



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Automobile Engineering

Course / Subject Code : DI03002051

Course / Subject Name : Automobile Design

w. e. f. Academic Year:	2024-25
Semester:	3rd
Category of the Course:	PCC

Prerequisite:	Math
Rationale:	This course introduces students to the fundamental principles of automotive component design. It builds an understanding of basic engineering terminology, concepts of loading conditions, and simple machine element design. Students will learn to apply basic design methods for automotive engine and transmission components such as pistons, connecting rods, flywheels, clutches, and gears. Emphasis is placed on functional requirements, basic calculations, and real-world application of concepts relevant to the automobile industry.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Explain basic terminology and fundamental concepts related to engineering design.	Understanding
02	Identify and apply basic design principles for simple machine elements subjected to simple (tensile, compressive, shear, bearing) stresses.	Application
03	Identify and apply basic design principles for simple machine elements subjected to torsional and bending stresses.	Application
04	Calculate and determine major dimensions for selected automotive engine components (such as pistons, connecting rods, and flywheels) based on given data and functional requirements.	Analysis
05	Calculate and determine major dimensions for selected transmission system components (such as clutches and gears) based on given specifications.	Analysis

*Revised Bloom's Taxonomy (RBT)

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA(M)	PA(I)	ESE (V)	
3	1	0	4	70	30	00	00	100



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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Introduction to Engineering Design and Terminology: 1.1 Design and its types, General consideration and factors influencing the design of machine elements and general design process. 1.2 Various materials used in manufacturing of automotive components. (Which and why) 1.3 Basic definitions and SI units of Mass, weight, force/load, stress, pressure, torque, work, energy, moment, couple, strain, young modulus, modulus of rigidity, Bulk modulus, inertia, power, area moment of inertia and mass moment of inertia 1.4 Types of loads, types of stresses. 1.5 Concept of stress concentration and factor of safety. 1.6 Standardization and interchangeability. 1.7 Column and Strut, different end conditions, Rankin's and Euler's Formulae. 1.8 Limits, fits and tolerances.	9	20%
2.	Design of simple machine components subjected to simple stress. 2.1 Load 2.2 Tensile, compressive, shear and bearing stresses. 2.3 Safety factor and material selection 2.4 Design of simple machine element subjected to pure tensile and/or compressive and/or shear and/or bearing stresses like rod, column, plates, rivets, pins etc.	9	20%
3.	Design of Design of simple machine components subjected to torsional and bending stress. 3.1 Torsional shear stress and bending stress in simple beam. 3.2 Design of propeller shaft on maximum torque to be transmitted. 3.3 Design of dead axle on bending.	9	20%
4.	Basic Design of Automotive Engine Components. 4.1 Design consideration for a piston of IC-engine. 4.2 Material for piston. 4.3 Piston head thickness based on maximum pressure and maximum temperature.	9	20%



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	4.4 Forces on connecting rod and material of connecting rod. 4.5 Design consideration for connecting rod. 4.6 Design of I-section of connecting rod. 4.7 Turning moment diagram of flywheel, fluctuation of speed and energy, finding mass and cross-sectional area of flywheel. 4.8 Understand uniform wear and pressure condition for designing clutch. Design face width and no. of clutch lining required for given torque and other boundary condition.		
5.	Basic design of automotive transmission system components. 5.1 Understand uniform wear and pressure condition for designing clutch. 5.2 Design criteria for a clutch. 5.3 Design face width and no. of clutch lining required for given torque and other boundary condition. 5.4 Gear terminology. 5.5 Types of gears. 5.6 Design consideration for gear drive. 5.7 Relation between number of teeth, speed and torque in gears. 5.8 Calculation of number of teeth and torque transmitted.	9	20%
	Total	45	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
10%	30%	30%	30%	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	A Text book of Machine Design	R S Khurmi J K Gupta	S. Chand & Co. Ltd, New Delhi(2022); ISBN: 978-8121925372



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2	Design of Machine Elements	V. B. Bhandari	McGraw Hill Education India Pvt. Ltd., Noida (2017) ISBN: 978-9339221126
3	Machine Design	P. C. Sharma D. K. Aggarwal	S. K. Kataria & Sons, New Delhi(2013) ISBN: 978-9350142813
4	Machine Design	R. K. Jain	Khanna Publishers, Delhi (1988) ISBN:978-81-7409-286-1
5	Automobile Design Problems	K. M. Aggarwal	Satya Prakashan, New Delhi(1994) ISBN: 8176842079, 9788176842075
6	A Text book of Engineering Mechanics	R S Khurmi N. Khurmi	S. Chand & Co. Ltd, New Delhi(2019); ISBN: 978-93-5283-396-2
7	Automobile Design problems	K. M. Agrawal	Satya Prakashan, New Delhi

(b) Open source software and website:

1. <https://nptel.ac.in>
2. <https://auto.howstuffworks.com>
3. <https://swayam.gov.in>
4. <https://www.howacarworks.com>

Suggested Tutorial Exercise:

Sr No.	Tutorial Outcome	Unit No.	Approx. Hrs. required
1	Simple calculation on work, power, velocity, energy, moment, torque and their inter relation.	1	2
2	Calculate area, centroid and area moment of inertia of simple given cross section.	1	1
3	Design cross section of simple machine element subjected to simple stresses	2	3
4	Design cross section of simple machine element subjected to torsional shear and bending stresses.	3	3
5	Design of piston head thickness from given data.	4	1
6	Design I-section of a connecting rod from given data.	4	1



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7	Design mass and cross-sectional area of fly wheel from given data.	4	1
8	Design number of plates/face width/torque transmitted by clutch from given data.	5	2
9	Calculate no. of teeth and gear ratio of gears in gear drive from given data.	5	1
	Total Hrs.		15

Suggested Activities for Students: If any

Other than the classroom and laboratory learning, following are the suggested student-related **co-curricular** activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of each activity. They should also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Charts can be prepared.
- Small report on any topic given by concern faculty.
- Small groups of students can be formed for assigned work. Assigned work should be such that it covers market survey, team work, presentation, time management, quality development.

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