

Syllabus for the trade of Mechanic Motor Vehicle

First Semester (Semester code No.)

Duration: Six Months.

Syllabus for Trade practical and Trade Theory

Week No.	Trade Practical (27 Hrs/week)	Trade Theory (5 Hrs/week)
1	Familiarisation with institute, Job opportunities in the automobile sector, Machinery used in Trade. Types of work done by the students in the shop floor.	Admission & introduction to the trade: Introduction to the Course duration, course content, study of the syllabus. General rule pertaining to the Institute, facilities available– Hostel, Recreation, Medical and Library working hours and time table
2	Practical related to Safety and Health, Importance of maintenance and cleanliness of Workshop. Interaction with health centre and fire service station to provide demo on First aid and Fire safety, Use of fire extinguishers. Demonstration on safe handling and Periodic testing of lifting equipment, and Safety disposal of Used engine oil. Energy saving Tips of ITI electricity Usage	Occupational Safety & Health Importance of Safety and general Precautions to be observed in the shop. Basic first aid, safety signs - for Danger, Warning, caution & personal safety message. Safe handling of Fuel Spillage, Fire extinguishers used for different types of fire. Safe disposal of toxic dust, safe handling and Periodic testing of lifting equipment, Authorization of Moving & road testing vehicles. Energy conservation -Definition, Energy Conservation Opportunities (ECOs)-Minor ECos and Medium ECos, Major ECos), Safety disposal of Used engine oil, Electrical safety tips.
3-5	Practice using all marking aids, like steel rule with spring calipers, dividers, scribe, punches, Chisel etc., Layout a work piece- for line, circle, arcs and circles. Practice to measure a wheel base of a vehicle with measuring tape. Practice to measure valve spring tension using spring tension tester Practice to remove wheel lug nuts with use of an air impact wrench Practice on General workshop tools & power tools.	Hand & Power Tools:- Marking scheme, Marking material -chalk, Prussian blue. Cleaning tools- Scraper, wire brush, Emery paper , Description, care and use of Surface plates, steel rule, measuring tape, try square. Calipers- inside and outside . Dividers, surface gauges, scribe, punches- prick punch, center punch, pin punch, hollow punch, number and letter punch . Chisel-flat, cross-cut. Hammer- ball pein, lump, mallet. Screw drivers- blade screwdriver, Phillips screw driver, Ratchet screwdriver . Allen key, bench vice & C-clamps, Spanners- ring spanner, open end spanner & the combination spanner, universal adjustable open end spanner . Sockets & accessories, Pliers - Combination pliers, multi grip, long nose, flat-nose, Nippers or pincer pliers, Side cutters, Tin snips, Circlip pliers, external circlips pliers . Air impact wrench, air ratchet, wrenches- Torque wrenches, pipe wrenches, car jet washers Pipe flaring & cutting tool, pullers-Gear and bearing .

6&7	<p>Measuring practice on Cam height, Camshaft Journal dia, crankshaft journal dia, Valve stem dia, piston diameter, and piston pin dia with outside Micrometers.</p> <p>Measuring practice on the height of the rotor of an oil pump from the surface of the housing or any other auto component measurement with depth micrometer.</p> <p>Measuring practice on valve spring free length.</p> <p>Measuring practice on cylinder bore, Connecting rod bore, inside diameter (ID) of a camshaft bearing with Telescope gauges.</p> <p>Measuring practice on cylinder bore for taper and out-of-round with Dial bore gauges.</p> <p>Measuring practice to measure wear on crankshaft end play, crankshaft run out, and valve guide with dial indicator.</p> <p>Measuring practice to check the flatness of the cylinder head is warped or twisted with straightedge is used with a feeler gauge.</p> <p>Measuring practice to check the end gap of a piston ring, piston-to-cylinder wall clearance with feeler gauge.</p> <p>Practice to check engine manifold vacuum with vacuum gauge.</p> <p>Practice to check the air pressure inside the vehicle tires is maintained at the recommended setting.</p>	<p>Systems of measurement, Description, care & use of - Micrometers- Outside and depth mirometer, Micrometer adjustments, Vernier calipers, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.</p>
8 & 9	<p>Practice on General cleaning, checking and use of nut, bolts, & studs etc.,</p> <p>Removal of stud/bolt from blind hole.</p> <p>Practice on cutting tools like Hacksaw, file, chisel, Sharpening of Chisels, center punch, safety precautions while grinding.</p>	<p>Fasteners- Study of different types of screws, nuts, studs & bolts, locking devices, Such as lock nuts, cotter, split pins, keys, circlips, lock rings, lock washers and locating where they are used. Washers & chemical compounds can be used to help secure these fasteners. Function of Gaskets, Selection of materials for gaskets and packing, oil seals.</p> <p>Cutting tools :- Study of different type of cutting tools like Hacksaw, File- Definition, parts of a</p>

