

COURSE TITLE	DESIGN OF MACHINE ELEMENT
COURSE CODE	09ME2603
COURSE CREDITS	4

Objective:

- 1 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

Course Outcomes: After completion of this course, student will be able to:

- 1 Understand basics of design procedure and selection of material
- 2 Analyze the component subjected to direct loading.
- 3 Analyze the mechanical component under the effect of combined stress
- 4 Design of shafts, keys and couplings
- 5 Design of pressure vessel
- 6 Analyze the component subjected to bending load.

Pre-requisite of course: Applied Mechanics, Strength of Material, Engineering Drawing, Theory of Machine.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	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
2	Design of machine elements subjected to bending stresses Fundamental principal 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	8

Contents : Unit	Topics	Contact Hours
3	Introduction General design process and factors to be considered, material selection for design, stress concentration, factor of safety, Bearing classification and designation, standardization and preferred numbers.	5
4	Design of machine elements subjected to direct and twisting moments Fundamental of twisting moment and it's equation, types of shaft and design procedure for shaft, types of keys and it's design procedure, types of coupling, design of muff and flange coupling, types of spring and it's terminology	9
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	7
6	Pressure vessel Types and application of pressure vessel, design of thin and thick cylinder, design of spherical vessel	5
Total Hours		42

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Examples on elements subjected to bending stress (levers and beam) Examples on elements subjected to bending stress (levers and beam)	4
2	Examples on combined loading Examples on combined loading	6
3	Examples on elements subjected to direct stress (cotter joint, knuckle joint, welded joint, riveted joint etc.) Examples on elements subjected to direct stress (cotter joint, knuckle joint, welded joint, riveted joint etc.)	6
4	Examples on design of thin and thick cylinders Examples on design of thin and thick cylinders	4
5	Examples on preferred numbers. Examples on preferred numbers.	4
6	Examples on design of shafts, keys and coupling Examples on design of shafts, keys and coupling	4
Total Hours		28

Textbook :

- 1 Design of Machine Elements, S. B. Soni, Atul Prakashan, 2018

References:

- 1 Design of Machine Elements, Design of Machine Elements, V B Bhandari, McGraw Hill, 2010
- 2 Machine Design, Machine Design, R. S. Khurmi, S. Chand publication, 2005

Suggested Theory Distribution:

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

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking
26.00	37.00	37.00			

Instructional Method:

- 1 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.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory
- 4 Students will use supplementary resources such as online videos, NPTEL videos ,e-courses

Supplementary Resources:

- 1 <http://ecoursesonline.iasri.res.in/course/view.php?id=521>
- 2 <https://archive.nptel.ac.in/courses/112/105/112105125/>