

Subject Code: 01ME0401

Subject Name: Machine Design & Industrial Drafting

B.Tech. II Year (Sem- IV) Mechanical & Automobile Engineering

Type of course: Under Graduate

Prerequisite: Engineering Graphics, Mechanics of Solid.

Rationale: Understanding the Geometrical Dimension and Tolerance for Production Drawing & Design the Machine Component.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
L	T	P		Theory Marks			Practical Marks		
			ESE(E)	IA	CSE	Viva (V)	Term Work		
4	0	2	5	50	30	20	25	25	150

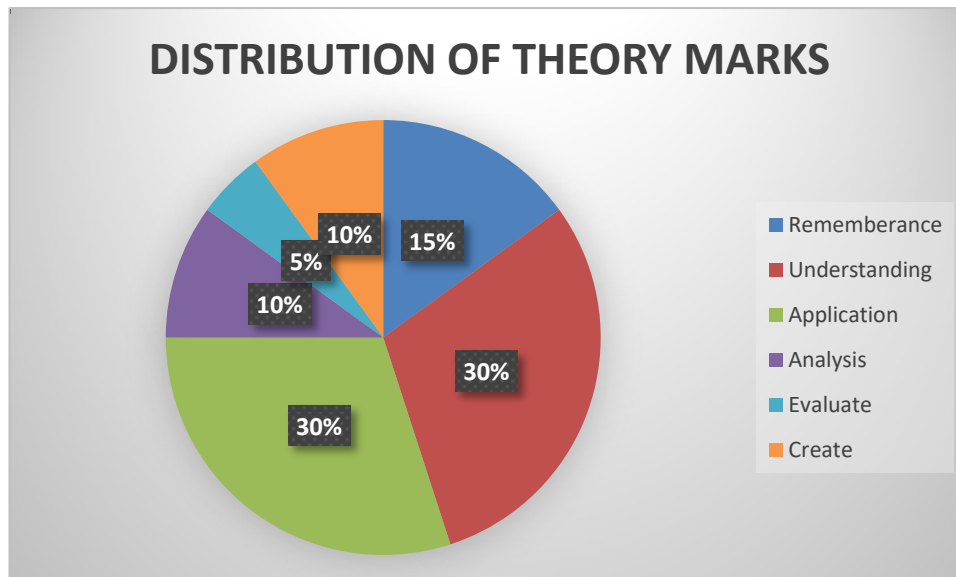
Content:
Syllabus is divided in Two Major Portion –I Machine Design Chapter No 1, 2, 3.

Portion –II Industrial Drafting Chapter 4 & 5.

Sr. No.	Content	Total Hrs	% Weight age
1	Introduction: Concepts of stresses and Strain, Combinations of Axial, Shear, Torsional and Bending loads; Theories of Failures: Distortion energy (von Mises), Maximum-Shear stress, Maximum Principal stress, Coulomb-Mohr Theory, Selection and Use of theories of failures; Factor of safety, Contact stresses, Crushing and Bearing stress.	10	20%

2	<p>Design of Machine Component : Temporary Joint <u>Cotter and Knuckle Joints</u> : Design of Cotter and Knuckle Joints <u>Design of screw and nut</u> : Forms of thread, Single and Multiple threaded screw, Basic types of screw fastening, Cap and Set screw, Bolt of Uniform strength, locking devices , Terminology of Screw thread, <u>Bolted Joint</u>: Simple and Eccentric loading. Torque requirement for bolt tightening. <u>Design of Power screw</u> : Terminology of power screw, Torque requirement of lifting/lowering, Self-locking, Efficiency of threads, coefficient of friction.</p> <p>Design of Machine Component : Permanent Joint</p> <p>Welded 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 and torsion. Riveted Joints: Rivet materials, types of failure, strength and efficiency of joint, Caulking and Fullering, Longitudinal and Circumferential lap joint, Eccentrically loaded riveted joint</p>	20	38 %
3	<p>Design of Machine Component :</p> <p>Beams and Columns: Different types of supports / end conditions, Revision of Stresses in beams: Effect of Section, Orientation, and type of loading 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. Shafts, Keys and Couplings: Design of solid and hollow circular shaft subjected to torque and combined loading; Design of shaft for rigidity and stiffness; Design of Keys: Saddle, Sunk, Woodruff, Square, Flat. Design of Couplings: Concept of rigid and flexible couplings.</p> <p>Design and analysis of levers: Cranked, Bell crank, Foot, Rocker arm.</p>	22	42%
4	<p>Geometric Dimensioning and Tolerance (GD&T) : Basic terminology of GD & T , The three major benefits of geometric dimensioning and tolerance GD&T Concepts, Size Tolerance Machining flowchart, Necessity of dimensional tolerance , Tolerance dimensioning , Ways of expressing tolerance , Specifying the tolerance for the assembly , Tolerance vs. Manufacturing process.</p>	6	---

