

## COURSE OUTLINE

Basic Module (Weeks 1–4)		
<b>1.1</b>	<b>Safety and Hazard</b>	
1.1.1	OHS (Occupational Health and Safety)	Introduction to workplace safety regulations, accident prevention, safe material handling, emergency procedures, and hazard identification.
1.1.2	PPE (Personal Protective Equipment)	Types of PPE (gloves, goggles, helmets, overalls, earplugs), correct selection and usage, inspection and replacement routines
1.1.3	Workshop Ethics	Professional conduct, punctuality, discipline, cleanliness, teamwork, responsibility for tools and environment
<b>1.2</b>	<b>Using Hand and Power Tools</b>	
1.2.1	Identify and Inspect Tools	Recognize common hand tools (spanners, pliers, hammers) and power tools (drills, grinders); Ensure suitability before use
1.2.2	Proper Use of Tools	Learn the correct usage techniques, handling positions, torque application, and manufacturer's instructions for safety and efficiency
1.2.3	Cleaning and Maintenance of Tools	Clean tools after use, apply lubricants where required, store in designated places, and conduct routine maintenance checks
<b>1.3</b>	<b>Interpret Major systems of Automobiles</b>	
1.3.1	Engine System	Basic engine types (Inline, V-type), 4-stroke cycle, cylinder block, timing system, crankshaft, oil sump, head gasket, combustion process
1.3.2	Fuel System & Servicing	Fuel tank, lines, filter, pump, carburetor/injector (EFI), throttle body; routine servicing, fuel pressure check, filter replacement
1.3.3	Cooling System & Servicing	Radiator, fan, thermostat, water pump, hoses; understanding heat exchange, leak checks, radiator flushing, coolant level maintenance
1.3.4	Transmission System	Manual and automatic gearboxes, clutch assembly, CVT, torque converter; lubrication check, clutch adjustment, gearbox oil change
1.3.5	Brake System	Disc and drum brakes, brake master & Wheel cylinder, lines, caliper, booster, ABS basics; brake fluid bleeding, pad replacement
1.3.6	Steering and Suspension System	Steering types (manual, power, EPS), suspension (coil spring, leaf spring, shock absorber, Torsion bar); components inspection
1.3.7	Electrical System	Battery, alternator, starter motor, fuse box, lighting, ignition switch; basic diagnostics with multimeter, wiring trace, fuse replacement
1.3.8	Exhaust System	Manifold, catalytic converter, silencer/muffler, tailpipe; identify leakage, rust damage, emissions relevance, sound reduction systems
<b>1.4</b>	<b>Engine System</b>	
1.4.1	Types of Engines (SI vs CI)	Introduces Spark Ignition vs Compression Ignition engines — key to understanding fuel systems and diagnostics
1.4.2	Engine Operating Cycles	4-stroke (Otto and Diesel cycles), sometimes 2-stroke — foundational for troubleshooting
1.4.3	Key Components of the Engine System	Cylinder block, piston, connecting rod, crankshaft, camshaft, valves, timing chain/belt, spark plug (SI), fuel injector (CI), lubrication system
