

GUJARAT TECHNOLOGICAL UNIVERSITY

AUTOMOBILE ENGINEERING

B. E. SEMESTER: VII

Subject Name: **Automobile System Design**

Subject Code: **170202**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	University Exam (E)		Mid Sem Exam (Theory) (M)	Practical (Internal)
				Theory	Practical		
4	0	2	6	70	30	30	20

Sr. No.	Course Contents	Total Hrs
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.	8
2.	Design of propeller shaft: Design of Propeller shafts for bending, torsion, & rigidity criteria, failure theories. Design of Universal joint and Slip joint. Propeller shaft Assembly testing for balancing.	4
3.	Axle design: 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.	8
4.	Design of Braking Systems: Internal expanding shoe brake, friction lining material, drum brake arrangements, disc brake arrangement. Mechanical, hydraulic and air brake system and their components, hydraulic brake fluids, vacuum servo assisted braking, parking brake systems, anti-lock braking system, engine exhaust brake, regenerative brake system, fail-safe- brake, brake efficiency & testing, Weight transfer, braking ratios.	10

5.	Design of Suspension System: Types of suspension springs based on applications. Material of spring, Stress-deflection Equation for helical springs, Wahl Correction Factor, Design of helical springs for Independent Suspension. Buckling of Compression springs, Tension springs, Springs in Series & in parallel, Design Considerations of Belleville springs, Elastomeric springs, Air (Pneumatic) springs, Design of leaf spring for automobile suspension system, Design of coil spring for front independent suspension system. Types of different suspension springs with their requirements, constructional details and characteristics of leaf spring, coils spring and torsion bar springs, Independent suspension, rubber suspension, pneumatic suspension, hydro-elastic suspension, use of anti-roll bar and stabilizer bar, shock absorbers- need, operating principles different types.	15
6.	Design of steering System: Steering mechanism and Linkage design for various types of Steering gear box arrangements and Design criterion for Mechanical & Power steering types. Steering geometry for Ackerman's steering.	5
7.	Vehicle Performance Testing and Validation of Design: Laboratory Testing – Testing of major components of vehicle like clutch, suspension, braking, steering etc., Engine, Vehicle testing on chassis dynamometers, Road and Track Testing, Initial inspection, running in and durability, extensive driving, maximum speed & acceleration, Brake testing on the road, Hill climbing, handling & ride characteristics on different road surfaces, ride comfort, corrosion testing etc. Validation w.r.t. design specifications, durability and reliability. Modification / improvements and validate.	5
8.	Optimum Design: Introduction to optimum design, for mechanical elements, adequate & optimum design, Johnson's method of optimum design-Simple problems in optimum design like axially loaded members like shaft subjected to torsional and bending moments.	5

Term Work:

The term work shall be based on the topics mentioned above.

Text Books:

1. Automotive Chassis by P.M.Heldt , Chilton Co., NY (1992)
2. Machine Design by Pandya and Shah, Charotar Publishing House.
3. Machine Design by R S Khurmi J.K.Gupta, S chand & Co.

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.Glri, Khanna Publishers
5. Machine Design by Sadhusingh, Khanna Publishers
6. Automobile Chassis Design by Dean Avern, 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.