	Practice on Hacksawing and filing to given dimensions.	file, specification, Grade, shape, different type of cut and uses., OFF-hand grinding with sander, bench and pedestal grinders, safety precautions while grinding. Limits, Fits & Tolerances: -Definition of limits, fits & tolerances with examples used in auto components
10 & 11	Practice on Marking and Drilling clear and Blind Holes, Sharpening of Twist Drills Safety precautions to be observed while using a drilling machine. Practice on Tapping a Clear and Blind Hole, Selection of tap drill Size, use of Lubrication, Use of stud extractor. Cutting Threads on a Bolt/ Stud. Adjustment of two piece Die, Reaming a hole/ Bush to suit the given pin/ shaft, scraping a given machined surface.	Drilling machine - Description and study of Bench type Drilling machine, Portable electrical Drilling machine, drill holding devices, Work Holding devices, Drill bits. Taps and Dies: Hand Taps and wrenches, Calculation of Tap drill sizes for metric and inch taps. Different type of Die and Die stock. Screw extractors. Hand Reamers – Different Type of hand reamers, Drill size for reaming, Lapping, Lapping abrasives, type of Laps.
12	Practice on making Rectangular Tray. Pipe bending, Fitting nipples unions in pipes. Soldering and Brazing of Pipes.	Sheet metal - State the various common metal Sheets used in Sheet Metal shop Sheet metal operations - Shearing, bending, Drawing, Squeezing Sheet metal joints - Hem & Seam Joints Fastening Methods - Riveting, soldering, Brazing. fluxes used on common joints. Sheet and wire-gauges. The blow lamp- its uses and pipe fittings.
13	Practice in joining wires using soldering Iron, Construction of simple electrical circuits, Measuring of current, voltage and resistance using digital multimeter, practice continuity test for fuses, jumper wires, fusible links, circuit breakers.	Basic electricity , Electricity principles, Ground connections, Ohm's law, Voltage, Current, Resistance, Power, Energy. Voltmeter, ammeter, Ohmmeter Multimeter, Conductors & insulators, Wires, Shielding, Length vs. resistance, Resistor ratings
14	Diagnose series, parallel, series-parallel circuits using Ohm's law, Check electrical circuit with a test lamp, perform voltage drop test in circuits using multimeter, measure current flow using multimeter /ammeter, use of service manual wiring diagram for troubleshooting.	Fuses & circuit breakers, Ballast resistor, Stripping wire insulation, cable colour codes and sizes, Resistors in Series circuits , Parallel circuits and Series-parallel circuits, Electrostatic effects, Capacitors and its applications, Capacitors in series and parallel.