1.4.4	Function of Engine	Function of Engine: conversion energy and transformation to mechanical energy.
1.4.5	Basic Engine Lubrication Path	How oil flows through moving parts and understanding engine wear
1.4.6	Engine Cooling Overview	Explains why and how engines are cooled
1.4.7	Basic Engine Measurements	Bore, stroke, displacement, compression ratio
<b>1.5</b>	<b>Assessments</b>	
1.5.1	Written Test	MCQ or short questions covering safety, tools, and basic systems
1.5.2	Practical Evaluation	Identifying tools, engine components, basic servicing check
1.5.3	Oral/Viva Assessment	Safety procedures, system functions, and component roles
1.5.4	Tool Handling Observation	Observation of correct tool usage, posture, and safety compliance

<b>2.1</b>	<b>Servicing and Replacing Fuel System Components</b>	
2.1.1	Main Components of Fuel System	Fuel tank, fuel pump (mechanical/electrical), fuel filter, fuel lines, fuel injectors, carburetor (in older models), fuel rail
2.1.2	Function of Fuel System	Stores and supplies clean fuel to the engine at the correct pressure and flow rate for combustion; enables efficient engine performance
2.1.3	Servicing and Replacing Tasks	Inspect and replace fuel filters, clean injectors, test fuel pressure, check for leaks in hoses/lines, replace worn-out pumps or others
<b>2.2</b>	<b>Servicing and Maintaining Cooling System</b>	
2.2.1	Main Components of Cooling System	Radiator, water pump, thermostat, radiator fan (mechanical/electric), coolant reservoir, hoses, temperature sensor
2.2.2	Function of Cooling System	Regulates engine temperature by dissipating heat from the engine; prevents overheating, ensure optimal engine efficiency
2.2.3	Servicing Tasks	Check coolant level and condition, pressure-test the radiator cap, flush and refill coolant, inspect/replace hoses and clamps, test thermostat and fan operation
<b>2.3</b>	<b>Servicing and Maintaining Lubrication System</b>	
2.3.1	Main Components of Lubricating System	Oil sump (pan), oil pump, oil filter, pressure relief valve, oil galleries, dipstick
2.3.2	Function of Lubricating System	Reduces friction between engine parts, removes heat, cleans internal engine components, provides sealing and rust protection
2.3.3	Servicing Tasks	Drain old engine oil, replace oil filter, refill with correct grade oil, check oil pressure, inspect for leaks and worn gaskets
<b>2.4</b>	<b>Assessments</b>	
2.4.1	Written Test	Questions on fuel, cooling, and lubrication systems — covering components, functions, and servicing steps
2.4.2	Practical Evaluation	Demonstration of draining and refilling coolant and engine oil, replacing fuel/oil filters, leak inspection
2.4.3	Tool Handling Observation	Evaluate proper use of tools such as oil drain pan, filter wrench, funnel, and coolant tester
2.4.4	Oral/Viva Assessment	Explain purpose of thermostat, oil pressure system, and fuel delivery system in own words
<b>3.1</b>	<b>Diagnosing and Servicing Starting System</b>	
3.1.1	Main Components of Starting System	Battery, ignition switch, starter motor, solenoid, flywheel ring gear, wiring harness
3.1.2	Function of Starting System	Converts electrical energy from the battery into mechanical motion to crank and start the engine
3.1.3	Servicing Tasks	Check battery charge and connections, test starter motor operation, inspect solenoid relay, clean terminals, diagnose abnormal noises
<b>3.2</b>	<b>Servicing and Replacing Ignition system</b>	
3.2.1	Main Components of Ignition System	Ignition coil, distributor (in older systems), spark plugs, ignition switch, crankshaft position sensor, control module (in modern vehicles), wiring harness
3.2.2	Function of Ignition System	Provides high-voltage spark at the right time to ignite the air-fuel mixture in petrol (SI) engines
3.2.3	Servicing and Replacing Tasks	Inspect and replace spark plugs, test and replace ignition coil, adjust timing (if applicable), check wiring and connectors, diagnose misfire or no-start conditions

