

GANPAT UNIVERSITY

FACULTY OF U. V. PATEL COLLEGE OF ENGINEERING

Programme	Degree Engineering	Branch/Spec.	Automobile Engineering
Semester	IV	Version	1.0.0.0
Effective from Academic Year	2018-19	Effective for the batch Admitted in	June 2017
Subject code	2ME401	Subject Name	Fundamentals of Machine Design
Teaching scheme		Examination scheme (Marks)	
(Per week)	Lecture(DT)	Practical(Lab.)	Total
	L TU	P TW	
Credit	3 0	1 0	4
Hours	3 0	2 0	5
		CE	SEE
		40	60
		30	20
			Total
			100
			50

Pre-requisites:

None

Learning Outcome:

Learning Outcomes:

After completion of this course, student will be able to

- Know behavior and properties of engineering materials pertaining to design.
- Understand the concepts of factor of safety.
- Identify functional characteristics of various machine elements.
- Design and analyze different machine components such as shaft, key, coupling, lever, power screw etc.
- Design various joints like cotter joint, knuckle joint, welded joint and riveted joint used in mechanical system.
- Interpret and prepare industrial drawings of different machine components

Theory syllabus

Unit	Content	Hrs
1	<p>Introduction to machine design: Meaning of Design, Mechanical engineering design, Introduction to machine design, Phases in design, Requisites of design engineer, Preferred numbers & standards, Codes for materials Properties & application of engineering materials and their selection.</p>	2
2	<p>Design considerations: Direct stresses (Tensile and Compressive), Stress-strain diagram, Bending stresses, Bearing stresses, Torsional stresses, Eccentric loading, Principal stresses, Contact stresses, Castigliano's theory for determining deflections. Factor of safety and factor influencing it, Theories of failures.</p>	3
3	<p>Design of cotter and knuckle joint: Design of simple cotter joint, Sleeve and Cotter joint, Cotter foundation bolt, Gib and cotter joint, Design of knuckle joint</p>	7
4	<p>Design of shaft, keys & couplings: Design of shaft & axles on basis of bending, Torsion & combined loading, Shaft design on the basis of rigidity, Effect of keyways, Design of Square key, Rectangular key, Kennedy key, Splines, Design of Muff or Sleeve coupling, Clamp coupling, Flange coupling, Pin-bushed coupling.</p>	10
5	<p>Design of bolt and riveted joints: Riveted joints: Types of riveted joints, Design of double and triple riveted butt joint with equal and unequal cover plates, Design of riveted joint as per IBR, Design of lap joint, Lozenge joint Bolted joints: Definitions, Types of threads, Screw fastenings, Locking devices for nuts, Washers, Eye bolts, Efficiency of threads, Static stresses in screw fastenings Eccentric loading in riveted and bolted joints: a) Loading parallel to axis of bolts b) Loading perpendicular to axis of bolts c) Eccentric loading on circular base</p>	8
6	<p>Design of springs: Types of springs, Terminology related to springs, Types of end in helical springs, Design of helical spring, Wahl's factor, Spring in combination: parallel and series, Concentric spring, Design of leaf spring</p>	4

7	Design of 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.	6
8	Struts and columns: Design of connecting rod, Design of push rod, Design of piston rod	2
9	Power Screw: Types of threads, design of screw with different types of threads used in practice, design of nuts, design of C clamp, screw jack, design of toggle jack, design of coupler.	6

Practical content

1. Design of machine elements and preparation of report:

- a) Design of screw, nut and other parts
- b) Design of levers
- c) Design of couplings
- d) Design of spring
- e) Design of riveted joint
- f) Design of shaft
- g) Design of column
- h) Design consideration

2. Design & Assembly & detailed drawing of:

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

The design calculations are included in above detail syllabus above. At least one drawing should be production drawing out of above. Drawing should be on A2 size (both details and assembly)
Preparation of assembly and detail drawings of machine components.

3. Drafting and modeling of mechanical components:

Preparation of assembly & detail drawings of machine components, assembly using drafting package.

Text Books

1	V. B. Bhandari, "Design of Machine Elements", Tata McGraw-Hill Education, 3 rd Edition
2	U. C. Jindal, "Machine Design", Pearson Education, 2010

Reference Books

1	<u>Pandya & Shah, "Machine Design", Charotar Publishing House Pvt. Limited, 2006.</u>
2	<u>Richard Budynas (Author), Keith Nisbett, "Shigley's Mechanical Engineering Design", McGraw Hill Education (India) Private Limited, 9th Edition.</u>
3	<u>Sharma C. S. (Author), Purohit Kamlesh, "Design of Machine Elements", PHI Learning, 1st Edition.</u>
4	<u>Sharma C. S. (Author), Purohit Kamlesh, "Design of Machine Elements", PHI Learning, 1st Edition.</u>
5	<u>R.S. Khurmi (Author), J.K. Gupta "A Textbook of Machine Design", S Chand; 25th Revised Edition.</u>
6	R.B. Patil, "Machine Design- I", Techmax publication, 2010