SEMESTER S4

MACHINE DESIGN

Course Code	PEPET411	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	Theory

Course Objective:

- To familiarize and apply the principles of stress strain and deformation to analyse and solve problems in mechanical components and structures.

SYLLABUS

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Module No.	Syllabus Description	Contact Hours
1	Introduction: Common Engineering materials and its Properties, Selection of Materials, steps in design Process Principles of standardisation, limit and fits as per IS specification. Estimation of design loads, factor of safety, Theories of failure, Stress concentration factor, Variable stress, fatigue failure, endurance limit, design for finite and infinite life, Soderberg and Goodman criteria.	9
2	Detachable joints: design of screws, standards, thread stresses, preloading of bolts, fatigue and shock load, eccentric loading. Power screws, mechanism of power screws, thread stresses, efficiency of power screws. Riveted joint: Stresses in riveted joint, design of riveted joints with central and eccentric loads, boiler and tank joints, structural joints.	9

	Welded joints: types of welded joints, stresses, design of welded joints subjected to axial, torsional and bending loads, welds subjected to fluctuating loads.	
3	Springs: Classification, Common Spring materials, stress and deflection in helical compression spring with axial loading, curvature effects, resilience, spring surging, buckling, critical frequency of helical springs – helical torsion springs design of automotive leaf springs. Pressure vessels, thin cylinders, Thick cylinder equation, Hydraulic accumulators. Compound Cylinders.	**9**
4	Design of gears: design of spur, helical, bevel gears, virtual or formative number of teeth - gear tooth failures- beam strength, Lewis equation, Buckingham's equation for dynamic load, wear load, endurance strength of tooth, heat dissipation. Design of Sliding contact bearings: lubricants & viscosity - journal bearings, hydrodynamic theory, bearing characteristic number, design considerations. Design of Rolling contact bearing: Classification, bearing life, static and dynamic load capacity, dynamic equivalent load, selection of bearings.	**9**

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Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24 marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 subdivisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

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	Course Outcomes	Bloom's Knowledge Level (KL)
CO1	Understand mechanical design procedure, Material selection, Codes & use of standards.	**K2**
CO2	Apply the knowledge in designing detachable and permanent joints.	**K3**
CO3	Determine safe design of spring and Pressure vessels describe different types of bearings and clutches, its application; design procedures.	**K3**
CO4	Describe different types of bearings and Gears, its application; design procedures.	**K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**2**
CO2	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**2**
CO3	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**3**
CO4	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**3**

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Design of machine Elements	V B Bhandari	McGraw Hill Education	5th Ed. 2020
2	Design of machine Elements	M. F. Spotts & Terry E. Shoup	Pearson Education	8th Ed. 2019
3	Machine Component Design	Robert C. Juvinall & Kurt M. Marshek	WILEY	5th Ed. 2019

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Design of Machine Elements	Dr.G.K.Vijayaraghavan	Lakshmi Publications	6th Ed. 2015
2	Shigley'S Mechanical Engineering Design	Richard G. Budynas J. Keith Nisbett	McGraw Hill	11th Ed. 2020

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