

16AE307 AUTOTRONICS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSB	CS	SA	S	BS
45	-	30	5	40	2	8	5	5

Course Description and Objectives:

This course offers fundamental concepts of automotive electrical and electronic systems and helps the learner develop basic skills necessary to diagnose problems in starting, charging, lighting and sensory systems. The objective of this course is to impart knowledge on basic and advanced electronic systems and technologies in automobiles like electronic battery charging, fuel injection systems, fuel cells, solar power systems along with advanced electric and hybrid vehicles.

Course Outcomes:

The student will be able to:

- recognize and understand different wiring diagrams used in manufacturer's workshop manuals.
- identify the various modules and sensors from the wiring diagrams.
- determine the function and operation of various electronic components and understand their role in the management of the vehicle control.
- understand construction and working of different electric and hybrid vehicles.

SKILLS:

Identify electrical wiring layouts of different systems.

Identify different electronic components in an automobile and their working.

Analyze the construction and working of different AC and DC generators.

Use tools and gauges for different measurements.

Propose alternative power systems for different applications.

Perform analog to digital interfacing and data acquisition.

UNIT - 1**L-10**

INTRODUCTION : AUTOMOTIVE ELECTRICAL SYSTEMS : Automotive electric power generation, Storage & Distribution systems, Wiring harness, Circuit diagrams and symbols, 12/24/42 volt system, Positive earth and negative earth, Earth return and insulated return systems, Multiplexed wiring systems, Electromagnetic compatibility, Electromagnetic interference, Controlled Area Networks (CAN)

Battery: Types, Principle of lead acid battery, Constructional details, Recharging the battery, Battery ratings, Battery Performance, Battery capacities, Battery efficiency, Battery tests, Battery failures, Alkaline battery, Maintenance free batteries, Hybrid batteries

UNIT-2**L-9**

CHARGING SYSTEMS & REGULATORS : Generators, A. C. Generators, Magnetos Constant current & Voltage systems, Current & Voltage regulator, Semi-conductor type regulator, Regulator for alternators

Starting Systems: Requirements of Starting system, Starting system layout, Selection of motor, matching battery, Drive mechanisms, Permanent magnet motors

UNIT - 3**L-9**

IGNITION SYSTEMS : Introduction, Types, Ignition coil, Distributor, Cam angle & Contact angle gap, Advance mechanisms, Ballast Resistance, Limitations of coil Ignition, Transistorized Ignition systems, Spark plugs, Types, Construction.

LIGHTING SYSTEMS: Fundamentals, Headlight, Types, Lighting circuits, Interior lighting, Signaling, LED lighting, Gas discharge lighting

UNIT - 4**L-9**

AUTOMOTIVE EQUIPMENT & ACCESSORIES : Fuel gauge, Oil pressure gauge, Temperature gauges, Speedometer, Warning Lights, Electric Horn, Horn Relay, Wind Shield wipers, Heaters & Defrosters, Electric windows.

AUTOMOTIVE SENSORS & ACTUATORS : Actuators, Air-flow rate sensor, Angular position sensor, Throttle angle sensor, Temperature sensor, Knock sensor, Pressure sensor. Feedback for engine control, Solenoid actuators, Motorized actuators.

UNIT - 5**L-8**

AUTOMOTIVE ELECTRONIC SYSTEMS : Electronic Ignition systems, Electronic injection systems, Antilock brake system circuit, Traction control, Electronic control of automobile transmission, Active suspension, Engine management system.

ELECTRONIC AND HYBRID VEHICLES : Types, Energy sources – batteries, Fuel cells, Solar and Hydrogen, Electric machines and controllers, Design considerations, Challenges and recent developments.

ACTIVITIES:

- Draw wiring diagrams for different electrical systems and implement circuits.
- Identify wiring requirements
- Carry out disassembly and assembly of alternator/ starting motor.
- Choose appropriate tool/gauge/ device to perform measurements
- Set up solar panels and perform voltage/current measurements
- Test different batteries
- Perform ECU diagnostics
- Perform A/D interfacing and data acquisition

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS

Total hours:30

1. Automotive electrical and electronic systems layout
2. Battery charging and testing
3. Testing of alternators/DC motors
4. Testing of starting motors
5. Electronic ignition system
6. Dash board panel instruments and controls
7. Headlight beam alignment and testing
8. Auto electrical component testing using multifunction tester
9. Demonstration of electric bike and hybrid vehicle
10. Electronic control unit diagnostic system
11. Analog/Digital converter interfacing and simple data acquisition

TEXT BOOKS:

1. Tom Denton, "Automobile Electrical and Electronic Systems", 4th edition, Butterworth-Heinemann, 2014.
2. P. L. Kohli, "Automotive Electrical Equipment", 27th reprint., Tata McGraw Hill, 2006.

REFERENCE BOOKS:

1. Primrose Young, Leonard Griffiths, "Automobile Electrical and Electronic Equipment", 9th edition, Butterworth-Heinemann Ltd, 1981.
2. William B. Ribbens, Norman P. Mansour, "Understanding Automotive Electronics", 6th edition, Newnes Publications, 2003.