

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme	Diploma Engineering				Branch	Mechanical Engineering			
Semester	V				Version	1.0.0.0			
Effective from Academic Year		2020-21			Effective for the batch Admitted in			July 2018	
Subject code	1ME2501	Subject Name			DESIGN OF MACHINE ELEMENTS				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	2	0	5	Theory	40	60	100
Hours	3	0	4	0	7	Practical	60	40	100

Pre-requisites:
None

Course Learning Outcomes:
<p>The objectives of learning of this course is to familiar with different techniques leading to the accomplishment of the following competencies and course learning outcomes:</p> <p>CO₁.To know different failures and to determine the value of resisting areas of machine elements.</p> <p>CO₂. Able to use preferred numbers and standardization to select element/element dimension.</p> <p>CO₃.Design machine element subjected to various stress such as Direct stresses, Bending stresses, Twisting stresses and Combined bending and direct stress.</p> <p>CO₄. Design of various types of pressure vessel.</p> <p>CO₅.Awarefor selection of various bearing for different application and make calculation of important bearing characteristics.</p>

Course Content				
Name of UNIT	Unit Content	Unit Learning Outcomes	Marks	Hrs
UNIT – 1 (Introduction)	1.1 consideration and factors affecting the design of machine elements and design process. 1.2 Diverse materials used in manufacturing of machine elements and their properties. 1.3 Types of loads, stresses, abstraction of stress concentration and factor of safety. 1.4 Standardization and preferred numbers, numerical on standard series, derived series and preferred numbers.	1a. List different factors to be considered for various design process. 1b. To get skill of identification and select ion of materials that can be used for design of machine elements. 1c. Elaborate loads, stresses, stress concentration factor and factor of safety. 1d. List Types of loads, types of stresses 1e. Choose standard parts and preferred numbers for designing simple machine elements.	10	08

<p>UNIT – 2 (Design of machine elements subjected to direct stresses.)</p>	<p>2.1 Illustration of simple machine elements subjected to direct stresses independently and identification of resisting areas (simple numeric examples).</p> <p>2.2 Design of simple machine elements subjected to uni-axial direct stresses which are not dependent.</p> <p>2.3 Design process (with numeric examples), steps, to identify resisting areas and design of Knuckle joint, Cotter joint, Riveted joints, Threaded fasteners & screw jack.</p>	<p>2a. Analyse resisting area of simple machine element subjected to direct stress.</p> <p>2c. Describe the design of cotter joint and knuckle joint..</p> <p>2d. Clarify the design process of riveted joint, Threaded fasteners & screw jack.</p>	15	10
<p>UNIT – 3 (Design of machine elements subjected to bending stresses.)</p>	<p>3.1 Principle of bending and its fundamental equation.</p> <p>3.2 Modulus of various sections, case of pure bending like levers, beams, axle, etc.</p> <p>3.3 Types of levers.</p> <p>3.4 Design procedure (with numerical) of levers counting cross section of arms, bosses and pins.</p> <p>3.5 Design procedure (with numerical) of leaf spring.</p>	<p>3a. Condition of the fundamental bending equation.</p> <p>3b. State modulus of various sections subjected to pure bending similar to levers, beams and axles</p> <p>3c. Listing types of levers.</p> <p>3d. Design simple lever and leaf spring based on given input.</p>	05	05
<p>UNIT – 4 (Design of machine elements subjected to direct and twisting moments.)</p>	<p>4.1 Fundamental equation of twisting moment with design method</p> <p>4.2 Types of shafts with significant features of each.</p> <p>4.3 Design of shafts (with numerical).</p> <p>4.4 Types of keys with applications of each and design procedure (with numerical).</p> <p>4.5 Types of couplings with applications.</p> <p>4.6 Design of muff and flange couplings (with numerical).</p> <p>4.7 Types of spring, terms used to helical spring and applications of helical spring.</p>	<p>4a. State fundamental equation of twisting moment.</p> <p>4b. Notes types of shafts and important features of each.</p> <p>4c. List types of keys, couplings, spring & uses of each</p> <p>4d. Give details of the design procedure of shafts, keys and couplings.</p> <p>4e. Term helical spring its applications.</p> <p>4f. Solve numerical on the design procedure of various parts subjected to torque.</p>	15	09
<p>UNIT – 5 (Design of machine elements subjected to direct and bending stresses.)</p>	<p>5.1. Eccentric loading</p> <p>i. idea.</p> <p>ii. Designs like frame, C-clamp, Bracket. (With numerical)</p> <p>iii. Study of Bolts in flange subjected to eccentric loading.</p>	<p>5a. Identify eccentric loading.</p> <p>5b. sketch frame-clamp, Bracket, Bolts in flange, etc.</p> <p>5c. Design machine elements subjected to eccentric loading.</p>	05	05
<p>UNIT – 6 (Design of pressure vessels.)</p>	<p>6.1 kinds and applications of pressure vessels used in industries.</p> <p>6.2 Design of thick and thin cylinders (with numerical), thin spherical shell (with numerical)</p>	<p>6a. Define pressure vessels</p> <p>6b. State types of pressure vessels</p> <p>6c. Design thick and thin cylinder, thin spherical shell.</p>	05	04