<b>3.3</b>	<b>Repair and Service Air Induction System</b>	
3.3.1	Main Components of Air Induction System	Air filter, intake manifold, throttle body, air flow sensor (MAF/Map), intercooler (in turbo engines), ducting and hoses
3.3.2	Function of Air Induction System	Supplies clean, filtered air to the engine; regulates air quantity for combustion; contributes to fuel efficiency and emissions control
3.3.3	Repair and Servicing Tasks	Clean or replace air filter, inspect ducting for cracks or leaks, clean throttle body, test air sensors, reseal or replace gaskets if needed
<b>3.4</b>	<b>Assessments</b>	
3.4.1	Written Test	Multiple choice or short answers covering ignition, starting, and air induction system components, functions, and procedures
3.4.2	Practical Evaluation	Demonstrate spark plug replacement, starter motor testing, air filter servicing, throttle body cleaning
3.4.3	Tool Handling Observation	Safe and correct use of multimeter, plug spanner, throttle cleaner, and basic diagnostic tools
3.4.4	Oral/Viva Assessment	Explain ignition sequence, signs of faulty air intake, or differences between SI and CI ignition methods
<b>4.1</b>	<b>Servicing and Repairing Exhaust System</b>	
4.1.1	Main Components of Exhaust System	Exhaust manifold, catalytic converter, muffler/silencer, exhaust pipes, oxygen sensors, resonator
4.1.2	Function of Exhaust System	Directs exhaust gases safely away from the engine and cabin, reduces emissions, and minimizes noise
4.1.3	Repair and Servicing Tasks	Inspect and replace damaged pipes, clean or replace catalytic converter, check oxygen sensors, repair leaks, and ensure mounting
<b>4.2</b>	<b>Perform Spark Ignition (SI) Engine Tune-Up</b>	
4.2.1	4- Stroke SI Engine Cycle	Intake, Compression, Power, and Exhaust strokes; how each stage works to convert fuel into mechanical energy
4.2.2	Function of SI Engine	Uses spark plug ignition to ignite the air-fuel mixture in petrol engines for power generation
4.2.3	SI Engine Tune-Up Tasks	Adjust ignition timing, clean or replace spark plugs, check and adjust carburetor/fuel injection, inspect valves and ignition system components
<b>4.3</b>	<b>Perform Compression Ignition (Diesel) Engine Tune-Up</b>	
4.3.1	4- Stroke Diesel Engine Cycle	Intake, Compression, Power, and Exhaust strokes; fuel injected under high pressure, ignited by compressed air heat
4.3.2	Function of Diesel Engine	Converts fuel into mechanical power using compression ignition; typically, more torque and fuel-efficient than SI engines
4.3.3	SI Engine Tune-Up Tasks	Adjust injector timing, clean/replace fuel injectors, check glow plugs, inspect valves and filters, verify compression levels
<b>4.4</b>	<b>Assessments</b>	
4.4.1	Written Test	Questions covering SI and Diesel engine cycles, functions, and tune-up procedures
4.4.2	Practical Evaluation	Demonstrate spark plug replacement, injector cleaning, timing adjustments, and valve inspection
4.4.3	Tool Handling Observation	Correct use of timing light, injector cleaner, compression tester, and hand tools
4.4.4	Oral/Viva Assessment	Explain differences between SI and Diesel engines, tune-up importance, and diagnostic steps

<b>Intermediate Module (Week 5-8)</b>		
<b>5.1</b>	<b>Overhauling and Servicing Powertrain System</b>	
5.1.1	Main Components of Power Train System	Clutch assembly, transmission (manual/automatic), driveshaft, differential, axle shafts, CV joints
5.1.2	Function of Power Train System	Transmits engine power to wheels, enabling vehicle movement with appropriate torque and speed control
5.1.3	Servicing Tasks	Inspect clutch wear, adjust linkage, change transmission fluid, check driveshaft and CV joints, replace worn components
<b>5.2</b>	<b>Servicing and Repairing Steering System</b>	
5.2.1	Main Components of Steering System	Steering wheel, steering column, steering rack and pinion, tie rods, power steering pump, hydraulic lines
