	Welded and Riveted Joints : Welded Joints : Stress relieving of welded joints, Strength of butt and fillet joint, Eccentric load in the plane of weld, Welded joint subjected to bending & torsion Riveted Joints : Rivet materials, Types of failure, Strength & Efficiency of joint, Caulking and Fullering, Longitudinal and Circumferential lap joint, Eccentrically loaded riveted joint.	10	14
09	Tolerances, Limits, and Fits: Introduction, Basic definitions, Basic terminology of GD&T, Different tolerance characteristics, Symbols and tolerance modifiers, Parameters of surface texture and qualifications, Relation of surface roughness and various manufacturing processes, Surface lay diagram.	**	08

**** Should be covered during laboratory sessions.**

Course Outcomes:

The student will be able to

1. Know behavior and properties of engineering materials pertaining to design.
2. Identify functional characteristics of various machine elements.
3. Design various joints like cotter joint, knuckle joint, welded joint and riveted joint used in mechanical system.
4. Interpret and prepare industrial drawings of different machine components.
5. Understand the basic of mechanical design process and design of simple machine components like shaft, key, coupling, lever power screw etc.
6. Apply the knowledge of computer aided drafting tools to prepare production drawings of machine components.

List of References:

1. V. B. Bhandari, "Design of Machine Elements", Tata McGraw-Hill Education, 3rd Edition
2. P.C. Sharma, D. K. Aggarwal, "A Textbook of Machine Design", S.K. Kataria & Sons, Edition 2013
3. Sharma C. S., Purohit Kamlesh, "Design of Machine Elements", PHI Learning, 1st Edition.
4. Dieter George, Schmidt Linda C, "Engineering Design", McGraw Hill Education, Indian Edition
5. Norton R.L, "Machine Design" An Introduction, Pearson.
6. Shigley, J.E and Mischke, C. R. Mechanical Engineering Design, 6/e, Tata McGraw Hill,
7. PS College of Technology, Design Data Book, DPV Printers, Coimbatore
8. Mahadevan & Reddy, Design Data Book, CBS Publishers & Distributors Pvt Ltd.
9. Bhatt N.D.Panchal V.M." Machine Drawing", Charotar Publishing House Pvt Limited,

Note: Use of Design data book during the Lectures/Practical sessions is desirable.

Syllabus for Laboratory:

1. Design of Machine Elements and Preparation of Report :

- a) Solve problems related to eccentric loading : Cotter and Knuckle joints, Design & Analysis of levers (Cranked, Bell crank, Foot, Rocker-arm)
- b) Case studied for design of parts subjected to buckling
- c) Design of shaft
- d) Design of couplings
- e) Design of screw jack, c-clamp, & toggle jack
- f) Problems for design of joints using welding & riveting

2. Design & Assembly and Detail Drawing of :

- a) Cotter joint/ Knuckle joint (one sheet)
- b) Coupling (one sheet)

Note: (Drawing should be on A1 size both detail & Assembly)

3. Drafting and Modeling of Mechanical Components

Preparation of assembly and detailed drawing of machine components, assembly using drafting software

List of open Source Software/ Learning website:

1. <http://www.nptel.ac.in/courses/112105125>
2. <https://ocw.mit.edu/courses/mechanical-engineering/2-72-elements-of-mechanical-design-spring-2009/lecture-notes/>