

GUJARAT TECHNOLOGICAL UNIVERSITY

PRODUCTION ENGINEERING DESIGN OF MACHINE ELEMENTS SUBJECT CODE: 212508 B.E. 5th SEMESTER

Type of course: Under Graduate

Prerequisite: Fundamentals Of Machine Design

Rationale: The course aims to impart advanced skills of design for analysis of mechanical component. Familiar with Industrial design concepts using Design Data Book.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		ESE (V)		PA (I)		
				PA	ALA	ESE	OEP			
4	2	0	6	70	20	10	30	0	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	<p>Variable Stresses in Machine Parts: Introduction, Completely reversed or cyclic stresses, Fatigue and endurance limit, Effect of loading on endurance limit- load factor, Effect of surface finish on endurance limit – surface finish factor, Effect of size on endurance limit-size factor, Effect of miscellaneous factors on endurance limit, Relation between endurance limit and ultimate tensile strength, Factors to be considered while designing machine parts to avoid fatigue failure, Stress concentration factor for various machine members, Fatigue stress concentration factor, Notch sensitivity, Combine steady and variable stresses.</p> <p>Failure theories: a) Gerber method of combination of stresses b) Goodman method of combination of stresses c) Soderberg method of combination of stresses</p>	06	10
2	<p>Design of Clutches and Brakes: A. Clutches: Introduction, Types of clutches, Material, Design of a disc or plate clutch, Multiple disc clutch, Cone clutch, Centrifugal clutch. B. Brakes: Introduction, Design of Single blocks or shoe brake. , Pivoted block or shoe brake. , Double blocks or shoe brake. , Simple band brake, Differential band brake, Band and block brake &, Internal expanding brake.</p>	10	15
3	<p>Design of Belts & Pulleys, Flywheel A. Belt & Pulley design: Introduction, Design of flat belt & pulley. Design of V-belt and its Pulley. B. Design of Flywheel: Design of Flywheel Arms, Design of Shaft,</p>	08	15

Hub, and Key, Construction of Flywheel.			
4	<p>Design of Gears:</p> <p>A. Spur Gears: Forms of teeth, Cycloid teeth, Involute teeth, Systems of gear teeth, Standard proportions of gear system, Gear materials, Design consideration for gear drive, Causes of gear tooth failure, Design procedure for spur gears.</p> <p>B. Helical Gears: Introduction, Terms used in helical gear, Design procedure for helical gears.</p> <p>C. Bevel Gears: Introduction, Terms used in bevel gears. , Proportions for bevel gears, Design of bevel gear.</p> <p>D. Worm Gears: Introduction, Types of worms, Types of worm gears. , Terms used in worm gearing, Proportions for worms, Proportions for worm gears, Design of worm & worm gearing.</p>	12	25
5	<p>Springs: Introduction, Types of Springs, Material for Helical springs, Terms used in Compression Springs, End Connections for helical spring, Stresses in helical spring of circular wire, deflection of helical spring of circular wire, Energy stored in helical spring of circular wire, stress and deflection in helical spring of non-circular wire, helical spring subjected to fatigue loading, spring, leaf spring , construction of leaf spring, equalized stresses in spring leaves, length of leaf spring leaves, standard sizes of automobile suspension spring,</p>	10	15
6.	<p>Thin and Thick Cylinders: Design of thick & thin cylinders, pipes, tubes, cylinder covers, covers bolts, Initial tightening of bolts, and design of pressure vessels according to different standard of design, design considerations in pressure vessels, design of pipes, hydraulic press, and hydraulic intensifier.</p>	10	10
7.	<p>Power Screws Types of threads, design of screw with different types of threads used in practices. Design of nuts, Design of C clamp, Screw jack, design of toggle jack, design of coupler.</p>	08	10

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
7	7	21	21	14	--

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Design Data Book by PSG college.
2. Machine Design by V.B.Bhandari, Tata McGrawhill.
3. Machine Design by R.C.Patel, C JamanaDas & Co.

4. Machine Design by R.S. Khurmi & J.K.Gupta, S Chand & Co.
5. Design Data (PSG College of Engg. &Tech.), Coimbtore.
6. Machine Design by Sadhusingh.
7. Machine Design by P.C.Sharma, Kataria & Sons

Course Outcome:

After learning the course the students should be able to:

1. Effects of variable stresses on design.
2. Design of brakes & clutches, Belts & Pulleys & Flywheel
3. Design of types of gears
4. Design of types of spring
5. Design of pressure vessels.
6. Design of Power screw.

List of Tutorials:

Tutorials based on design of:

1. Components subjected to variable stress.
2. Brakes & clutches.
3. Belts & Pulleys
4. Flywheel
5. Types of Gears.
6. Types of springs.
7. Pressure vessels.
8. Power screw

Major Equipment:

1. Computational facility.
2. CAD Software.

List of Open Source Software/learning website:

1. AutoCAD
2. <http://nptel.ac.in>

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.