15	<p>Cleaning and topping up of a lead acid battery, Testing battery with hydrometer, Connecting battery to a charger for battery charging, Inspecting & testing a battery after charging, Measure and Diagnose the cause(s) of excessive Key-off battery drain (parasitic draw) and do corrective action. Testing of relay and solenoids and its circuit.</p>	<p>Description of Chemical effects, Batteries & cells, Lead acid batteries & Stay Maintenance Free (SMF) batteries, Magnetic effects, Heating effects, Thermo-electric energy, Thermistors, Thermo couples, Electrochemical energy, Photo-voltaic energy, Piezo-electric energy, Electromagnetic induction, Relays, Solenoids, Primary & Secondary windings, Transformers, stator and rotor coils.</p>
16	<p>Identify and test power and signal connectors for continuity, Identify and test different type of Diodes, NPN & PNP Transistors for its functionality, Construct and test simple logic circuits OR, AND & NOT and Logic gates using switches.</p>	<p>Basic electronics: Description of Semi conductors, Solid state devices- Diodes, Transistors, Thyristors, Uni Junction Transistors (UJT), Metal Oxide Field Effect Transistors (MOSFETs), Logic gates-OR, AND & NOT and Logic gates using switches.</p>
17& 18	<p>Practice to make straight beads and Butt, Lap & T joints Manual Metal Arc Welding.</p> <p>Setting of Gas welding flames, practice to make a straight beads and joints Oxy – Acetylene welding</p> <p>Film on Heat treatment process</p>	<p>Introduction to welding and Heat Treatment</p> <p>Welding processes – Principles of Arc welding, brief description, classification and applications. Manual Metal Arc welding -principles, power sources, electrodes, welding parameters, edge preparation & fit up and welding techniques; Oxy – Acetylene welding - principles, equipment, welding parameters, edge preparation & fit up and welding techniques;.</p> <p>Heat Treatment Process– Introduction, Definition of heat treatment, Definition of Annealing, Normalizing, Hardening and tempering. Case hardening, Nitriding, Induction hardening and Flame Hardening process used in auto components with examples.</p>
19 & 20	<p>Practice on Liquid penetrant testing method and Magnetic particle testing method.</p> <p>Identification of Hydraulic and pneumatic components used in vehicle.</p> <p>Tracing of hydraulic circuit on hydraulic jack, hydraulic power steering, and Brake circuit.</p>	<p>Non-destructive Testing Methods- Importance of Non-Destructive Testing In Automotive Industry, Definition of NDT, Liquid penetrant and Magnetic particle testing method – Portable Yoke method</p> <p>Introduction to Hydraulics & Pneumatics: - Definition of Pascal law, pressure, Force, viscosity. Description, symbols and application in automobile of Gear pump-Internal & External,</p>

	Identification of components in Air brake systems.	single acting, double acting & Double ended cylinder; Directional control valves-2/2, 3/2, 4/2, 4/3 way valve, Pressure relief valve, Non return valve, Flow control valve used in automobile. Pneumatic Symbols, Description and function of air Reciprocating Compressor. Function of Air service unit (FRL-Filter, Regulator & Lubricator).
21	Identification of different type of Vehicle. Demonstration of vehicle specification data; Identification of vehicle information Number (VIN). Demonstration of Garage, Service station equipments.- Vehicle hoists – Two post and four post hoist, Engine hoists, Jacks, Stands.	Auto Industry - History, leading manufacturers, development in automobile industry, trends, new product. Brief about Ministry of Road transport & Highways, The Automotive Research Association of India (ARAI), National Automotive Testing and R&D Infrastructure Project (NATRIP), & Automobile Association. Definition: - Classification of vehicles on the basis of load as per central motor vehicle rule, wheels, final drive, and fuel used, axles, position of engine and steering transmission, body and load. Brief description and uses of Vehicle hoists – Two post and four post hoist, Engine hoists, Jacks, Stands.
22-23	In-plant Training	
24-25	Revision and Test	
26	NCVT Exam	

**Syllabus for the trade of Mechanic Motor Vehicle
Second Semester (Semester code No.)
Duration: Six Months.**

Syllabus for Trade practical and Trade Theory

Week No.	Trade Practical (27 Hrs/week)	Trade Theory (5 Hrs/week)
1 & 2	<p>Identification of parts in a diesel engine of LMV/ HMV</p> <p>Practice on starting and stopping of diesel engines.</p> <p>Observe and report the reading of Tachometer, Odometer, temp and Fuel gauge under ideal and on load condition.</p> <p>Practice on dismantling Diesel engine of LMV/HMV as per procedure.</p>	<p>Introduction to Engine: Description of internal & external combustion engines, Classification of IC engines, Principle & working of 2&4-stroke diesel engine (Compression ignition Engine (C.I)), Principle of Spark Ignition Engine(SI), differentiate between 2-stroke and 4 stroke, C.I engine and S.I Engine, Direct injection and Indirect injection, Technical terms used in engine, Engine specification. Study of various gauges/instrument on a dash board of a vehicle- Speedometer, Tachometer, Odometer and Fuel gauge, and Indicators such as gearshift position, Seat belt warning light, Parking-brake-engagement warning light and an Engine-malfunction light. Different type of starting and stopping method of Diesel Engine Procedure for dismantling of diesel engine from a vehicle..</p>
3 & 4	<p>Overhauling of cylinder head assembly, Use of service manual for clearance and other parameters, Practice on removing rocker arm assembly manifolds.</p> <p>Practice on removing the valves and its parts from the cylinder head, cleaning. Inspection of cylinder head and manifold surfaces for warping, cracks and flatness. Checking valve seats & valve guide – Replacing the valve if necessary. Testing leaks of valve seats for leakage – Dismantle rocker shaft assembly -clean & check rocker shaft-and levers, for wear and cracks and reassemble. Check valve springs, tappets, push rods, tappet screws and valve stem cap. Reassembling valve parts in sequence, refit cylinder head and manifold & rocker arm assembly, adjustable valve clearances, starting engine after adjustments.</p>	<p>Diesel Engine Components: Description and Constructional feature of Cylinder head, Importance of Cylinder head design, Type of Diesel combustion chambers, Effect on size of Intake & exhaust passages, Head gaskets. Importance of Turbulence</p> <p>Valves & Valve Trains- Description and Function of Engine Valves, different types, materials, Type of valve operating mechanism, Importance of Valve seats, Valve seats inserts in cylinder heads, importance of Valve rotation, Valve stem oil seals, size of Intake valves, Valve trains, Valve- timing diagram, concept of Variable valve timing. Description of Camshafts & drives , Description of Overhead camshaft, importance of Cam lobes, Timing belts & chains, Timing belts & tensioners.</p>

