

DIPLOMA (AUTOMOBILE) – PART SIX

Optional Early Certificate :- N/A

Syllabus:-

| Sr. No. | Module Code | Name of Module | Credits | Total Marks |
|---------|-------------|--|---------|-------------|
| 1 | MC21-26 | Automotive Electrical System & Electronics | 5 | 100 |
| 2 | MC21-27 | Vehicle Body Engineering | 5 | 100 |
| 3 | MC21-28 | Automotive Fuels & Lubricants | 5 | 100 |
| 4 | MC21-29 | Projects | 4 | 100 |

Module Name: Automotive Electrical Systems & Electronics

- 1. Batteries:** Principles and construction of lead-acid battery. Characteristics of battery, rating capacity and efficiency of batteries. Various tests on battery condition, charging methods. Constructional aspect of alkaline battery.
- 2. Starting System:** Condition at starting. Behaviour of starter during starting. Series motor and its characteristics. Principle & construction of starter motor. Working of different starter drive units, care and maintenance of starter motor. Starter Switches.
- 3. Charging System:** Generation of direct current. Shunt generator characteristics. Armature reaction. Third brush regulation. Cut-out. Voltage & current regulators. Compensated voltage regulator alternators principle & constructional aspects and bridge benefits.
- 4. Ignition Systems:** Types, Construction & working of battery coil and magneto ignition systems. Relative merits, Centrifugal and vacuum advance mechanisms, types and construction of spark plugs, electronic ignition systems.
- 5. Lighting System & Accessories:** Insulated & earth return systems. Positive & negative earth systems. Details of head light & side light. Headlight dazzling & preventive methods. Electrical fuel-pump, Speedometer, Fuel, oil & temperature gauges, Horn, Wiper system, Trafficator.

6. Automotive Electronics: Current trends in modern automobiles, Open and close loop systems- Components for electronic engine management. Electronic management of chassis system. Vehicle motion control.
7. Sensors and Actuators: Basic sensor arrangement, Types of sensors such as-Oxygen sensors, Crank angle position sensors-Fuel metering/vehicle speed sensor and detonation sensor-Altitude sensor, flow sensor. Throttle position sensors. Solenoids, stepper motors, and relays.
8. Electronic Fuel Injection and Ignition Systems: Introduction, feedback carburetor systems. Throttle body injection and multi-port or point fuel injection, fuel injection systems, Injection system controls. Advantages of electronic ignition systems: Types of solid-state ignition systems and their principle of operation, Contact less electronic ignition system, and electronic spark timing control.
9. Digital Engine Control System: Open loop and closed loop control systems-Engine cranking and warm up control-Acceleration enrichment-Deceleration leaning and idle speed control. Distributor less ignition-Integrated engine control systems, Exhaust emission control engineering.
10. Electronic dashboard instruments-Onboard diagnosis system, security and warning system.

Module Name: Vehicle Body Engineering

1. Car Body Details: Types: Saloon, Convertibles, Limousine, Estate van, racing and sports car. Visibility: regulations, driver's visibility, test for visibility, Methods of improving visibility and space in cars. Safety: safety design, safety equipments for car. Car body construction.
2. Vehicle Aerodynamics: Objectives, Vehicle drag and types, various types of forces and moments, Effects of forces and moments, side wind effects on forces and moments, various body optimization techniques for minimum drag. Wind tunnel testing: Flow visualization techniques, scale model testing. Component balance to measure forces and moments.
3. Bus Body Details: Types, mini bus, single decker, double decker, two level, split level and articulated bus. Bus Body Lay Out: Floor height, engine location, entrance and exit location, seating dimensions. Constructional details: Frame construction, Double skin construction-Types of metal section used-Regulations-Conventional and Integral type construction.
4. Commercial Vehicle Details: Types of body, Flat platform, drop side, fixed side, tipper body, tanker body. Light commercial vehicle body types, Dimensions of driver's seat in relation to controls, driver's cabin design.
5. Body Materials, Trim And Mechanisms: Steel sheet, timber, plastics, GRP, properties of materials-Corrosion anticorrosion methods, scallation of paint and painting process, body trim items. Body mechanisms.

Module Name: Automotive Fuels & Lubricants

- 1. Manufacture of Fuels and Lubricants:** Fuels, Structure of petroleum, refining process, thermal and catalytic cracking, products of refining process, manufacture of lubricating oil base stocks and finished automotive lubricants.
- 2. Fuels for I.C. Engines:** Types of Fuels, Liquid and gaseous fuels, heating value of fuels, higher and lower heating values, chemical structure of hydro-carbons SI Engine fuels, Volatility characteristics, desirable characteristics of SI Engine fuels, knock rating and additives, alternate fuels for SI engines. CI engine fuels, desirable characteristics, cetane rating, alternate fuels for CI engines, biodiesels.
- 3. Combustion of Fuels:** Stoichiometry - calculation of theoretically correct air required for combustion of liquid and gaseous fuels, volumetric and gravimetric analysis of the dry products of combustion, mass of dry gas per kg of fuel burnt, mass of carbon in the exhaust gas, mass of carbon burnt to carbon-monoxide per kg of fuel, heat loss due to incomplete combustion, exhaust gas analysis by Orsat apparatus.
- 4. Theory of Lubrication:** Engine friction: introduction, total engine friction, effect of engine variables on friction, hydrodynamic lubrication, elasto hydrodynamic lubrication, boundary lubrication, Hydrostatic lubrication bearing lubrication, functions of the lubrication system.
- 5. Lubricants:** Specific requirements for automotive lubricants, oxidation deterioration and degradation of lubricants, additives and additive mechanism, synthetic lubricants, classification of lubricating oils, properties of lubricating oils, tests on lubricants. Grease, classification, properties, testing of grease