GUJARAT TECHNOLOGICAL UNIVERSITY
DIPLOMA IN MECHANICAL ENGINEERING
Semester – V

Subject Code : **2351902**
Subject Name **: Design Of Machine Elements**

Sr. No.	Subject Content	Hrs.
1	**Introduction:** 1.1 General consideration and factors influencing the design of machine elements, design process. 1.2 Various materials used in manufacture of machine elements (Metallic, Non-metallic, ferrous and non-ferrous - I.S. designation). 1.3 Types of loads, types of stresses, concept of stress concentration and factor of safety. 1.4 Standardization and preferred numbers.	**06**
2	**Design of Machine Elements Subjected to Direct Stresses:** 2.1 Simple examples of machine elements e.g. link of chain, eye bolt, Punching operation, etc. 2.2 Design of knuckle Joint. 2.3 Design of cotter Joint. 2.4 Design of riveted Joint. 2.5 Threaded fasteners. 2.6 Design procedure of the screw for power transmission.	**10**
3	**Design the Machine Elements Subjected to Bending:** 3.1 Concept of bending moment. Fundamental equation of Bending, Section modulus of various sections, examples of pure bending like levers, beams, axle, etc. 3.2 Design procedure for levers. Types of levers, design of cross- section of arms, bosses and pins. 3.3 Design of leaf spring.	**06**
4	**Design of Machine Elements Subjected to Direct Twisting Moments:** 4.1 Fundamental equation of Twisting Moment and design procedure. 4.2 Design of shafts (solid and hollow) on basis of strength. 4.3 Design of keys - types and design procedure. 4.4 Types and applications of couplings. Design of muff and flange coupling. 4.5 Design of closed coiled helical spring, calculation of dimensions (wire diameter, stiffness , number of coils, free length), helical spring-tension and compression both.	**08**

5	**Design Machine Element Subjected to Direct and Bending Stresses:** 5.1 Eccentric loading - frame of a machine, clamp, bracket. 5.2 Various types of load on bolts in assembly - design of bolt under static load and calculation of size of foundation bolt for pillar crane.	**04**
6	**Pressure Vessels:** 6.1 Types of pressure vessels used in process industries. 6.2 Design of thick cylinders. 6.3 Design of thin cylinders and thin spherical shell.	**04**
7	**Selection Procedure for Bearings:** 7.1 Bearings - types, characteristics and commonly used Materials, designation as per IS. 7.2 Design of journal bearings. 7.3 Antifriction bearings: types, advantages, applications. 7.4 Selection procedure of anti-friction bearing. 7.5 Different calculation of bearings : basic dynamic load, load rating, equivalent load, bearing life.	**04**
	Total	**42**

Laboratory Experiences:

Experience Type	Experience Number	Description of Laboratory Experience	Hrs.
Preparatory Activity (Includes Home Assignments Also)	1	a. SI units ,SI prefixes, various conversions. b. Normal values of ultimate tensile stress and yield stress of commonly used materials. c. Area, volume, section modulus, moment of inertia, radius of gyration, etc. for commonly used various sections/shapes. d. Orthographic projections. e. Symbols of threads, surface roughness, geometrical symbols, sections, etc. f. Limits, fits and tolerances.	2

