

1. Preamble

This course provides the fundamentals of basic hardware components to the sophistication of digital control systems algorithms. It will start with a review of automotive sensors and actuators technologies and progress with the fundamental notions of digital signal processing and digital control system design which are necessary to the engineer who works with computer-controlled systems

2. Pre Requisite

NIL

3. 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 principles of basic electronic components related with automobiles.	K2
CO2	Understand the basic principles of control system and embedded system in automobile	K2
CO 3	Study about the working of operating system in automobile	K2
CO4	Study about components of electronic control unit	K2
CO5	Understand the wiring harness in automobile	K2

4. Correlation of COs with Programme Outcomes

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

5. Course Content

UNIT-1 Fundamentals of Automotive Electronics

L-9

Semiconductor Devices- Diodes- Rectifier Circuit- Transistors- Transistor Amplifiers- Operational Amplifiers- Logic Gates- Flip-Flops. ADC and Its Types- DAC and Its Types. Manufacturing of Semiconductor Components and Circuits.

UNIT-2 Control Systems and Embedded Systems

L-9

Open-Loop and Closed-Loop Control Systems: Modeling- Block Diagrams-Discrete Systems- Time-Discrete Systems- Value-Discrete Systems and Signals- Time- and Value-Discrete Systems and Signals- State Machines. Embedded Systems: Microcontroller

Construction- Memory Technologies: Read/Write Memory- Non-Erasable-Read-Only Memory- Reprogrammable Nonvolatile Memory- Microcontroller Programming- Program Version and Data Version-Functional Principles of Microcontrollers -Principal Microcontroller Operations- Microprocessor Architecture and instruction Set- I/O Module Architecture.

UNIT-3 Automotive Software

L-9

Real-Time Systems- Distributed and Networked Systems- System Reliability- Safety-Monitoring- and Diagnostics.

UNIT-4 Electronic Control Unit

L-9

Operating Conditions- Design- Data Processing- Digital Modules in the Control Unit.

UNIT-5 Wiring Harness

L-9

Wiring Harness and Cables- Wiring System interfaces- Circuit Protection- Circuit Diagrams.

45 periods

6. Text book

1. Jörg Schäuffele Thomas Zurawka, Automotive Software Engineering: Principles, Processes, Methods, and Tools, SAE International, Fachverlage GmbH, Wiesbaden, Germany, 2003, ISBN 3-528-01040-1
2. William B. Ribbens, Understanding Automotive Electronics, Fifth Edition, Butterworth–Heinemann publications, 1998.

7. References

1. Bosch Automotive Electrics and Automotive Electronics: Systems and Components, Networking and Hybrid Drive, 5th Edition, Robert Bosch GmbH, 2007.
2. Najamuz Zaman, Automotive Electronics Design Fundamentals, Springer International Publishing Switzerland 2015