



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**

**Subject Code: 3161920**

**AUTOMOBILE ENGINEERING**

**SEMESTER: 6**

**Type of course:** Undergraduate

**Prerequisite:** Basics of Mechanical Engineering, Physics, Environmental Sciences, Kinematics and Theory of Machines and Dynamics of Machinery,

**Rationale:** The aim is to introduce students to the vehicle structure and associated systems. Fundamentals related to vehicle and its systems' layouts, basic design of vehicle body structure and selection of systems components are introduced.

### Teaching and Examination Scheme:

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

### Content:

Sr. No.	Content	Total Hrs
1	<p><b>Introduction:</b> Automobile classification and specification, Automobile chassis: General layout, types of layout and its arrangement, Body construction type and materials, Functional requirements of vehicle body, Body trim and fittings.</p>	3
2	<p><b>Road Load Analysis:</b> Vehicle Loads: Forces acting on vehicle in motion, Transmission efficiency, Factors affecting it. Rolling resistance, Grade resistance, tractive force with uniform speed and with acceleration of vehicle, Traction characteristic. Dynamic factor, weight transfer due to various resistance acting on a vehicle in motion. Stability of a vehicle in motion around the curve.</p>	6
3	<p><b>Power Transmission systems:</b> Clutch: Constructional features and working of single plate, multi plate, semi centrifugal and centrifugal clutch, Calculation of surface area and number of driving and driven plates. Transmission gear box: sliding mesh, constant mesh, synchromesh gearboxes and four wheel drive. Propeller shaft and Final drive: Propeller shaft, universal joints, Hotchkiss &amp; Torque tube Drives, front drive shaft types and its construction and working, Differential gear box, rear axle. Automatic Transmission and CVT Fault and diagnosis of power transmission system.</p>	10
4	<p><b>Axle, Suspension and Steering System:</b> <b>Axle:</b> Classification, types of front axle, Construction, Components and their functions, types of rear axle and application. <b>Suspension:</b> Principle, Types of suspension systems, Functional requirements of suspension systems, types and Constructional features of Front Suspension and Rear suspension system, Spring types, Rubber and Air suspensions, Factors affecting design and selection; Analysis of Suspension system: Mobility, kinematic/graphical analysis, Roll centre analysis and force analysis. <b>Steering System:</b> Steering Layout, types of steering gears, steering linkages, steering mechanism, definitions, and significance of camber, caster king, pin inclination, toe in and toe</p>	8



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	out on turn. Measurement and adjustment of various steering system layouts, steering ratio, under steering and over steering, power assisted steering, steering geometry, wheel alignment, and diagnosis of fault.	
5	<b>Brake system:</b> Components and configurations, Fundamentals of braking: braking distance, braking efficiency, weight transfer, wheel skidding, Brake proportioning and adhesion utilization, Hydraulic brake system, Power assisted brakes, ABS and EBD: Working principles, Features and advantages, Fault and diagnosis.	4
6	<b>Wheel and Tyres:</b> Types of wheels, types of tyres, tyre construction, constituents of tyre, tyre tread pattern, tyre pressure and wear, tyre properties, tyre size, tyre maintenance.	3
7	<b>Electrical, Electronics and Safety systems:</b> Engine control Unit, Monitoring and Instrumentation, Safety interlocks and alarms, Lamps, Lighting and other circuits, fuel gauge, temperature gauge, wiper, speedometer and odometer. Active and Passive Safety systems, Seat belt, Air bag, ACD, Electronic Stability Control (ESC), Tire Pressure Monitoring System (TPMS), Lane Departure Warning System (LDWS), Adaptive Cruise Control (ACC), Driver Monitoring System (DMS), Blind Spot Detection (BSD) and Night Vision System (NVS).	7
8	<b>Modern Automobiles:</b> Layout and components of Electric and Hybrid Vehicle, Types of Hybrid vehicles, Batteries, Electric Motors, Regenerative Braking.	4

## A. List of Experiments

1. Study of different types of layout of Automobiles.
2. Study of different types of Transmission gearbox
3. Fault and diagnosis of power transmission system.
4. Study of constructional features of Front and rear suspension system.
5. Study of Hydraulic braking system.
6. Study of safety features of the automobile system.
7. Study of Electronic system of Automobiles.
8. Study of Hybrid vehicles.

## Suggested Specification table with Marks (Theory):

Distribution of Theory Marks (%)					
R Level	U Level	A Level	N Level	E Level	C Level
25	35	35	5	-	-

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

Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual



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distribution of marks in the question paper may vary slightly from above table.

**Course Outcomes:** Students will be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Compare and select type of vehicle as per safety, features and applications.	7
CO-2	Evaluate vehicle performance for different driving and road conditions.	14
CO-3	Demonstrate working of various Automobile Systems	48
CO-4	Study of wheel and tyre, identify faults and diagnosis of automobile systems.	22
CO-5	Study of modern hybrid Automobiles	9

Major Equipment: Cut section of any four wheeler, cut section of various automobile systems

List of Open Source Software/learning website:

1. <http://nptel.ac.in>

**Reference Books:**

1. Automobile Engineering Vol- I & II by Dr. Kirpal Singh, Standard Pub.& Dist.
2. Automobile Engineering by R.B.Gupta , Satya Prakashan
3. Automobile Engineering Vol- I & II by Dr. K.M.Gupta,Umesh Pub.
4. Automobile Technology by Dr. N.K.Giri, Khanna Pub.
5. Automotive Mechanics by W.Crouse , Tata Mc Graw Hill
6. Automobile Engineering by G.B.S.Narang, Khanna Pub