GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC
Subject Code: 2941903
Semester – IV
DESIGN OF MACHINE ELEMENTS

Type of course: Professional Core

Prerequisite: None**.**

Rationale: The course aims to impart basic skills of force and stress analysis for design of machine elements.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	1	0	4	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1	**Design Considerations** Standardization, Preferred numbers, Tolerances and Fits, Ergonomics, System design, Manufacturing considerations.	**02***
2	**Design of Coupling** Types of coupling, Design of Muff coupling, Clamp coupling, Rigid flange coupling and Bush pin type flexible coupling	**03**
3	**Spring** Types of spring, Stress and deflection equations, Design of helical spring, Concentric springs, Design of Multi-leaf spring	**05**
4	**Pressure vessels** Thin cylinder, Thin spherical vessels, Thick cylinders, Lame's equation, Clavarino's and Birnie's equations, Cylinder with external pressure, Autofrettage, Compound cylinder.	**05**
5	**Rolling contact bearings**** Types of rolling-contact bearings, Selection of bearing type, Static load carrying capacity of bearing, Dynamic load carrying capacity of bearing, Equivalent bearing load, Load-life relationship, Selection of bearing from manufacturer's catalogue, Bearing with probability of survival other than 90 percent, Design for cyclic load	**04**
6	**Sliding contact bearings**** Basic mode of lubrication, Measurement of viscosity, Viscosity index, Petroff's equation, McKee's equations, Interpretation of Reynold's equation, Difference between hydrodynamic and hydrostatic bearing, Performance parameters for journal bearings, Bearing design – selection of parameters for journal bearing	**03**
7	**Design of gear drives (Spur, Helical, Bevel and Worm)**** Classification of gears, Selection of type of gears, Standard system of gear tooth, Force analysis, Gear tooth failures, selection of material, beam strength of gear tooth, wear strength of gear tooth, Virtual number of teeth, Thermal considerations for worm gear.	**10**
8	**Speed Gear box** Various laws of stepped Regulation, Standard values of G. P. ratio and guidelines for selecting a proper value, Break up of speed steps, Structural diagram and their analysis to	**05**

	select the best possible version, Speed chart, General recommendations for developing the gearing diagram, Determine the no. of teeth of gear.	
9	**Design of Mechanisms** Valve gear mechanism for IC engine, Hoisting tackle analysis, wire rope design ,Crane hook Assembly	**07**

* Topic 1 should be covered during tutorial class.

** Use PSG design data book for equations/data/chart.

Reference Books:

1. Design of Machine Elements, V B Bhandari, 3/e, Tata McGraw Hill.
2. A Textbook of Machine Design, P C Sharma and D K Aggarwal,S K Kataria & sons.
3. Shigley's Mechanical Engineering Design, R G Budnyas, J K Nisbett, McGraw Hill.
4. Fundamentals of Machine Component Design, R C Juvinall, 4/e, Wiley.
5. Machine Design: An Integrated Approach, R L Norton, Pearson
6. Machine Tool Design and Numerical Control, N K Mehta, Tata McGraw Hill Edu.
7. Design Data, Faculty of Mechanical Engineering, PSG College of Engineering, Coimbatore.

Distribution of marks weightage for cognitive level

Bloom's Taxonomy for Cognitive Domain	Marks % weightage
Recall	10
Comprehension	10
Application	20
Analysis	40
Evaluate	10
Create	10

Course Outcome:

After learning the course the students will be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Relate various standard used in industry and utilize knowledge of manufacturing process in design of machine elements.	05
CO-2	Determine forces acting on machine elements like couplings, springs, gears, bearings and perform stress analysis for machine components.	40
CO-3	Estimate life of rolling element bearings and determine performance parameters of sliding contact bearings.	15
CO-4	Evaluate speed variation on gear box shafts and optimize fluctuation of shaft speeds in gear box.	10
CO-5	Design and dissect mechanisms for strength and improve their life.	30

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List of Tuttorials:

Tutorials should cover all topics discussed in subject content.

Major Equipment:

1. Computational facility.

List of Open Source Software/learning website:

1. http://nptel.ac.in