5.2.2	Function of Steering System	Allows the driver to control the direction of the vehicle by turning the front wheels
5.2.3	Servicing Tasks	Inspect and adjust steering linkage, check power steering fluid level and condition, repair leaks, replace worn tie rods or seals
<b>5.3</b>	<b>Assessments</b>	
5.3.1	Written Test	Questions covering powertrain and steering system components, functions, and servicing tasks
5.3.2	Practical Evaluation	Demonstrate inspection and adjustment of steering linkage, clutch adjustment, and transmission fluid check
5.3.3	Tool Handling Observation	Proper use of torque wrench, fluid tester, steering wheel puller, and inspection tools
5.3.4	Oral/Viva Assessment	Explain powertrain functions, steering system components, and common troubleshooting methods
<b>6.1</b>	<b>Servicing and Inspecting Suspension System</b>	
6.1.1	Main Components of Suspension System	Springs (coil, leaf), shock absorbers, control arms, bushings, struts, stabilizer bars
6.1.2	Function of Suspension System	Absorbs shocks from road irregularities, maintains vehicle stability and ride comfort
6.1.3	Servicing Tasks	Inspect and replace worn shocks and bushings, lubricate joints, check alignment, test suspension travel and rebound
<b>6.2</b>	<b>Perform Wheel Balancing and Alignment</b>	
6.2.1	Function of Wheel Balancing and Alignment	Ensures even tire wear, smooth vehicle handling, reduces vibration, and improves fuel efficiency
6.2.2	Servicing Tasks	Use balancing machines to correct wheel imbalance, adjust camber, toe, and caster angles; inspect tires and suspension for alignment
<b>6.3</b>	<b>Assessments</b>	
6.3.1	Written Test	Questions on suspension, wheel balancing, and alignment theory and procedures
6.3.2	Practical Evaluation	Demonstrate wheel balancing, alignment adjustments, and suspension inspection
6.3.3	Tool Handling Observation	Proper use of balancing machine, alignment tools, and suspension measuring instruments
6.3.4	Oral/Viva Assessment	Explain importance of wheel alignment and balancing and common symptoms of misalignment

<b>7.1</b>	<b>Servicing and Repairing Braking System</b>	
7.1.1	Types of Brake System	Disc brakes, drum brakes, anti-lock braking system (ABS), hydraulic and pneumatic systems
7.1.2	Main Components of Brake System	Brake pedal, master cylinder, brake lines, brake calipers, brake pads/shoes, wheel cylinders
7.1.3	Function of Brake System	Converts driver input into hydraulic pressure to slow or stop vehicle by applying friction to wheels
7.1.4	Repair and Servicing Tasks	Inspect and replace brake pads/shoes, bleed brake lines, check and refill brake fluid, repair leaks, inspect ABS sensors and wiring
<b>7.2</b>	<b>Perform Basic Maintenance of Air Conditioning System</b>	
7.2.1	Main Components of A/C System	Compressor, condenser, evaporator, expansion valve, refrigerant lines, blower motor
7.2.2	Function of the A/C System	Cools and dehumidifies air inside the vehicle cabin by circulating refrigerant
7.2.3	Basic A/C Maintenance Tasks	Check refrigerant level and refill, inspect belts and hoses, clean condenser and evaporator coils, replace cabin air filter, check blower
<b>7.3</b>	<b>Assessments</b>	
7.3.1	Written Test	Questions on components, functions, and A/C system maintenance
7.3.2	Practical Evaluation	Demonstrate brake pad replacement, brake bleeding, A/C refrigerant level check, and filter replacement
7.3.3	Tool Handling Observation	Proper use of brake bleeding kit, refrigerant gauge, and A/C diagnostic tools
7.3.4	Oral/Viva Assessment	Explain brake system safety checks and common A/C system issues
<b>8.1</b>	<b>Servicing Body Electrical and Electronics System</b>	
8.1.1	Main Components of Electrical/Electronics	Charging system, lighting system, horn and alarm, interior electronics (power windows, locks), wiring harness and fuses, instrument cluster, sensors, actuators, and ECU
8.1.2	Charging System	Alternator, battery, voltage regulator, wiring; responsible for electrical energy generation and storage
