SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35.

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai.

DEPARTMENT OF AUTOMOBILE ENGINEERING

COURSE NAME : 19AUB204 – AUTOMOTIVE ELECTRICAL AND ELECTRONICS ENGINEERING

II YEAR / IV SEMESTER

Unit 5 – Electronics Systems

Topic : Current Trends in Automotive Electronic Engine Management System

ELECTRIFICATION

- **Hybrid and Electric Vehicles (EVs)**: There is a significant shift towards hybrid and fully electric powertrains. EEMS for these vehicles are more complex, managing not only the internal combustion engine (ICE) but also electric motors and battery systems.
- **Battery Management Systems (BMS)**: For EVs, the integration of advanced BMS is crucial to monitor and manage the battery's state of charge, health, and temperature.

ADVANCED SENSORS AND ACTUATORS

- **Improved Sensors**: Modern EEMS utilize a wide array of sensors for precise control of engine parameters. These include oxygen sensors, mass airflow sensors, knock sensors, and more.
- **Smart Actuators**: Actuators are becoming more intelligent, providing better control over engine components such as fuel injectors, throttle valves, and variable valve timing systems.

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

- **Predictive Maintenance**: AI and machine learning algorithms analyze engine data to predict potential failures and maintenance needs before they occur, enhancing reliability and reducing downtime.
- **Optimized Performance**: Machine learning is used to continuously optimize engine performance under various driving conditions, improving fuel efficiency and reducing emissions.

INTEGRATION WITH ADAS AND AUTONOMOUS DRIVING

- **Synergy with ADAS**: EEMS are increasingly integrated with Advanced Driver Assistance Systems (ADAS) for functions such as adaptive cruise control and lane-keeping assistance, which require precise control of the engine and transmission.
- **Autonomous Vehicles**: For autonomous vehicles, EEMS must work seamlessly with the vehicle's overall control system, ensuring the engine operates efficiently and safely without human intervention.

CONNECTIVITY AND IoT

- **Vehicle-to-Everything (V2X) Communication**: EEMS are incorporating V2X technology to communicate with other vehicles and infrastructure, enhancing traffic efficiency and safety.
- **Over-the-Air (OTA) Updates**: EEMS can receive software updates remotely, allowing manufacturers to improve engine performance, fix bugs, and add new features without requiring a visit to the service center.

FUEL EFFICIENCY IMPROVEMENT

- **Start-Stop Systems**: These systems automatically shut off the engine when the vehicle is stationary and restart it when the accelerator is pressed, reducing fuel consumption and emissions.
- **Cylinder Deactivation**: This technology allows the engine to deactivate some of its cylinders under light-load conditions to save fuel.

ENHANCED CONTROL ALGORITHM

- **Model Predictive Control (MPC)**: Advanced control algorithms like MPC are used to predict and optimize engine performance in real-time.
- **Real-Time Data Processing**: The use of faster processors and real-time data analytics enables more precise control of engine functions.

SOFTWARE AND SECURITY

- **Software-Defined Vehicles**: Modern vehicles increasingly rely on software updates to enhance performance, safety, and features. EEMS must support these updates seamlessly.
- **Cybersecurity**: Protecting EEMS from cyber threats is crucial, requiring robust security measures to prevent unauthorized access and manipulation.

THANK YOU !!!