

1152AU113

ENGINE ELECTRONICS AND MANAGEMENT SYSTEMS**L T P C****3 0 0 3****1. Preamble**

This course imparts knowledge about the sensors and electronic components used in an automobile and the engine control system.

2. Prerequisite

1151AU215 Automotive Electrical and Electronics

3. Related Courses

- IC Engines
- Automotive chassis

4. Course Educational Objectives

Students undergoing this course are expected to:

- Gain knowledge about the construction and working of electronic components in an engine management system.
- Gain knowledge about how the combustion and pollution can be varied by sensors.

5. Course Outcomes

Upon the successful completion of the course, learners will be able to

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
CO1	Understand the basic electronic components and controls used in sensors	K2
CO2	Explain the different types of sensors used in an automobile engine	K2
CO3	Describe the ignition and injection methods used in an SI engine	K3
CO4	Describe the fuel injection systems in a diesel engine and the emission control systems	K3
CO5	Explain the electronic systems used in the fuel control system and the dash board unit.	K2

(K2 – Understand; K3 – Apply)

6. Correlation of COs with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	H	M	L	M	L					L		M	M
CO2	H	H	M	L	M	L					L		M	M
CO3	H	H	M	L	M	L					L		M	H
CO4	H	H	M	L	M	L					L		H	H
CO5	H	H	M	L	M	L					L		H	H

H- High; M-Medium; L-Low

7. Course Content

UNIT I FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS

L-9

Components for Electronic Engine Management System, Open and Closed Loop Control Strategies, PID Control, Look Up Tables, Introduction to Modern Control Strategies Like Fuzzy Logic and Adaptive Control. Switches, Active Resistors, Transistors, Current Mirrors/Amplifiers, Voltage and Current References, Comparator, Multiplier. Amplifier, Filters, A/D and D/A Converters.

UNIT II SENSORS AND ACTUATORS

L-9

Inductive, Hall Effect, Thermistors, Piezo Electric, Piezoresistive, Based Sensors. Throttle Position, Mass Air Flow, Crank Shaft Position, Cam Position, Engine Speed Sensor, Exhaust Oxygen Level (Two Step, Linear Lambda and Wideband), Knock, Manifold Temperature and Pressure Sensors. Solenoid, Relay (Four and Five Pin), Stepper Motor

UNIT III SI ENGINE MANAGEMENT

L-9

Layout and Working of SI Engine Management Systems. Group and Sequential Injection Techniques. MPFI, GDI, Advantages of Electronic Ignition Systems. Types of Solid State Ignition Systems and their Principle of Operation, Contactless (BREAKERLESS) Electronic Ignition System, Electronic Spark Timing Control.

UNIT IV CI ENGINE MANAGEMENT

L-9

Fuel Injection System Parameters Affecting Combustion, Noise and Emissions in CI Engines. Electronically Controlled Unit Injection System - Common Rail Fuel Injection System. Working of Components Like Fuel Injector, Fuel Pump, Rail Pressure Limiter, Flow Limiter, EGR Valve.

UNIT V DIGITAL ENGINE CONTROL SYSTEM

L-9

Cold Start and Warm Up Phases, Idle Speed Control, Acceleration and Full Load Enrichment, Deceleration Fuel Cutoff. Fuel Control Maps, Open Loop and Closed Loop Control – Integrated Engine Control System, Electromagnetic Compatibility – EMI Suppression Techniques – Electronic Dash Board Instruments – Onboard Diagnosis System.

Total: 45 periods

8. Text Books:

1. Understanding Automotive Electronics William B Ribbens, SAE 1998
2. Automobile Electronics by Eric Chowanietz SAE

9. References:

1. Diesel Engine Management by Robert Bosch, SAE Publications, 3rd Edition, 2004
2. Gasoline Engine Management by Robert Bosch, SAE Publications, 2nd Edition, 2004