8.1.3	Lighting System	Headlights, tail lights, indicators, brake lights, interior lights; ensures vehicle visibility and signaling
8.1.4	Horn and Alarm System	Audio signaling and security alarms for safety and theft prevention
8.1.5	Interior Electronics	Power windows, door locks, infotainment systems, climate controls
8.1.6	Wiring and Fuses	Wiring harnesses, fuse boxes, connectors; essential for circuit protection and connectivity
8.1.7	Instrument Cluster	Speedometer, tachometer, fuel gauge, warning lights; provides driver information
8.1.8	Sensor, Actuator, ECU	Input devices (temp, oxygen sensors), output devices (fuel injectors, relays), and electronic control unit for engine and system management
8.1.9	Repair/Servicing Tasks	Diagnose electrical faults using scan tools, replace faulty wiring/fuses, repair or replace sensors and actuators, troubleshoot ECU errors
<b>8.2</b>	<b>Diagnosing, Servicing and Repairing EFI System</b>	
8.2.1.	Main Components of EFI System	Fuel injectors, electronic control unit (ECU), fuel pump, sensors (MAF, oxygen, throttle position), fuel rail, wiring harness
8.2.2	Function of the EFI System	Controls precise fuel delivery electronically for optimal combustion, improved efficiency, and reduced emissions
8.2.3	Servicing/Repair Tasks	Diagnose EFI faults using scan tools, clean or replace fuel injectors, test and replace sensors, inspect wiring and connectors, calibrate ECU

<b>8.3</b>	<b>Servicing and Repairing Charging System</b>	
8.3.1	Main Components of Charging System	Alternator, voltage regulator, battery, drive belt, wiring harness
8.3.2	Function of Starting System	Generates and regulates electrical power to charge the battery and power vehicle electrical systems
8.3.3	Servicing Tasks	Test alternator output, inspect and replace drive belts, check voltage regulator, clean battery terminals, check wiring for corrosion
<b>8.4</b>	<b>Assessments</b>	
8.4.1	Written Test	Covering EFI system, charging system, and general vehicle electronics
8.4.2	Practical Evaluation	Diagnose EFI faults using scan tools, test alternator and battery condition, replace faulty sensors or wiring components
8.4.3	Tool Handling Observation	Use of diagnostic tools such as multimeter, scan tools, and battery testers
8.4.4	Oral/Viva Assessment	Explain EFI functions, charging system components, and common troubleshooting procedures
<b>Advance Level (Week 9-11)</b>		
<b>9.1</b>	<b>Installing LPG and CNG Conversion Kit</b>	
9.1.1	Main Components of LPG and CNG Kits	Pressure regulator, fuel injectors or mixers, gas cylinders, electronic control unit (ECU), safety valves, hoses, and mounting brackets
9.1.2	Installation Tasks	Safely mount gas cylinders, connect fuel lines and regulators, install ECU and sensors, perform leak tests, ensure compliance with safety standards, calibrate system for engine compatibility
<b>9.2</b>	<b>Testing and Adjusting LPG and CNG Calibration</b>	
9.2.1	Purpose of Calibration	Ensure optimal air–fuel mixture for performance, fuel efficiency, and reduced emissions; prevent engine knocking or misfiring
9.2.2	Steps to Test and Adjust Calibration	Connect diagnostic tool or manual tuning device, measure pressure and flow, fine-tune fuel delivery using ECU or regulator, perform test drive, monitor exhaust and engine response, adjust timing if required
<b>9.3</b>	<b>Assessments</b>	
9.3.1	Written Test	Questions on components and functions of LPG/CNG kits, safety protocols, and calibration procedures
9.3.2	Practical Evaluation	Demonstrate installation of gas cylinder and regulator, leak test, calibration using scanner or manual method
9.3.3	Tool Handling Observation	Proper use of gas leak detectors, calibration tools, and ECU interfaces
9.3.4	Oral/Viva Assessment	Explain the importance of correct calibration, safety measures, and fuel switching process
<b>10.1</b>	<b>Servicing Automotive CNG and LPG System</b>	