5	<p>Overhauling piston and connecting rod Assembly. Use of service manual for clearance and other parameters:- Practice on removing oil sump and oil pump – clean the sump. Practice on removing the big end bearing, connecting rod with the piston. Practice on removing the piston rings; Dismantle the piston and connecting rod. Check the side clearance of piston rings in the piston groove & lands for wear. Check piston skirt and crown for damage and scuffing, clean oil holes. Measure -the piston ring close gap in the cylinder, clearance between the piston and the liner, clearance between crank pin and the connecting rod big end bearing. Check connecting rod for bend and twist. Assemble the piston and connecting rod assembly.</p>	<p>Description & functions of different types of pistons, piston rings and piston pins and materials. Used recommended clearances for the rings and its necessity precautions while fitting rings, common troubles and remedy. Compression ratio. Description & function of connecting rod, importance of big- end split obliquely, Materials used for connecting rods big end & main bearings. Shells piston pins and locking methods of piston pins.</p>
6	<p>Overhauling of crankshaft, Use of service manual for clearance and other parameters:- Practice on removing damper pulley, timing gear/timing chain, flywheel, main bearing caps, bearing shells and crankshaft from engine checking oil retainer and thrust surfaces for wear, Measure crank shaft journal for wear, taper and ovality, Checking crankshaft for fillet radii, bend & twist.</p>	<p>Description and function of Crank shaft, camshaft, Engine bearings- classification and location – materials used & composition of bearing materials- Shell bearing and their advantages- special bearings material for diesel engine application bearing failure & its causes-care & maintenance. Crank-shaft balancing, Firing order of the engine.</p>
7	<p>Checking of flywheel and mounting flanges, spigot, bearing. Check vibration damper for defects, Practice on removing cam shaft from engine block, Check for bend & twist of camshaft. Inspection of cam lobe, camshaft journals and bearings and measure cam lobe lift. Fixing bearing inserts in cylinder block & cap check nip and spread clearance & oil holes & locating lugs fix crank shaft on block-torque bolts - check end play remove shaft - check seating, repeat similarly for connecting rod and Check seating and refit.</p>	<p>Description and function of the fly wheel and vibration damper. Crank case & oil pump, gears timing mark, Chain sprockets, chain tensioner etc. Function of clutch & coupling units attached to flywheel.</p>
8	<p>Cleaning and Checking of cylinder blocks Surface for any crack, flatness, Measure cylinder bore for taper & ovality, clean oil gallery passage and oil pipe line, Bore - descale water passages and examine</p>	<p>Description of Cylinder block, Cylinder block construction, and Different type of Cylinder sleeves (liner).</p>

