

Subject Code: 01AE0602

Subject Name: AUTOMOBILE SYSTEM DESIGN

B.Tech. III Year – (Sem-6) Automobile Engineering

Type of course: Automobile System and Machine Design and Industrial Drafting

Prerequisite: Automobile engine, 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.

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.

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Evaluation Scheme					Total Marks
Theory	Tutorial	Practical		Theory Marks			Practical Marks		
				ESE(E)	IA	CSE	Viva(V)	Term Work(TW)	
4	0	2	5	50	30	20	25	25	150

Sr. No.	Content	Duration	Weightage
1	Design of Propeller Shaft: Design of propeller shaft for bending, torsion, rigidity and critical speed criteria. Design of universal joint and slip joint.	5	10
2	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	18

3	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
4	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.	8	12
5	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.	5	10
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 of torsion bar spring	12	20
7	Optimum Design: Optimum design for automotive elements like shaft-springs etc, Johnson's method of optimum design	8	10

Distribution of Theory Marks

R Level	U Level	A Level	N Level	E Level	C Create
20	20	25	15	10	10

Legends: **R:** Remembrance; **U:** Understanding; **A:** Application, **N:** Analyze, and **E:** Evaluate

Reference Books:

1. Automotive Mechanics by N. K. Giri, Khanna Publishers
2. Machine Design by Sadhu singh, Khanna Publishers
3. Automobile Chassis Design by Dean Aaverns, Ll life Books Ltd (1992)
4. Automobile Engg. Vol-I & II by Kirpal Singh, Standard Pub.
5. Automobile Engg. Vol-I & II by K.M.Gupta, Umesh Pub.
6. Auto Design by R. B. Gupta, Satya Prakashan
7. Mechanical Engineering Design”, Fourth Edition, by Joseph E. Shigley & Larry D.Mitchell, McGraw-Hill International Book Company

8. Design of Machine Elements by Bhandari, Tata McGraw-Hill Publishing Company Ltd
9. Machine Design by, Sharma and Agrawal, S. K. Kataria & Sons
10. Transmission System Design by R. B. Patil, Tech Max Pub, Pune.
11. Elements of Motor Vehicles Design by D T Bdonkins, TMH
12. Automobile Chassis Design and calculations by P. Lukin, Mir Publishers
13. Auto design Problems by K. M. Agrawal, Satya prakashan.
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, Schand & Co.
19. Bearing Manufacturers Catalogues.

List of Experiments

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. <http://ocw.mit.edu/>