UNIT –7 (Selection procedure for bearings.)	7.1 Types of bearings. 7.2 Designation of bearings as per Indian Standards. 7.3 Types of antifriction bearings with advantages and applications. 7.4 Selection procedure of anti-friction bearings. 7.5 Calculation for ball and roller bearings: basic dynamic load, load rating, equivalent load, bearing life.	7a. Categorize bearings. 7b. Give explanation of bearing's designation. 7c. Select suitable anti-friction bearings from producer's catalogue. 7d. Analyse the load on the bearings.	05	04
		Total	60	45

List of Practical		
No.	Unit	Name of Practical
1	All.	Preparatory Activity : a. Understand and note down variety of course related SI units and their conversions. b. Note down typical values of ultimate tensile strength, yield strength, density, modulus of elasticity and Poisson's ratio of normally used materials. c. Record usual values of factor of safety for diverse situations. d. Recall area, volume, section modulus, moment of inertia, radius of gyration, etc. for normally used a variety of section and shapes. e. Draw symbols used in orthographic projections. f. Draw symbols of threads, surface roughness, geometrical tolerances symbols, section lines, etc. g. Summon up by sketching the universal systems for limits, fits and tolerances.
2	II	Design of cotter joint, knuckle joint with given load (each one problems) . Sketch detail and assemblies drawings of cotter and knuckle joint and make 3D model using any modelling software Tutorial on riveted joint and power screw
3	III	Tutorial on bell crank , rocker arm lever and leaf springs design
4	IV	Design of Flange coupling taking(i) load.....kN,(ii).....material(iii) Factor of safety =.....Draw assemblies drawings. Tutorial on helical spring design
5	V	Tutorials on C-clamp, Eccentric loading parts
6	VI	Tutorial on thin and thick cylinder , spherical pressure vessels
7	VII	Tutorial on anti-friction bearings.

List of Instruments/Equipment/Trainer Board

1	Power point presentations, live examples, demonstration of BIS on preferred numbers and standardizations,
2	Movies/ animations/ educational charts, videos & model of different machine elements subjected to various stresses, live demonstration of failed components,

Link of Text Books

No	Title of Books	Authors	Publication
1	A Text book of Machine Design	R.S.Khurmi and J.K.Gupta	S. Chand.
2	Machine Design	R.K.Jain.	Khanna Publishers.
3	Machine Design	Pandya and Shah.	Charotar Publishing House Pvt. Limited.

List of Reference Books

No	Title of Reference Books	Authors	Publication
1	Machine Design	TVS Murthy and N.Shanmugam	Anuradha publications.
2	Machine Design	R.C.Patel and A.D.Pandya	Acharya Book Depot, 1959.

3	Design of Machine Elements	Shigley.	Tata McGraw-Hill Education.
4	Design Data Book	P.S.G. College of Technology, Coimbatore.	P.S.G. Publication.
Link of Learning Web Resource			
1	http://www.nptel.com/		

PO & CO Mapping							
Sr.No	Name of PO	Description	Co1	Co2	Co3	Co4	Co5
1	PO 1	Acquire fundamental knowledge of mathematics, science, and mechanical engineering.	Moderate	Moderate	Moderate	Moderate	Moderate
2	PO 2	Design and conduct experiments, as well as analyse and interpret data.	Slight	Moderate	Moderate	Moderate	Slight
3	PO 3	Use the techniques, skills, and modern engineering tools necessary for engineering practice	Slight	Moderate	Moderate	Moderate	Slight
4	PO 4	Function in multi-disciplinary teams and identify, formulate, and solve engineering problems.	Moderate	Moderate	Moderate	Moderate	Moderate
5	PO 5	Clear understanding of his duties and responsibilities as a mechanical engineer.	Moderate	Slight	Moderate	Moderate	Slight
6	PO 6	Develop effective communication skill and provide leadership for professional development.	Slight	Slight	Slight	Slight	Slight
7	PO 7	Engage in life-long learning in mechanical engineering field and comprehend issues related to environment and sustainable development.	Moderate	Moderate	Moderate	Moderate	Moderate
8	PO 8	Graduate will demonstrate knowledge of professional and ethical responsibilities.	Slight	Moderate	Moderate	Moderate	Moderate
9	PO 9	Incorporate economics and business practice including project and risk management.	Moderate	Moderate	Moderate	Moderate	Moderate
10	PO 10	Graduated are able to share their knowledge to the industries as well as society.	Moderate	Moderate	Moderate	Moderate	Moderate
11	PO 11	Graduated will be able to apply their skill and knowledge for the sustainable development of nation.	Moderate	Moderate	Moderate	Moderate	Moderate
12	PO 12	Graduated are able to learn to work with the team and also with the inter discipliners.	Moderate	Slight	Slight	Slight	Slight