10.1.1	Main Components to Be Serviced	CNG/LPG tank and valves, regulator, injectors or mixer, ECU, filters, fuel lines, pressure relief devices
10.1.2	Typical Servicing Tasks	Inspect for gas leaks, test regulator pressure, clean or replace filters, check injector/mixer function, verify ECU diagnostics, perform routine safety inspection
<b>10.2</b>	<b>Assessments</b>	
10.2.1	Written Test	On CNG/LPG system functions, servicing intervals, and safety checks
10.2.2	Practical Evaluation	Pressure tests, leak detection, component cleaning, system reset
10.2.3	Tool Handling Observation	Use of gas leak detectors, pressure gauges, and protective equipment
10.2.4	Oral/Viva Assessment	Explain routine CNG/LPG maintenance, symptoms of failure, and emergency handling procedures

<b>10.3</b>	<b>Basics of Hybrid and Electric Vehicle (EV)</b>	
10.3.1	Types of Vehicles	Mild hybrid, full hybrid, plug-in hybrid (PHEV), battery electric vehicles (BEV), extended-range EVs
10.3.2	Key Components	Electric motor, inverter, battery pack, battery management system (BMS), regenerative braking, high-voltage cables
10.3.3	Function of the of Hybrid/EV	Use electric motors alone or in combination with internal combustion engines to reduce emissions and improve fuel efficiency
10.3.4	Benefits of Hybrid/EV	Lower operating costs, reduced emissions, improved energy efficiency, government incentives, quieter operation
<b>10.4</b>	<b>Assessments</b>	
10.4.1	Written Test	Questions on hybrid/EV types, components (motor, inverter, battery), benefits, and basic functions
10.4.2	Practical Evaluation	Identify hybrid/EV system components on a training vehicle or diagram, simulate safe shutdown of HV system
10.4.3	Tool Handling Observation	Proper use of insulated tools, safety gloves, and voltage testers for EVs
10.4.4	Oral/Viva Assessment	Regenerative braking, hybrid configurations, and high-voltage safety
<b>11.1</b>	<b>Basics Automotive Electronics and Advanced Diagnostics</b>	
11.1.1	Key Components	Sensors (e.g., oxygen, throttle, crankshaft), actuators (e.g., injectors, relays), ECUs, wiring, CAN Bus system
11.1.2	Tools Used	Multimeter, OBD-II scanner, oscilloscope, diagnostic software tools
11.1.3	Diagnostic Steps	Retrieve fault codes using OBD-II, interpret live data, perform guided tests, inspect wiring/sensor signal, clear fault codes and validate repair
<b>11.2</b>	<b>Advanced Driver Assistance Systems (ADAS)</b>	
11.2.1	Common ADAS Components	Cameras, ultrasonic sensors, radar, LiDAR, ECUs, steering and braking actuators
11.2.2	Main Functions of ADAS	Lane-keeping assist, adaptive cruise control, automatic emergency braking (AEB), blind-spot detection, parking assist
11.2.3	Benefits of ADAS	Enhances driver safety, reduces collisions, supports semi-autonomous driving, lowers driver fatigue
<b>11.3</b>	<b>Assessments</b>	
11.3.1	Written Test	Questions on automotive electronics, OBD diagnostics, and ADAS components and functions
11.3.2	Practical Evaluation	Retrieve and interpret OBD fault codes, perform sensor tests, demonstrate basic ADAS function check (e.g., camera/sensor alignment)
11.3.3	Tool Handling Observation	Safe use of diagnostic tools: OBD-II scanner, multimeter, calibration interface tools
11.3.4	Oral/Viva Assessment	Explain CAN Bus system, ADAS safety features, and sensor/actuator roles in modern diagnostics
<b>12.1</b>	<b>Week 12 (Final Examination &amp; Certification)</b>	
12.1.1	Final Written Examination	Comprehensive theory test covering all modules: safety, systems, diagnostics, EFI, hybrid/EV, and ADAS
12.2.2	Final Practical Examination	Hands-on tasks from each module — diagnostics, servicing key systems (engine, brakes, electronics), EFI tuning, A/C servicing, etc.
12.3.3	Oral/Viva Evaluation	Panel Q&A testing conceptual understanding, troubleshooting approach, and communication skills
12.4.4	Certification & Feedback	Issuing certificates to qualified trainees, performance review, career guidance, and final feedback session