

GUJARAT TECHNOLOGICAL UNIVERSITY

AUTOMOBILE ENGINEERING (02) AUTOMOBILE SYSTEM DESIGN SUBJECT CODE: - 2180206 B.E 8TH SEMESTER

Type of Course: - Advanced / Application

Pre-requisite:- Automobile System and Machine Design and Industrial Drafting

Rationale- To make student get acquainted with to standardize the automobile part after designing the system component like clutch , propeller shaft , axle , steering linkages , braking parts , suspension system etc. within the space limitations and optimize it.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		ESE (V)		PA (I)		
				PA	ALA	ESE	OEP			
4	0	2	6	70	20	10	20	10	20	150

CONTENT:-

Sr.N.	Course Content	Total Hours	% Weightage
1	Design of clutch system Design of various clutch system components (Single plate, multiple plates, centrifugal clutch, lining material) and Pressure Plate Assembly components. Hydraulic Clutch system components (Master Cylinder, Slave cylinder, reservoir) clutch fluid – its properties, hydraulic pipes. Clutch Pedal & Clutch hand lever design. Clutch cable Design / selection considerations.	10	17
2	Design of propeller shaft: Design of propeller shaft for bending, torsion, rigidity and critical speed criteria. Design of universal joint and slip joint.	05	8
3	Design of Axle: Front Axle beam, Steering Knuckle, King pin. Rear Axle (drive Axle) tube, Design of fully floating, half floating axle and dead axle. Design of Final drive and differential: Design of spiral bevel and hypoid type of final drive/differential.	08	13
4	Design of steering system: Condition for true rolling, Turning circle radius, Principle of Ackermann steering, Ackermann-linkage geometry, Steering gear ratio, Steering box torque, Design of various steering gear box.	05	9
5	Design of braking system: Brake balance, Stopping distance, Brake fade, Work done in braking, Braking efficiency, Braking of vehicle, Braking of vehicle moving in a curved path, Design of drum brake, Design of disc brake, Design of hydraulic brake system, Design of hand brake or parking brake.	12	20
6	Design of suspension system: Function of suspension, Forces act on suspension, Suspension springs (laminated or leaf, coil, torsion bar, rubber spring, pneumatic spring), Design of laminated or leaf spring, Design of helical or coil spring, Design	12	20

	of torsion bar spring.		
7	Optimum design: Optimum design for automotive elements like shaft-springs etc, Johnson's method of optimum design.	08	13
	Total	60	100

SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Distribution of Theory Marks (%)					
R Level	U Level	A Level	N Level	E Level	C Level
15	15	25	10	5	-

NOTE: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

Reference Books:

1. Elements of Motor Vehicles Design by DTB donkins, TMH
2. Automobile Chassis Design and calculations by P.Lukin, Mir Publishers
3. Auto design Problems by K.M.Agrawal, Satyaprakashan.
4. Automotive Mechanics by N.K.Giri, Khanna Publishers
5. Machine Design by Sadhusingh, Khanna Publishers
6. Automobile Chassis Design by Dean Aaverns, Lllife Books Ltd (1992)
7. Automobile Engg. Vol - I & II by Kirpal Singh, Standard Pub.
8. Automobile Engg. Vol - I & II by K.M.Gupta, Umesh Pub.
9. Auto Design by R.B. Gupta, Satya Prakashan
10. "Mechanical Engineering Design", Fourth Edition, by Joseph E. Shigley & Larry D. Mitchell, McGraw-Hill International Book Company
11. Design of Machine Elements by Bhandari , Tata McGraw-Hill Publishing Company Ltd
12. Machine Design by, Sharma and Agrawal, S.K.Kataria & Sons
13. Transmission System Design by R.B.Patil, TechMax Pub., Pune.
14. Machine Design Vol - II & III by F.Haideri, Nirali Prakashan, Pune.
15. PSG Design Data Book.
16. Automotive Chassis by P.M.Heldt , Chilton Co., NY (1992)
17. Machine Design by Pandya and Shah, Charotar Publishing House.
18. Machine Design by R S Khurmi J.K.Gupta, S chand & Co.

COURSE OUTCOME:

1. Student will be able to select and design the different automobile system for given situation.
2. Student will be able to standardize the different parts.
3. Student will be able to optimize the parts for given situation.

LIST OF PRACTICALS:

The term work shall be based on the topics mentioned above and one system must be design and sheet must be drawn for assembly and parts.

1. To Standardize the any automobile system part for size , torque and power point of view.
2. To design the **clutch** for given situation of automobile vehicle.
3. To design the **propeller shaft** for given situation of automobile vehicle.
4. To design the **Axle** for given situation of automobile vehicle.
5. To design the **steering system** for given situation of automobile vehicle.
6. To design the **braking system** for given situation of automobile vehicle.
7. To design the **suspension system** for given situation of automobile vehicle.

8. To optimize the part from above design given situation of automobile vehicle.

List of Open Source Software/learning website:

1. <http://nptel.ac.in/>
2. www.learnerstv.com
3. <http://auto.howstuffworks.com/>
4. nptel.iitk.ac.in/

ACTIVE LEARNING ASSIGNMENTS:

Preparation of power-point slides, which can include mathematical calculations, videos, animations, pictures, graphics for better understanding of theory and practical work . The faculty will allocate chapters/ parts of chapters to various groups of students so that the entire syllabus can be covered. The power-point slides should be made available on the College/ Institute's web-site along with the name of the students, faculty, Department and College on the first slide. Best three presentations should be submitted to GTU.