Devi Ahilya University, Indore, India Institute of Engineering & Technology				**IV Year B.E. (Mechanical Engg.) (Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
8MERC3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
AUTOMOBILE ENGINEERING	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Course Objectives:

1. To understand the principles and working of different systems of automobiles.
2. To understand the principles and design of different systems of automobiles.
3. To understand the principles and working of Microprocessor based automobiles.
4. To understand the principles and working of Electrical systems of automobiles.

Pre requisite(s): IC Engines, Theory of Machines, Dynamics of Machines, Engineering Mechanics.

COURSE CONTENTS

UNIT-I

Chassis and Body Engineering: Chassis classification, Types of frames, Vehicle body types & construction, Body materials, Driver's visibility and methods for improvement, Safety aspects of vehicles, Chassis layout, layout of an automobile with reference to engine location, stability of vehicles, structural dynamics, Performance of Vehicle, types of automobiles.

UNIT-II

Steering System: Front axle beam, Stub axle, Front wheel assembly, Principles of types of wheel alignment, Front wheel geometry viz. camber, Kingpin inclination, Castor, Toe-in and Toe-out, Condition for true rolling motion, Centre point steering, Directional stability of vehicles, Steering Gears, Power steering, Slip angle, Cornering power, Over steer & Under Steer, electronic steering control, Wheels and tyres Specifications, Types, Construction and tread pattern.

UNIT-III

Suspension System: Vehicle Dynamics and requirement of suspension, Suspension types & construction, Shock absorber, Types of leaf springs coil spring, Air spring, Torsion bar, Location of shackles, electronic suspension system, Brakes-classification & construction, Mechanical, Hydraulic & Pneumatic power brake systems, Air-bleeding of Hydraulic brakes, Antilock braking system, Performance- Braking efforts, Efficiency, Stopping Distance & time, traction control system,

UNIT-IV

Transmission System: Clutches-requirement, Types and construction, Various Resistances to Motion of Automobile, Traction, tractive effort Performance curves, Need for transmissions, Types and construction, Synchronizer, Gear shifter mechanism, Determination of gear ratio for vehicles, Gear box performance at different vehicle speed, Torque converters, Fluid coupling, Automatic transmission, epicyclic and hydromatic transmission – continuously variable transmission (Continuous Variable Transmission – CVT), Electrical drives: advantages and limitations, Modern electric drive for buses and performance characteristics, Propeller shaft, Universal joints, CV joints, Differential gear box, Rear axle types & construction.

UNIT-V

Electrical and Control Systems: Types of storage battery, Construction and operation of lead acid battery, Testing of battery, Principle & operation of starting mechanism, Different Bendix drive systems, Starter relay switch, Electrical accessories -fuel gauge, Fuel pump, Horn, Wiper, Lighting system, Head light dazzling, Signaling devices and circuit, Car air conditioning systems, Battery operated vehicles. Microprocessor based control system for automobiles. Intelligent automobiles control systems.
Indian standards for automotive vehicles exhaust emission-Bharat and Euro norms, Indian Motor vehicle act-preliminary information.

Course Outcomes:

Upon Completing the Course, Student will able to:

CO1. Understand the design and working principles of Chassis systems of automobiles.
CO2. Understand the specifications of automobiles.
CO3. Understand the working of all systems of automobiles.
CO4. Learn advanced system of automobiles.
CO5. Industry ready for Automotive industry.

BOOKS RECOMMENDED:

[1] Singh Kirpal, *Automobile Engineering, Vol.1*, Standard Pub, 9e.
[2] Giri N.K., *Automotive Technology*, Khanna Pub, 4e 2009.
[3] Newton & Steeds, *Automobile Engineering*, Butterworth Int.
[4] Heitner Joseph, *Automotive Mechanics, Principles and Practices*, East-West Pub.
[5] Crouse W.H., *Automotive series Part-I to VI*, Tata McGrawhill, 9.e
[6] Crouse W.H., *Automotive Emission*, Tata McGrawhill.
[7] BIS and Euro –I and Euro-II, *Emission standards.*

LIST OF PRACTICAL ASSIGNMENTS:

1. Study of chassis frame and body.
2. Study by dismantling and assembly of steering linkage mechanism and Steering Boxes.
3. Study by dismantling and assembly of Front and Rear suspension systems.
4. Study by dismantling and assembly of hydraulic brake and power brake system.
5. Study by dismantling and assembly of single plate and multi plate clutch system.
6. Study by dismantling and assembly of sliding mesh, constant mesh, synchromesh gearboxes.
7. Study by dismantling and assembly of -Propeller shaft, Differential, Rear axles.
8. Study of electrical circuit, self-starter and battery.

Course Objective:

1. To understand the principles and working of different systems of automobiles.
2. To understand the principles and design of different systems of automobiles.
3. To understand the principles and working of Microprocessor based automobiles.
4. To understand the principles and working of Electrical systems of automobiles.

Course Outcome:

Students earned credits will develop ability to

CO. No.	CO	PO
CO1	Understand the design and working principles of Chassis systems of automobiles.	PO1, PO2
CO2	Understand the specifications of automobiles.	PO1, PO3, PO5
CO3	Understand the working of all systems of automobiles.	PO1, PO2, PO11
CO4	Learn advanced system of automobiles.	PO1, PO3, PO5, PO12
CO5	Industry ready for Automotive industry.	PO1, PO3, PO7

CO-PO Relationship

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	3	3										
CO2	3		3		2							
CO3	3	3									2	
CO4	3		3		3							2
CO5	3		3				2					

* CO (rows) mention nil/very small/insignificant contribution to the PO(column)
1→ relevant and small significance 2 → medium or moderate and 3 →strong