

Subject Code: 01ME1401

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.

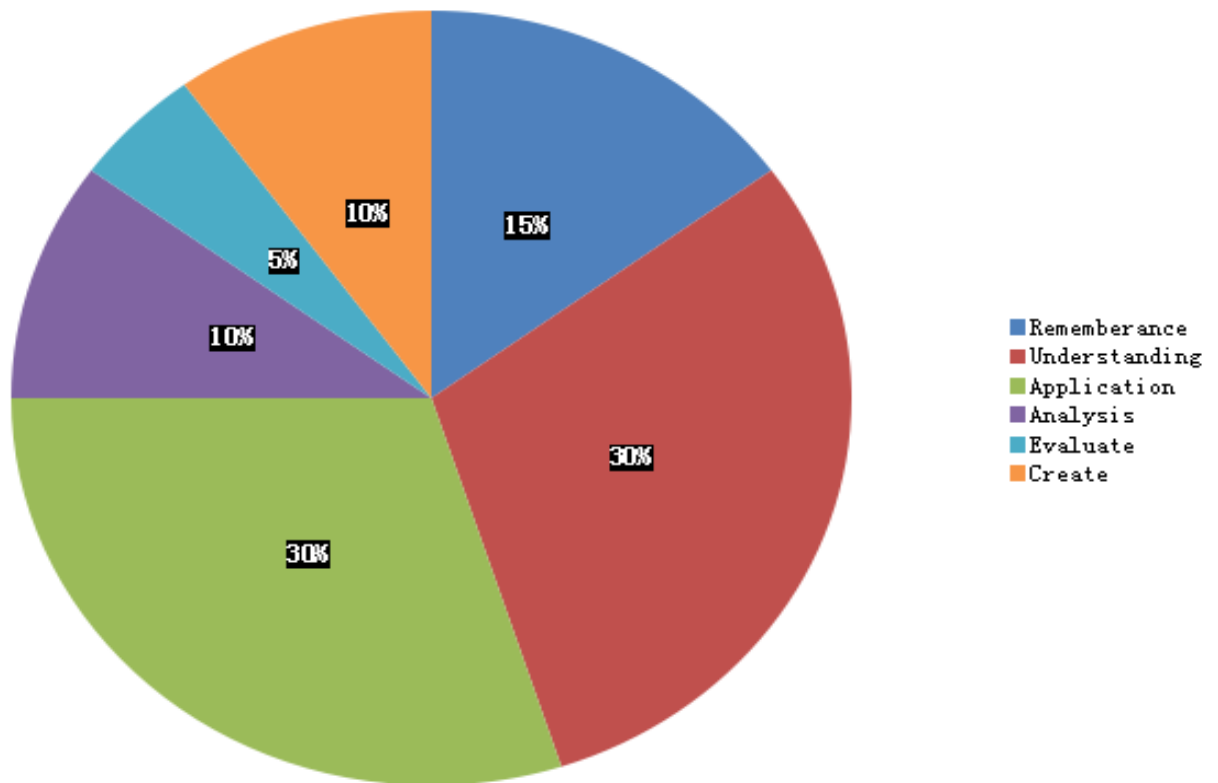
Portion –II Industrial Drafting Chapter 4 & 5 (To be covered in laboratory)

Sr. No.	Content	Theor y hrs	%Weight age
1	<p>Principle Stresses:</p> <p>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.</p> <p>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>	6	12%
2	<p>Design concepts of Mechanical Components:</p> <p>Concepts of stresses, Strain, strain and its relation, Shear loading and Torsion as well as Bending loads; 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 Bearing pressure.</p>	6	12%

3	<p>Design of Mechanical Joints :</p> <p>Temporary Joint</p> <p><u>Cotter and Knuckle Joints</u> : Design of Cotter and Knuckle Joints</p> <p><u>Screw and nut</u>: 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, Simple and Eccentric loading. Torque calculation for bolt tightening.</p> <p><u>Design of Power screw</u> :</p> <p>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> <p>Permanent Joint</p> <p>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.</p> <p>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>	20	38 %
4	<p>Design of Machine Component :</p> <p>Shafts, Keys and Couplings:</p> <p>Design of solid and hollow circular shaft subjected to torque as well combined loading; Design of shaft based on rigidity and stiffness; Design of Keys: Saddle, Sunk, Woodruff, Square, and Flat. Design and Concept of Couplings, Rigid coupling Flexible coupling.</p>	16	22%
5	<p>Design and analysis of levers: Cranked, Bell crank, Foot, Rocker arm.</p>	4	
6	<p>Columns: Type of loading compressive axial loading of columns and struts,</p>	4	
7	<p>Geometric Dimensioning and Tolerance (GD&T) :</p> <p>Basic terminology of GD & T , major advantages of geometric dimensioning and tolerance GD&T Concepts and its application, Size Tolerance Machining flowchart, Requirement of dimensional tolerance , Tolerance dimensioning , Methods of conveying tolerance in industrial drawing, Identifying the tolerance for the assembly drawing , Tolerance for Manufacturing process.</p>	6	To be covered in Lab

8	Limits , Fit, And Tolerances & Surface Roughness : Deviation , Hole and shaft basic system , Indian Tolerance grades , Different types of Fits with application , Allowance , Clearance , Maximum Material Condition of a feature of size , Minimum Material Condition of a feature of Modifiers and Symbols , Types of geometric characteristic symbols , Fourteen geometric characteristic symbols , Common modifying symbols used in geometric tolerance , Detecting the parts of a feature control frame , Detecting 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	To be covered in Lab
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DISTRIBUTION OF THEORY MARKS



Course Outcome:

After learning the course the students will be competent

1. To Recognize the Important of GD & T.
2. To generate and interpret assembly and production drawings in 2D Drafting Computer software Packages.
3. To analyze components subjected to various mechanical loads.
4. To analyze beams and columns for stresses and deflection.
5. To design and analyze shafts, keys and couplings.
6. 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 Examples (DE)/ Open Ended Example:

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 Base Software/learning website:

1. <http://nptel.ac.in/course.php>