	Removing cylinder liners from scrap cylinder block, practice in measuring and refitting new liners as per maker's recommendations precautions while fitting new liners.	
9	Reassemble all parts of engine in correct Sequence and torque all bolts and nuts as per workshop manual of the engine. Engine component procedures- Testing cylinder compression, Checking idle speed, Removing & replacing a cam belt, Inspecting & adjusting an engine drive belt, Replacing an engine drive belt.	Engine assembly procedure with aid of special tools and gauges used for engine assembling. Introduction to Gas Turbine, Comparison of single and two stage turbine engine, Different between gas turbine and Diesel Engine.
10-12	Practice on Checking & Top up coolant, Draining & refilling coolant, Checking / replacing a coolant hose, Testing cooling system pressure, Practice on Removing & replacing radiator/ thermostat. Inspect the radiator pressure cap, Testing of thermostat. Cleaning & reverse flushing. Overhauling water pump and refitting. Practice on Checking engine oil, Draining engine oil, Replacing oil filter, Refilling engine oil. Overhauling of oil pump, oil coolers, air cleaners and air filters and adjust oil pressure relief valves, repairs to oil flow pipe lines and unions if necessary.	Need for Cooling systems , Heat transfer method, Boiling point & pressure, Centrifugal force, Vehicle coolant properties and recommended change of interval, Different type of cooling systems, Basic cooling system components - Radiator, Coolant hoses, Water pump, Cooling system thermostat, Cooling fans, Temperature indicators, Radiator pressure cap, Recovery system, Thermo-switch. Need for lubrication system , Functions of oil, Viscosity and its grade as per SAE , Oil additives, Synthetic oils, The lubrication system, Splash system, Pressure system, Corrosion/noise reduction in the lubrication system. Lubrication system components - Description and function of Sump, Oil collection pan, Oil tank, Pickup tube, different type of Oil pump & Oil filters Oil pressure relief valve, Spurt holes & galleries, Oil indicators, Oil cooler.
13.	Practice on Dismantling air compressor and exhauster and cleaning all parts - measuring wear in the cylinder, reassembling all parts and fitting them in the engine. Dismantling & assembling of turbocharger, check for axial clearance as per service manual. Check Exhaust system for rubber mounting for damage, deterioration and out of position; for leakage, loose connection, dent and damage; Practice on Exhaust manifold removal and	Intake & exhaust systems – Description of Diesel induction & Exhaust systems. Description & function of air compressor, exhauster, Super charger, Intercoolers, turbo charger, variable turbo charger mechanism. Intake system components - Description and function of Air cleaners, Different type air cleaner, Description of Intake manifolds and material, Exhaust system components - Description

	<p>installation. Practice on Catalytic converter removal and installation.</p>	<p>and function of Exhaust manifold, Exhaust pipe, Extractors, Mufflers- Reactive, absorptive, Combination., Catalytic converters, Flexible connections, Ceramic coatings, Back-pressure, Electronic mufflers.</p>
14 - 16	<p>Practice on removing & Cleaning fuel tanks, checking leaks in the fuel lines, soldering & repairing pipe lines and Unions, brazing nipples to high pressure line studying the fuel feed system in diesel engines, draining of water separators.</p> <p>Bleeding of air from the fuel lines, Servicing primary & secondary filters.</p> <p>Removing a fuel injection pump from an engine-refit the pump to the engine re- set timing - fill lubricating-oil start and adjust slow speed of the engine. Practice on overhauling of injectors and testing of injector. General maintenance of Fuel Injection Pumps (FIP).</p>	<p>Diesel Fuel Systems- Description and function of Diesel fuel injection, fuel characteristics, concept of Quiet diesel technology & Clean diesel technology. Diesel fuel system components – Description and function of Diesel tanks & lines, Diesel fuel filters, water separator, Lift pump, Plunger pump, Priming pump, Inline injection pump, Distributor-type injection pump, Diesel injectors, Glow plugs, Cummins & Detroit Diesel injection. Electronic Diesel control- Electronic Diesel control systems, Common Rail Diesel Injection (CRDI) system, Hydraulically actuated electronically controlled unit injector (HEUI) diesel injection system. Sensors, actuators and ECU (Electronic Control Unit) used in Diesel Engines.</p>
17	<p>Practice on Start engine adjust idling speed and damping device in pneumatic governor and venture control unit checking Performance of engine with off load adjusting timings. Start engine- adjusting idle speed of the engine fitted with mechanical governor checking- high speed operation of the engine. Checking performance for missing cylinder by isolating defective injectors and test- dismantle and replace defective parts and reassemble and refit back to the engine</p>	<p>Marine & Stationary Engine:- Types, double acting engines, opposed piston engines, starting systems, cooling systems, lubricating systems, supplying fuel oil, hydraulic coupling, reduction gear drive, electromagnetic coupling, electrical drive, generators and motors, supercharging.</p>
18	<p>Monitoring emissions procedures by use of Engine gas analyser or Diesel smoke meter. Checking & cleaning a Positive crank case ventilation (PCV) valve. Obtaining & interpreting scan tool data. Inspection of EVAP canister purge system by use of scan Tool. EGR /SCR Valve Remove and installation for inspection.</p>	<p>Emission Control:- Vehicle emissions Standards- Euro and Bhart II, III, IV, V Sources of emission, Combustion, Combustion chamber design. Types of emissions: Characteristics and Effect of Hydrocarbons, Hydrocarbons in exhaust gases, Oxides of nitrogen, Particulates, Carbon monoxide, Carbon dioxide, Sulfur content in fuels Description of Evaporation emission control, Catalytic conversion, Closed loop,</p>