5	Limits , Fit, And Tolerances & Surface Roughness : Deviation , Basic hole system , Basic shaft system , IT grades , Different types of Fits between mating parts , Allowance , Clearance , Maximum Material Condition of a feature of size , Least Material Condition of a feature of Modifiers and Symbols , Five types of geometric characteristic symbols , Fourteen geometric characteristic symbols , Common modifying symbols used in geometric tolerance , Identifying the parts of a feature control frame , Identifying the additional symbols used in geometric tolerance Parameters of surface texture and qualifications, Relation of surface roughness and various manufacturing processes, Surface Lay Indication.	8	---
----------	--	----------	-----



Reference Books:

1. Design of Machine Elements, V B Bhandari, 3/e, McGraw Hill.
2. Machine Design: An Integrated Approach, R L Norton, Pearson
3. Machine Drawing, B Bhattacharyya, 1/e, Oxford Press.
4. Engineering Metrology and Measurements, N.V. Raghavendra & L. Krishnamurthy, Oxford Press.
5. Design data Book , PSG College of technology, Coimbatore
6. Design of Machine Elements M.F.Spotts,T.E.Shoup, L.E.Hornberger, C.V.Venkatesh(Pearson)
7. Indian Standard : B.I.S. : 1076-1967 Preferred Numbers , IS SP 46, 2003.
8. A Text Book Of Machine Design - R S Khurmi - S. Chand Publishing

Course Outcome:

After learning the course the students should be able to:

1. Student will be Understand the Important of GD & T.
2. Students will be able to generate and interpret assembly and production drawings in 2D Drafting Computer software Packages.
3. Students will be able to analyze components subjected to various mechanical loads.
4. Students will be able to analyze beams and columns for stresses and deflection.
5. Students will be able to design and analyze shafts, keys and couplings.
6. Students will be able to select fasteners and design welded / riveted joints.

List of Experiments:

Practical should be designed to include chapter no 4 & 5. Industrial Drafting Portion.

1. Problems related to Limits, fits and tolerances & Indian Tolerance Grade.

2. Introduction to computer aided drafting tools and 2D software Packages, Using drafting software, generate Assembly and Production drawings after completion of basic Drawing.
3. Understanding of Reverse Engineering and Draw at least two Assembly drawing and Detailed Drawing of Actual Machines per industrial Standard.
4. Case study on Drafting and Designing problem Any Real case of Industrial problem and Solution.

List of Assignment:

Assignment should be designed to include chapter no 1 , 2 & 3. Machine Design Portion.

1. Theory and Example on Beam & Column.
2. Theory and Example on Lever & Rocker Arm.
3. Theory and Example on Shaft , Key and Coupling.
4. Theory and Example on Power Screw.
5. Theory and Example on All Temporary Joint.
6. Theory and Example on All Permanent joint.

Major Equipment:

1. Computational facility.
2. CAD Software.
3. Workshop hand tool and Machinery.

Design based Problems (DP)/ Open Ended Problem:

Design / Analyse a mechanical structure which may involve different components included in Syllabus From Machine Design Portion. Prepare assembly and production drawings in 2D computer Graphics.

List of Open Source Software/learning website:

1. <http://nptel.iitm.ac.in>,