GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3170202

SUBJECT NAME: AUTOMOBILE COMPONENT AND SYSTEM DESIGN

B.E 7th SEMESTER

Type of Course: - Professional Core

Pre-requisite:-

Rationale: The course aims to impart basic skills of force analysis, understanding of automobile systems, and design of automobile components.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

NOTE:

1. University theory exam duration is 3 hours.
2. PSG design data book is permitted during university exam.

CONTENT:-

Sr. No.	Course Content	Total Hours
1	**Design Considerations*** Standardization, Preferred numbers, Tolerances and Fits, Ergonomics, System design, Manufacturing considerations.	02*
2	**Bearing Selection:** **Rolling Contact Bearing:** Types of rolling contact bearings, static and dynamic load capacities, Stribeck's Equation, Equivalent bearing load, load life relationship, Bearing life, Load factor, Selection of bearings from manufacturers catalogue. Lubrication and mountings, dismounting and preloading of bearings, Oil seals and packing.	04
3	**Gears:** Types of gears, Design consideration of gears, material selection, Types of gear failures, Gear lubrication. **Spur Gears**: Force analysis, Number of teeth, Face width & Beam strength of gear tooth. Dynamic tooth load. Effective load on gear tooth. Estimation of module based on beam strength. Wear strength of gear tooth. Estimation of module based on wears strength. Spur gear design for maximum power transmission. **Helical Gears**: Virtual number of teeth, Tooth proportions, Force analysis, Beam strength of helical gears, Effective load on gear tooth, Wear strength of helical gears, Design of helical gears **Bevel Gears**: Terminology of bevel gears, Force analysis, Beam strength of bevel gears, Wear strength of bevel gear, Effective load on gear tooth, Design of bevel gear.	09
4	**Transmission Drive:** Manual gearboxes, Manual gearbox classification, Mechanical efficiency, Manual automobile	09

	gearboxes, Manual gearboxes for industrial vehicle, Gear shifting mechanisms, Synchronizers, Differential drives, Automatic gearboxes	
5	**Design of I.C. Engine Components :** Design of piston assembly, Design and selection of cylinders, Valve gear mechanism design	**08**
6	**Automotive System :** Wheels and tyres, Suspension system, Steering Systems, Braking System, Control System, Chassis Structure	**15**

*Topic should be discussed in tutorial class.

Use PSG design data book for equations/data/chart.

Reference Books:

1. Design of Machine Elements, V B Bhandari, 3/e, Tata McGraw Hill.
2. A Textbook of Machine Design, P C Sharma and D K Aggarwal,S K Kataria & sons.
3. Shigley's Mechanical Engineering Design, R G Budnyas, J K Nisbett, McGraw Hill.
4. Machine Design: An Integrated Approach, R L Norton, Pearson
5. Machine Tool Design and Numerical Control, N K Mehta, Tata McGraw Hill Edu.
6. Design Data, Faculty of Mechanical Engineering, PSG College of Engineering, Coimbatore.
7. Automotive Chassis, Vol. I : Components Design, G Genta, L Morello, Springer
8. An Introduction to Modern Vehicle Design, Julian Happian Smith, Butterworth Heine Mann
9. Automotive Transmissions : Fundamentals, Selection, Design and Application, H Naunheimer, B Bertsche, J Ryborz, W Novak, Springer

Distribution of marks weightage for cognitive level

Bloom's Taxonomy for Cognitive Domain	Marks % weightage
Recall	10
Comprehension	10
Application	30
Analysis	40
Evaluate	05
Create	05

Course Outcome:

After learning the course the students will be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Relate various standard used in industry and utilize knowledge of manufacturing process in design of machine elements.	05
CO-2	Determine forces acting on automobile components like gears, bearings, piston assembly, cylinders and perform stress analysis for automobile	40

	components.	
CO-3	Inspect manual and automatic automobile gear boxes and gear shifting mechanisms.	20
CO-4	Dissect and examine automobile systems.	35

List of Experiments:

Experiments should cover all topics discussed in subject content. Like

1. Design of gears and selection of bearings for automobiles.
2. Design of IC engine components for automobiles.
3. Analysis of transmission drives.
4. Study and analysis of automobile systems like braking system, suspension system, steering systems.

Major Equipment:

1. Computational facility.

List of Open Source Software/learning website:

1. http://nptel.ac.in