		Crankcase emission control, Exhaust gas recirculation (EGR) valve, , Controlling air-fuel ratios, Charcoal storage devices, Diesel particulate filter (DPF). Selective Catalytic Reduction (SCR), EGR VS SCR
19	Practice on removing alternator from vehicle dismantling, cleaning checking for defects, assembling and testing for motoring action of alternator & fitting to vehicles. Practice on removing starter motor Vehicle and overhauling the starter motor, testing of starter motor	Description .of charging circuit operation of alternators, regulator unit, ignition warning lamp- troubles and remedy in charging system. Description of starter motor circuit , Constructional details of starter motor solenoid switches, common troubles and remedy in starter circuit.
20 & 21	Practice on troubleshooting in LMV/HMV for Engine Not starting – Mechanical & Electrical causes, High fuel consumption, Engine overheating, Low Power Generation, Excessive oil consumption, Low/High Engine Oil Pressure, Engine Noise.	Troubleshooting : Causes and remedy for Engine Not starting – Mechanical & Electrical causes, High fuel consumption, Engine overheating, Low Power Generation, Excessive oil consumption, Low/High Engine Oil Pressure, Engine Noise.
22-23	In-plant Training	
24-25	Revision and Test	
26	NCVT Exam	

Syllabus for the trade of Mechanic Motor Vehicle
Third Semester (Semester code No.)
Duration: Six Months.

Syllabus for Trade practical and Trade Theory

Week No.	Trade Practical (27 Hrs/week)	Trade Theory (5 Hrs/week)
1	Identification of different major components of Heavy vehicle and their function & placement study of different make lorry/bus/tractor in Institute with different dealers or organizations.	Introduction: Study of different major components & assemblies of heavy vehicle, and different make (indigenous). Name plate-constructural differences and their merits. leading manufacturers in Heavy vehicle Industry
2 -4	Practice on adjusting clutch pedal play-removing gearbox and clutch assembly from Light & Heavy Vehicle. Dismantling clutch assembly, cleaning inspecting parts. Removing & fitting of new pilot bearing, removing & fitting of ring gear in fly wheel relining a clutch plate, checking condition of flywheel and pressure plate surface for reconditioning. Assembling of pressure plate adjusting the fingers checking run out of fly wheel and aligning clutch assembly with flywheel. Dismantling cleaning and assembling of gearshift mechanism changing oil in gear box. Dismantling a synchromesh gear box, cleaning, inspecting parts replacing worn out defective parts assembling & testing for correct performance identifying noises from gear boxes and rectifying.	Clutches & Manual Transmissions- Clutch principles, Single-plate clutches, Multi-plate clutches, Dual mass flywheels, Operating mechanisms Clutch components- Pressure plate, Driven/ center plate, Throw-out bearing. Manual transmissions- Gear ratios, Compound gear trains, Gear selection, Bearings, Oil seals & gaskets, Brief about Automated Manual Transmission (AMT) Gearbox layout & operation- Gearbox layouts, Transaxle designs, Gearbox operation, Baulk-ring synchromesh unit, Transaxle synchromesh unit. Gear shift mechanism.
5-7	Practice on Removing open type propeller shaft from vehicle, Practice on removing universal joints, cleaning replacing worn out parts, re-assembling & refitting to vehicle- and their alignment special precautions while removing torque tube drive shaft. Practice on FWD Driveshaft Removal and Replacement. Practice on overhauling & inspection of rear axle. Practice on overhauling & inspection of differential assembly. Trouble shooting – causes and remedy for clutch slip, clutch noise, clutch binding, hard clutch, gearbox noise, gear slip, rear axle noise, propeller shaft noise, universal joint noise, differential noise.	Final Drive & Drive Shafts - Basic layouts Front-wheel drive layout, Rear-wheel drive layout, Four-wheel drive layout, All-wheel drive layout, 4WD v/s AWD Front-wheel drive, Front-wheel drive shafts, Front-wheel final drives, Front-wheel differentials Rear-wheel drive- Propeller shaft, Type of Universal joints, Type of Constant velocity Joints, Rear-wheel final drives, Salisbury axles, Rear-wheel drive differentials, Limited slip differentials. Four-wheel drive- Four-wheel drive shafts, Four-wheel final drive, Four-wheel drive transfer case, Freewheeling hubs, Four-wheel drive differentials All-wheel drive- four wheel final drives,

