



Subject Code:09ME1603

Subject Name: Design of Machine Elements

Semester –VI

Objective: For production any machine part or component, its detailed design is required. Design of any machine part or component includes selection of material for that as well as determine its shape and size and prepared a detailed drawing. Thus, designing of component required knowledge of subjects Mathematics, Engineering Mechanics, Strength of Materials, Theory of Machines, Workshop Processes and Engineering Drawing which students have already studied in previous semesters. This course provides knowledge of designing various mechanical components like cotter joint, knuckle joint, power screw, springs, levers, coupling etc. After learning this subject, students will be able to analyse mechanical components subjected to different stresses and moments like direct stress, bending stress, twisting moment, combined stress etc.

Credits Earned: 4 Credits

Course Outcomes:

- Understand basics of design procedure and selection of material
- Analyze the component subjected to direct loading
- Analyze the mechanical component under the effect of combined stress
- Design of shafts, keys and couplings
- Design of pressure vessel
- Design and selection of bearing according to application

Teaching and Examination Scheme

Teaching Scheme (in Hrs)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA	(CSE)	Viva (V)	Term work (TW)	
3	2	0	4	50	30	20	25	25	150

Contents:

Sr.no	Content	Total hrs.	%weightage
1	Introduction: General design process and factors to be considered, various material and its properties, material selection for design, types of load, types of stress, stress concentration, factor of safety, standardization and preferred numbers.	5	12%
2	Design of machine elements subjected to direct stresses: Illustration of machine components subjected to direct stresses with numerical examples, design procedure for cotter joint, knuckle joint, welded joint (fillet and lap joint), riveted joint, threaded joint.	8	19%
3	Design of machine elements subjected to bending stresses: Fundamental principle of bending and its equation, modulus of elasticity for various sections of elements subjected to pure bending like lever, beam, axels etc. Types of lever and its design procedure, design of leaf spring.	6	14%
4	Design of machine elements subjected to direct and twisting moments: Fundamental of twisting moment and its equation, types of shaft and design procedure for shaft, types of keys and its design procedure, types of coupling, design of muff and flange coupling, types of spring and its terminology	8	19%
5	Design of machine elements subjected to direct and bending stresses: Concept of eccentric loading, design of C-Clamp, bracket, foundation bolt and bolts in flange.	5	12%
6	Pressure vessel: Types and application of pressure vessel, design of thin and thick cylinder, design of spherical vessel.	5	12%
7	Bearings: Classification of bearings, designation of bearings as per IS, selection procedure for anti-friction bearing, terms related to bearing life (basic dynamic load, load rating, equivalent load, bearing life)	5	12%

References:

1. V B Bhandari, Design of Machine Elements, 3/e, McGraw Hill.
2. Farazdak Haideri, Machine Design Vol.-I,II, 1/e, Nirali Prakashan.
3. P C Gope, Machine Design: Fundamentals and Applications, 1/e, PHI.
4. R L Norton, Machine Design and Introduction, 1/e, Pearson.
5. P.C.Sharma & D.K. Agrawal Machine Design – S.K. Kataria & Sons
6. R.S.Khurmi, Machine design, S.chand publication, New Delhi.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching learning process



Syllabus for Diploma Engineering

Mechanical Engineering

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
26%	37%	37%	---	---	---

Suggested list of Lab Exercises:

1. Examples on elements subjected to direct stress (cotter joint, knuckle joint, welded joint, riveted joint etc.)
2. Examples on elements subjected to bending stress (levers and beam)
3. Examples on design of shafts, keys and coupling
4. Examples on combined loading
5. Examples on design of thin and thick cylinders
6. Examples on bearing design

Instructional Method:

- a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by blackboard, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory