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| Program : Diploma in Automobile Engineering | |
| Course Code : 5053A | Course Title: Automotive Power Train Control |
| Semester : 5 | Credits: 4 |
| Course Category: Program Core | |
| Periods per week: 4 (L:4, T:0, P:0) | Periods per semester: 60 |

Course Objectives:

- To explain the principle of engine control system and transmission control systems

Course Prerequisites:

| Topic | Course code | Course name | Semester |
|--|-------------|---|----------|
| Electricity storage and distribution, electronic systems | | Automobile electrical and electronics systems | 3 |

Course Outcomes:

On completion of the course, the student will be able to:

| CO _n | Description | Duration (Hours) | Cognitive Level |
|-----------------|--|------------------|-----------------|
| CO1 | Summarize the concept of electronic engine control Systems | 14 | Understanding |
| CO2 | Identify various sensors and actuators used in electronic engine control system. | 15 | Applying |
| CO3 | Outline the features of digital engine control system | 15 | Understanding |
| CO4 | Outline the integrated engine control system and automatic transmission control | 14 | Understanding |
| | Series Test | 2 | |

CO – PO Mapping:

| Course Outcomes | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|-----------------|-----|-----|-----|-----|-----|-----|-----|
| CO1 | 3 | | 2 | | | | |
| CO2 | 3 | | 2 | | | | |
| CO3 | 3 | | 2 | | | | |
| CO4 | 2 | | 2 | | | | |

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

| Module Outcomes | Description | Duration (Hours) | Cognitive Level |
|---|---|------------------|-----------------|
| CO1 | Summarize the concept of electronic engine control Systems | | |
| M1.01 | Outline the functions of engine and controls | 3 | Understanding |
| M1.02 | Outline the terms related to engine performance | 4 | Understanding |
| M1.03 | Explain the mapping of engine. | 3 | Understanding |
| M1.04 | Outline electronic fuel control system | 4 | Understanding |
| Contents: | | | |
| The concept of electronic Engine control system - Engine functions and control - Parameters and variables - Input to controller - output from controller - Definition of engine performance terms - Power - torque - fuel consumption - Volumetric efficiency - Thermal efficiency - calibration, Engine mapping-Effect of air fuel ratio, spark timing and exhaust gas recirculation on performance - Electronic fuel control system - Engine control sequence - open loop control - closed loop control - closed loop operation - Idle speed control. | | | |
| CO2 | Identify various sensors and actuators used in electronic engine control system. | | |
| M2.01 | Outline the engine Variables | 4 | Understanding |
| M2.02 | Illustrate the working of various sensors | 7 | Understanding |
| M2.03 | Illustrate the working of various actuators | 3 | Understanding |
| M2.04 | Identify various actuators and actuators | 1 | Applying |
| | Series Test – I | 1 | |

Contents:

Typical electronic Engine Control System. Variables to be measured, Sensors and actuators- Temperature sensor- Pressure sensor-Mass air flow sensor-Oxygen sensor- Position sensor-Position/speed sensor-Knock sensor-

Automotive Engine Control Actuators-Solenoid-switches-relays-motors-Fuel injection- Exhaust gas recirculation actuators-Variable valve timing.

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| CO3 | Outline the features of digital engine control system | | |
| M3.01 | Illustrate the features of digital power train control systems. | 5 | Understanding |
| M3.02 | Explain various modes for fuel control | 5 | Understanding |
| M3.03 | Explain Electronic ignition control | 5 | Understanding |

Contents:

Digital power train control systems - features - Components - Digital engine control system diagram - Modes for fuel control - Control during Engine crank - Engine Warm up - After the engine warm up - open loop - closed loop - Acceleration enrichment - Deceleration leaning - Idle speed control - EGR Control - Variable valve timing control - Electronic ignition control-Distributor less Ignition control.

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| CO4 | Outline the integrated engine control system and automatic transmission control | | |
| M4.01 | Explain integrated engine control systems | 4 | Understanding |
| M4.02 | Explain improvements in Electronic engine control system | 5 | Understanding |
| M4.03 | Explain automatic transmission and traction control | 5 | Understanding |
| | Series Test – II | 1 | |

Contents:

Integrated engine control system - Secondary air Management - Evaporative emission canister purge - Automatic system adjustment - System diagnosis - Improvements in Electronic Engine Control system - Oxygen sensor improvements - Heated exhaust gas oxygen sensor - Fuel injection Timing - Transmission control - Automatic transmission control - Torque convertor lock up control - Differential and traction control

Text / Reference:

| T/R | Book Title/Author |
|------------|---|
| T1 | U.Kienck, and L. Nielsen, Automotive Control Systems, SAE and Springer-Verlag 2000 |
| R1 | LjuboVlacic, Michel Parent, Fumio Harashima, "Intelligent Vehicle Technologies", Butterworth-Heinemann publications, Oxford, 2001 |
| R2 | Crouse, W.H & Anglin, D.L,"Automotive mechanics", Intl.Student edition, 9 th edition, TMH, New Delhi, 2002. |
| R3 | William B. Ribbens-Understanding Automotive Electronics, 5 th edition, Butter worth Heinemann Woburn 1998. |
| R4 | Bosh, "Automotive Handbook", 6 th edition, SAE, 2004 |

Online Resources:

| Sl.No | Website Link |
|--------------|---|
| 1 | https://www.electronicsforu.com/technology-trends/tech-focus/automobile-industry-sensor |
| 2 | https://www.youtube.com/watch?v=jyQuRgQHGck |
| 3 | https://www.youtube.com/watch?v=8e4QB1DYYJU |
| 4 | https://www.youtube.com/watch?v=FpGGpgSEU94 |
| 5 | https://www.youtube.com/watch?v=PFNe7NyJeb0 |