

DIPLOMA (AUTOMOBILE) – PART FIVE

Optional Early Certificate: - Certificate (Automobile)

Syllabus:-

Sr. No.	Module Code	Name of Module	Credits	Total Marks
1	MC21-21	English - III	5	100
2	MC21-22	Automotive Petrol & Diesel Engines	5	100
3	MC21-23	Fluid Mechanics	5	100
4	MC21-24	Power Units and Transmission	5	100
5	MC21-25	Automotive Chassis	5	100

Module Name: English-III

- The Seven C's of the Effective Communication:** Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness.
- Communication:** Its interpretation: Basics, Nonverbal Communication, Barriers to Communication.
- Business Communication at Work Place:** Letter Components and Layouts, Planning a letter, Process of Letter writing, Email Communication, Memo and Memo Reports, Employment Communication, Notice Agenda and Minutes of Meeting, Brochures.
- Report Writing:** Effective Writing, Types of Business Reports, Structure of Reports, Gathering Information, Organization of the Material, Writing Abstracts and Summaries, Writing Definitions, Visual Aids, User Instruction Manual.
- Required Skills:** Reading Skills, Note-making, Précis Writing, Audio Visual Aids, Oral Communication.
- Mechanics of Writing:** Transitions, Spelling Rules, Hyphenation, Transcribing Numbers, Abbreviating Technical and Non-Technical Terms, Proof Reading.

Module Name: Automotive Petrol & Diesel Engines

Petrol Engines:

- Engine Construction and Operation: Constructional details of 4-stroke petrol engine. Working principle, Otto cycle, and actual indicator diagram.
- Two stroke engine construction and operation. Comparison of four stroke and two-stroke engine operation. Firing order and its significance.

9. SI Engine Fuel System: Carburettor working principle. Requirements of an automotive carburettor; Starting, idling, acceleration and normal circuits of carburettors, compensation, Maximum power devices, constant choke and constant vacuum carburetors. Fuel feed systems, Mechanical and electrical pumps. Petrol injection.
10. Cooling and Lubrication System: Need for cooling system. Types of cooling system, Liquid cooled system, Thermosyphon system, Pressure cooling system. Lubrication system, Mist lubrication system, Wet sump and dry sump lubrication. Properties of lubricants. Properties of coolants.
11. Combustion and Combustion Chambers: Combustion in SI engines, stages of combustion, flame propagation, rate of pressure rise, abnormal combustion, knocks. Effect of engine variables and knock. Combustion chambers, Different types, Factor controlling combustion chamber design.
12. Two Stroke Engines: Types of two strokes engines, Terminologies and definitions, Theoretical scavenging methods. Scavenging pumps. Types of scavenging.

Diesel Engines

13. Engine construction and operation. Two stroke and four stroke diesel engines. Diesel cycle. Fuel-air and actual cycle analysis. Diesel fuel, Ignition quality. Cetane number.
14. Fuel Injection System: Requirements, Air and solid injection, function of components, Jerk and distributor type Pumps. Pressure waves, Injection lag, Unit injector, Mechanical and Pneumatic governors. Fuel injector-types of injection nozzle, Spray characteristics, injection timing, pump calibration.
15. Combustion Chambers: Importance of air motion-swirl, squish and turbulence-swirl ratio. Fuel air mixing –stages of combustion, delay period, factors affecting delay period. Knock in CI engines-comparison of knock in CI & SI engines. Direct and indirect injection. Combustion Chambers-Air cell chamber, combustion chamber design objectives. Different types of combustion chamber.
16. Supercharging and Turbocharging: Necessity and limitation, Charge cooling, Types of supercharging and turbocharging, relative merits, matching of turbocharger.
17. Diesel Engine Testing and Performance: Automotive and stationary diesel engine testing and related standards. Engine power and efficiencies.
18. Performance characteristics. Variables affecting engine performance. Methods to improve engine performance. Heat balance. Performance maps.

Module Name: Fluid Mechanics

1. **Basic Concepts and Properties:** Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges.
2. **Fluid Kinematics and Fluid Dynamics:** Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms)- Equation of streamline - stream function - velocity potential function - circulation - flow net – fluid dynamics - equations of motion - Euler's equation along a streamline - Bernoulli's equation – applications - Venturi meter, Orifice meter, Pitot tube - dimensional analysis - Buckingham's ? Theorem-applications - similarity laws and models.
3. **Incompressible Fluid Flow:** Viscous flow - Navier - Stoke's equation (Statement only) - Shear stress, pressure gradient relationship - laminar flow between parallel plates - Laminar flow through circular tubes (Hagen poiseulle's) - Hydraulic and energy gradient - flow through pipes - Darcy -weisback's equation - pipe roughness -friction factor- Moody's diagram-minor losses - flow through pipes in series

and in parallel - power transmission - Boundary layer flows, boundary layer thickness, boundary layer separation - drag and lift coefficients.

