



C.U.SHAH UNIVERSITY – WADHWANCITY

FACULTY OF: - Technology and Engineering (Diploma Engineering)

DEPARTMENT OF: - Mechanical Engineering

SEMESTER: - V **CODE:** - 2TE05DME1

NAME OF SUBJECT: - Design of Machine Elements.

Teaching & Evaluation Scheme:-

Subject Code	Name of the Subject	Teaching Scheme				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hours	Marks	Hours	Pr/Viva	TW	Pr	
<u>2TE05DME1</u>	Design of Machine Elements	4	0	2	6	5	30	1.5	70	3	--	20	30	150

Objective: - Specific shape and size of machine parts are required to be determined before we do the production of that machine or machine part. We also have to select specific material for that. This process is called as design. The course curriculum provides the students knowledge of design process, as well as familiarity with design of components subjected to various stresses and moments like direct stress, bending stress, twisting moment and combined stresses. In this course students will learn design of components like cotter joint, knuckle joint, power screw, levers, helical and leaf springs, couplings, pressure vessels, bearings etc. After completion of this course Students will be able to demonstrate the fundamentals of stress analysis, theories of failure and material science in the design of machine components. Also Students will be able to make proper assumptions with respect to material, factor of safety, static and dynamic loads for various machine components.

Prerequisites: - The student would have to be well-versed with mechanics of materials and engineering mechanics. In designing a machine component it is necessary to have a good knowledge of many subjects such as Mathematics, Engineering Mechanics, Strength of Materials, Theory of Machines, Workshop Processes and Engineering Drawing. Students have learnt these subjects in previous semesters

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Introduction. Design, Mechanical Engineering/Machine Design, Phase/steps in Machine design process. Design Considerations, Design Methods. Various materials used in manufacturing of machine elements and their properties. Types of loads, types of stresses, concept of stress concentration and factor of safety. Standardization and preferred numbers, numeric examples on preferred numbers. Geometrical tolerances and dimensions.	07
2	Design of Machine Elements Subjected to Direct Stresses. Illustration of simple machine elements subjected to direct stresses-independently and identification of resisting areas (simple numeric examples), Design of simple machine elements subjected to uni-axial direct stresses-independently. Design procedure (with numeric examples), steps, identification of resisting areas and design of, Knuckle joint, Cotter joint, Riveted joints, Welded joint-fillet & lap joint, Threaded fasteners & screw jack.	14
3	Design of Machine Elements Subjected to Bending Stresses. Principle of bending and its fundamental equation, Modulus of various sections, example of pure bending like levers, beams, axle, etc, Types of levers, Design procedure (with numeric examples) of levers including cross-section of some levers and also Design	07

4	Design of Machine Elements Subjected to Direct and Twisting Moments. Fundamental equation of twisting moment with design procedure. Types of shafts with important features of each. Design of shafts (with numeric examples). Types of keys, applications of each and design procedure (with numeric examples). Types of couplings and applications. Design of muff and flange couplings (with numeric examples). Types of spring, terminology related to helical spring and applications of helical spring.	11
5	Design of Machine Elements Subjected to Direct and Bending Stresses. Eccentric loading-Concept, Illustrations like frame, C-clamp, Bracket, Foundation bolt, Bolts in flange, etc, Design of machine element like C-Clamp, bracket, foundation bolt and bolts in flange.(with numeric examples).	06
6	Design of Pressure Vessels. Types and applications of pressure vessels used in industries. State Range of pressure also. Design of thick and thin cylinders (with numeric examples). Design of thin spherical shell (with numeric examples).	05
7	Selection Procedure For Bearings. Classification of bearings. Bearing designation as per IS Antifriction bearings: types, advantages, applications. Selection procedure of anti-friction bearings. Calculation for anti-friction bearings: basic dynamic load, load rating	06

List of Experiments:-

- **Preparatory Activity.**
- **Design of simple components.**
- **Design of assemblies:** Knuckle joint, Cotter joint, Screw jack, Flange coupling.
- **Tutorials:** pressure vessel, bearings,
- **Mini project:**
Assign simple mechanical assembly (preferably from real life or thought by batch teacher, but not from book.) Students will be provided with a sketch having 5-6 machined components (exclude gears, cotter, knuckle or other book oriented assemblies), load conditions and other necessary information in a batch, Batch student will design this assembly with dimensions, Sketch production drawings (details and assembly) in A4 size drawing paper manually, Prepare 3D model of assembly using parametric CAD software (Creo or Inventor or SolidEdge), Perform stress simulation of this model with under given loads using any analysis software, Present this mini project with photos/movies of mini project execution and with work distribution executed. Use power point presentation.

Books Recommended:

- Machine Design, R..K.Jain
- Machine Design, Pandya and Shah
- Machine Design, R.C.Patel and A.D.Pandya
- Design of Machine Elements, Joseph E Shigley and Charles R. Mischke
- A Text book of Machine Design, R.S.Khurmi and J.K.Gupta
- Design of machine elements, TataMcgrawhill, V.B.Bhandari .