



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**

**Subject Code: 3152009**

**Semester – V**

**Subject Name: Automobile Engineering**

**Type of course:** Engineering

**Prerequisite:** Zeal to learn the subject

**Rationale:** The aim is to introduce students to the vehicle structure and associated systems. Fundamentals related to vehicle and its systems' layouts and study of systems components are introduced. Moreover, the basic electrical and electronics requirements of automobiles are also incorporated in this course.

**Teaching and Examination Scheme:**

| Teaching Scheme |   |   | Credits<br>C | Examination Marks |        |                 |        | Total<br>Marks |
|-----------------|---|---|--------------|-------------------|--------|-----------------|--------|----------------|
| L               | T | P |              | Theory Marks      |        | Practical Marks |        |                |
|                 |   |   |              | ESE (E)           | PA (M) | ESE (V)         | PA (I) |                |
| 4               | 0 | 2 | 5            | 70                | 30     | 30              | 20     | 150            |

**Content:**

| Sr. No. | Content   | Total<br>Hrs |
|---------|---|--------------|
| 1       | <b>Introduction to Automotive Systems:</b><br>Vehicle body classification and specification: Body construction type, Location of engine and Drive system types and arrangement, specification of vehicles; Functional requirements of vehicle body, Body trim and fittings, Overview of various systems including safety features, steering system types, Tyre construction and types.  | 7            |
| 2       | <b>Power Unit-Automobile Engines:</b><br>Introduction to IC Engines, Fuel Supply System for SI and CI Engines, Engine cooling and lubrication system, Supercharging of IC Engines, Exhaust gas recirculation system, Emission control system.   | 8            |
| 3       | <b>Transmission and Driveline systems:</b><br>Constructional features and working of clutches, Single mass flywheel, Dual mass flywheel, Gear Train: sliding mesh, constant mesh and synchromesh gear boxes with related components, Propeller and drive shaft, universal joints, Rear wheel drive arrangements, Rear axle final drive, the differential, rear axle, Simple problems in all mentioned topics, Automatic Transmission and CVT. | 7            |
| 4       | <b>Suspension, Steering and Braking systems:</b><br>Types of suspension systems, Functional requirements of suspension systems, Front suspension system and Steering: Types, Definitions for wheel orientation and its effect, Types and Constructional features of Front Suspension, Steering layout, types of steering  | 13           |



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|   |   |    |
|---|---|----|
|   | gears, steering linkages, steering mechanism, definitions and significance of camber, caster and king pin inclination, toe in and toe out on turn, measurement and adjustment of various steering system layouts, steering ratio, under steering and over steering, steering geometry; Rear suspension system: Types, Factors affecting design and selection; Performance Analysis of Suspension system: Mobility, kinematic / graphical analysis, Roll center analysis, and force analysis Brake system components and configurations, Fundamentals of braking: braking distance, braking efficiency, weight transfer, wheel skidding, Brake proportioning and adhesion utilization, ABS and Electronic Braking system: Working principles, Features and advantages. |    |
| 5 | <b>Electrical and Electronics:</b><br>Electrical and electronic components of vehicle, fundamentals of engine electricals, Lighting and Indicators: Features, Requirements and typical settings, Body electrical and electronic systems, Monitoring and Instrumentation, Introduction to starting system, Battery, Starting motor, Generator(Alternator), Introduction to Automotive sensors.   | 11 |
| 6 | Maintenance and troubleshooting of Automobile; Introduction to modern electric and hybrid vehicles  | 4  |

### Suggested Specification table with Marks (Theory): (For BE only)

| Distribution of Theory Marks |         |         |         |         |         |
|------------------------------|---------|---------|---------|---------|---------|
| R Level                      | U Level | A Level | N Level | E Level | C Level |
| 30                           | 30      | 15      | 10      | 10      | 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 distribution of marks in the question paper may vary slightly from above table.

### Reference Books:

1. A Text Book of Automobile Engineering, R K Rajput, Laxmi Publication
2. Motor Vehicle Structures: Concepts and Fundamentals, Jason C. Brown, A. John Robertson, Stan T. Serpento, Butterworth Heinemann, 2002.
3. Automobile Technology, N.K. Giri, Khanna Publishers, 2011.
4. An Introduction to Modern Vehicle Design, Julian Happian-Smith, Butterworth- Heinemann, 2002.
5. Theory of Ground Vehicles, J.Y. Wong, John Wiley and Sons, 2001.
6. Automobile Mechanical and Electrical Systems Automotive Technology: Vehicle Maintenance and Repair, Tom Denton, Butterworth Heinemann, 2011.
7. Automotive Mechanics by William H Crouse.
8. Advanced Vehicle Technology by Heinz and Heisler



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**Course Outcomes:** After learning the course the students should be able to:

| Sr. No. | CO statement  | Marks % weightage |
|---------|---|-------------------|
| CO-1    | Summarize the construction details and functions of various systems in automobile vehicles. | 30                |
| CO-2    | Analyse the basic requirements of automobile engines and emission system.                   | 30                |
| CO-3    | Study various mechatronics systems in modern vehicles.                                      | 30                |
| CO-4    | Identify general maintenance related issues and troubleshooting of modern automobiles.      | 10                |

## List of Experiments:

1. Study constructional features of vehicle body, various layouts, vehicle classifications and specifications.
2. Load analysis of two to three different classes of four wheelers.
3. Study vehicle Aerodynamics: Vehicle features and Loading.
4. Study components of transmission system.
5. Study constructional features and working of clutches and automatic transmission system.
6. Develop mathematical model of a suspension system and analyse the same.
7. Study different types of steering systems, constructional features and related configurations.
8. Study different types of braking systems, their constructional features and typical layout for hydraulic pneumatic and electronic brakes.
9. Study features, requirement and components of electrical and lighting system.
10. Study electronic systems of a vehicle along with different types of sensors, safety features and their integration.

## Major Equipment:

1. Frames of different types of vehicles.
2. Section model of different types of transmission systems.
3. Working models of vehicle systems.
4. Educational cut section models of all the modules are required.

## List of Open Source Software/learning website:

NPTEL