4. **Hydraulic Turbines:** Fluid machines: definition and classification - exchange of energy - Euler's equation for turbo machines - Construction of velocity vector diagram's - head and specific work - components of energy transfer-degree of reaction. Hydro turbines: definition and classifications - Pelton turbine - Francis turbine - propeller turbine - Kaplan turbine - working principles - velocity triangles - work done - specific speed - efficiencies -performance curve for turbines.
5. **Hydraulic Pumps:** Pumps: definition and classifications - Centrifugal pump: classifications, working principles, velocity triangles, specific speed, efficiency and performance curves - Reciprocating pump: classification, working principles, indicator diagram, work saved by air vessels and performance curves - cavitations in pumps - rotary pumps: working principles of gear and vane pumps.

Module Name: Power Units and Transmission

1. Requirement of transmission system.
2. Different types of clutch: Principle, construction, torque capacity and design aspects.
3. Determination of gear ratios for vehicles. Performance characteristic in different speeds. Different types of gearbox, conventional gearbox.
4. Hydrodynamic Drive: Fluid coupling: Principle of operation. Constructional details, torque capacity. Performance characteristics, reduction of drag torques.
5. Torque Converter: Principle of operation, constructional details, performance characteristics, converter coupling, multistage torque converters and polyphase torque converters.
6. Automotive Transmission: Ford—T-model gearbox, Wilson gearbox, Electro-magnetic transmission, Automatic overdrive, Hydraulic control system for automatic transmission.
7. Hydrostatic Drive and Electric Drive: Hydrostatic drive: Various types of hydrostatic drive systems- Principles of hydrostatic drive system, Advantages and limitations. Comparison of hydrostatic drive with hydrodynamic drive, Construction and working of typical Janny hydrostatic drive.
8. Electric drive: Principles of early and modified Ward Leonard Control system, advantages & limitations. Performance characteristics.
9. Automatic Transmission Applications: Chevrolet “Turboglide” transmission, power glide transmission, Toyota “ECT-I” automatic transmission with intelligent electronic control system. Clutch hydraulic actuation system.

Module Name: Automotive Chassis

1. Introduction: Types of chassis layout with reference to power plant locations and drive. Vehicle frames. Various types of frames. Constructional details. Materials. Testing of vehicles frames. Unitised frame body construction, Loads acting on vehicle frame.
2. Front axle and Steering System: Types of front axle. Constructions details. Materials. Front wheel geometry viz. Castor, Camber, King pin inclination, Toe-in. Conditions for true rolling motion of wheels during steering. Steering geometry. Ackerman and Davis steering system. Constructional details of steering linkages. Different types of steering gear boxes. Steering linkages and layouts. Power and Power assisted steering. Steering of crawler tractors.
3. Drive Line: Effect of driving thrust and torque reactions. Hotch Kiss drive, torque tube drive and radius rods. Propeller shaft. Universal joints. Constants velocity universal joints. Front wheel drive.
4. Final Drive Differential: Different types of final drive. Worm and worm wheel, Straight bevel gear, Sprial bevel gear and hypoid gear final drives. Double reduction and twin speed final drives. Differential principles. Construction details of differential unit. Non-slip differential.
5. Differential locks. Differential housings.

6. Rear Axles: Construction of rear axles. Types of loads acting on rear axles. Full floating. Three quarter floating and semi floating rear axles.
7. Rear axle housing. Construction of different types of axle housings. Multi axles vehicles. Construction details of multi drive axle vehicles.
8. Suspension System: Need of suspension system, types of suspension, suspension springs, constructional details and characteristics of leaf, coil and torsion bar springs. Independent suspension, Rubber suspension, Pneumatic suspension, Shock absorbers.

Braking System: Classification of brakes, drum brake & disc brakes. Constructional details-Theory of braking. Mechanical hydraulic and Pneumatic brakes. Servo brake. Power and power assisted brakes-different types of retarders like eddy current and hydraulic retarder. Anti-lock braking systems.