



**Diploma branch in which subject is offered:** - Automobile Engineering

**Objective:** 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.

**Credits Earned:** 4

**Course Outcomes:**

After learning the course, the students should be able to:

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

**Pre-requisite of course:** Automobile engine, Automobile Component Design.

**Teaching and Examination Scheme**

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term work	
3	2	0	4	50	30	20	25	25	150

**Contents:**

Sr. No.	Topics	Teaching hrs.	Weightage
1	<b>Design of Propeller Shaft:</b> Design of propeller shaft for bending, torsion, rigidity and critical speed criteria. Design of universal joint and slip joint.	6	12
2	<b>Design of Braking System:</b> 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.	14	20



3	<b>Design of Axle:</b> 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.	9	14
4	<b>Design of Steering System:</b> 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.	6	14
5	<b>Design of Suspension System:</b> 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
6	<b>Optimum Design:</b> Optimum design for automotive elements like shaft-springs etc, Johnson's method of optimum design, FMEA	12	20

**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 Avern, Lillife 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
8. Machine Design by, Sharma and Agrawal, S. K. Kataria & Sons
9. Transmission System Design by R. B. Patil, Tech Max Pub, Pune.
10. Elements of Motor Vehicles Design by D T Bdonkins, TMH
11. Automobile Chassis Design and calculations by P. Lukin, Mir Publishers
12. Auto design Problems by K. M. Agrawal, Satya prakashan.
13. Machine Design Vol-II & III by F.Haideri, NiraliPrakashan, Pune.
14. PSG Design Data Book.
15. Automotive Chassis by P. M. Heldt, Chilton Co., NY(1992)
16. Machine Design by Pandya and Shah, Charotar Publishing House.
17. Machine Design by R. S. Khurmi, J. K. Gupta, Schand & Co.
18. Bearing Manufacturers Catalogues.



**List of Tutorials**

1. To design the clutch for given situation of automobile vehicle.
2. To design the propeller shaft for given situation of automobile vehicle
3. To design the Axle for given situation of automobile vehicle
4. To design the steering system for given situation of automobile vehicle.
5. To design the braking system for given situation of automobile vehicle
6. To design the suspension system for given situation of automobile vehicle.

**Suggested Theory distribution:**

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyse	Evaluate	Create
35%	40%	25%	0	0	0

**List of Open Source Software/learning website**

1. <http://nptel.ac.in/>
2. <http://ocw.mit.edu/>