Design Reports and Calculation (Includes Home Assignments Also)	2	From given data, design (Calculating and determining dimensions) : I. Knuckle joint II. Cotter joint III. Turn buckle IV. Screw jack V. Flange/Flexible coupling VI. Screw and nut of C clamp. VII. Bell crank lever VIII. Helical spring IX. Leaf spring X. Thick/Thin cylinder XI. Thin spherical shell XII. Journal bearing NOTE : I. Report writing includes calculations and sketches of assembly and details with dimensions (as applicable). II. Each student must be given separate data.(Varying design parameters like Factor of safety, permissible stresses, load, etc. III. Also show specific area under specific stress/es in details drawings using light shade color.	4
Manual Drafting on Half Imperial Drawing Sheets. Use Both Sides of Drawing Sheets.	3	Draw assembly and detail drawings of followings based on designs reports preparation. 1. Knuckle joint (as per experience number 2-I). 2. Cotter joint and turn buckle(as per experience number 2-II & 2-III). 3. Screw jack ((as per experience number 2-IV). 4. Flange / flexible coupling (as per experience number 2-V). **Note:** Each sheet should contain details and assembly production drawings including zone and folding mark, limits, fits and tolerances, surface roughness symbols, heat treatment requirements, etc.	16
Seminar Presentation	4	On topic approved by batch faculty, prepare the Seminar. Also present the seminar at least for 10 minutes using Power point Presentation.	4
Visual Aids	5	Collect/Download product catalogues with specifications of various fasteners/items with drawing and their standards.(Like various threaded bolts, nuts, circlips, cylindrical pins, rivets, various types of bearings, various types of springs, etc).Attach the catalogues/printout of downloaded content. Download application situations for knuckle joints , cotter joints, couplings, springs, bell crank levers, screws, etc.	2

Assignments (Home Assignment)	6	Solve the given assignments. One assignment must be on preparation of chart / diagram / poster / graph / drawing / etc on half imperial size of drawing sheet.	-
		Total	28

Notes:

1. Term work report content of each experience should also include following.
   a. Experience description / data and objectives.
   b. Skill/s which is / are expected to be developed in student after completion of experience.
   c. Steps / procedure to execute experience.
2. Term work report of student of regular mode should exclude Distance Learning manual, photocopies, printed content(except visual aids), etc. Focus should be on developing the term work as original efforts of students.
3. Term work should also include experience logbook duly certified by subject teachers.

References Books:

(A) Books:

1. Machine Design, Pandya and Shah
2. Machine Design, R.C.Patel and A.D.Pandya
3. Machine Design, R.K.Jain
4. Machine Design, TVS Murthy and N.Shanmugam
5. Design of Machine Elements, Joshi and Joshi
6. Machine Design, Black, Paul H.
7. Design Data Hand Book, Msnadevan & Reddy.
8. Design og Machine Elements, Shigley
9. Design data Book , PSG College of technology, Coimbatore.
10. Data Book for Machine Designer , N.R.Chakrabarti
11. Handbook for machine Design, G.N. Maitra and L.G.Prasad
12. Hand book of properties of Engg, Materials and Design Data for M/C Elements A.Shariff.
13. Design of Machine Elements M.F.Spotts,T.E.Shoup, L.E.Hornberger, C.V.Venkatesh(Pearson)

(B) Indian Standards:

1. B.I.S. : 1076-1967 Preferred Numbers
2. B.I.S. : 2048-1975 Parallel Keys and Keyways
3. B.I.S. : 2399-1964 Glossary of terms related to rolling bearings
4. B.I.S. : 2709-1964 Slide for the selection of fits
5. B.I.S. : 3823 Methods of evaluating static load ratings of rolling bearings
   Part 1-1966 Radial ball bearings
   Part 2-1966 Radial roller bearings
   Part 3-1966 Thrust ball bearings
   Part 4-1966 Thrust roller bearings
6. B.I.S. : 3824 Methods of evaluating Dynamic load ratings of rolling bearings
   Part 1-1966 Radial ball bearings
   Part 2-1966 Radial roller bearings
   Part 3-1966 Thrust ball bearings
   Part 4-1966 Thrust roller bearings
7. B.I.S. : 4215-1967 Needle bearings
8. B.I.S. : 1135-1966 Proportions of leaf springs
9. B.I.S. : 2693-1964 Cast Iron flexible couplings
10. B.I.S. : 1570-1961 Plain Carbon and alloy steel
11. B.I.S. : 1871-1965 Wrought steels
12. B.I.S. : 617 -1959 Aluminum and Al alloys
13. B.I.S. : 2278-1974 Copper and its Alloys