		All-wheel drive transfer case, Transfer case differential action.
8 & 9	<p>Identification of Automatic transmission components</p> <p>Checking automatic transmission fluid, Changing transmission fluid & filter. Checking automatic transmission fluid, Changing transmission fluid & filter. Practice on oil pressure control cable play adjustments, Inspection of shift lever switch, throttle position sensor, speed sensor and automatic transmission wiring harness coupler.</p>	<p>Automatic Transmissions - Torque converters, Torque converter principles, drive plate, Converter operation, Torque multiplication, Fluid flow, Heat exchanger, Lock-up converters, clutches.</p> <p>Planetary gearing- Planetary gears, Simple planetary gear sets, Compound planetary gear sets, Automatic transmission brake bands, Multi-disc clutches,</p> <p>Electronic control transmission - Electronic control Unit, Fully hydraulically controlled transmission, Electronic shift programs, Manual selection.</p> <p>Layout & operation for P,R,N&D (1st & 2nd) Selector positions, Planetary gear set, High range power flow, Low range power flow Servos & clutches-Rear servo, Front servo, One way clutch, Multi-plate front clutch, Clutch pack, Rear clutch.</p> <p>Hydraulic system & controls-Hydraulic system components, Spool valves, Regulating or flow control valves, Control valves, Orifices</p> <p>Valve types & functions- Basic valve action, Regulator & control valves, Shift & governor valves</p> <p>Pressure regulation- The primary regulating valve, Line pressure variation, Modulator valve pressure, The governor, Governor pressure, Kickdown pressure.</p> <p>Flow control- Gear position 1, 1-2 shift valve, 2-3 shift valve assembly, The servo orifice control valve, 3-2 kick down</p> <p>Continuously variable transmission (C.V.T.)- Continuously variable transmission, Drive or reverse, The steel belt, Secondary pulley shaft.</p>

<p>10-12</p>	<p>Following practical to be Practiced On Light & Heavy Vehicle.</p> <p>Practice on removing the drop arm, Check and adjust the turning angle, align the drop arm and steering wheel with the front wheel. Check and correct toe-in.</p> <p>Practice on removing steering wheel, steering gearbox.</p> <p>Inspect and overhaul steering boxes, adjusting steering gear backlash, pre-load and adjust toe-in, toe-out, camber angle, castor angle, kingpin inclination and wheel run out. Checking & adjusting power steering fluid, Pressure testing a power steering system, Flushing a power steering system, Inspecting & adjusting an engine drive belt, Servicing a steering system, Servicing wheel bearings.</p> <p>Troubleshooting- Causes and remedy for abnormal wear of tyre, wheel wobbling, poor self centering, hard steering, and vehicle pulling to one side.</p>	<p>Steering Systems:- Description and function of Steering systems, Principles of steering, Rack-and-pinion steering system, Recirculation ball & nut steering system, Four-wheel steering systems, collapsible steering system.</p> <p>Steering boxes & columns - Description and function of Steering columns, Rack-and-pinion gearbox, Helix, Variable ratio steering, Worm gearbox, Power Assisted steering, Steering process, Flow-control valve, Electric power assisted steering, Basic electric power steering operation</p> <p>Steering arms & components- Forward control vehicle steering, Steering linkages, Joints, Bushes/bushings</p> <p>Wheel alignment fundamentals:- Basic principles of wheel alignment, wheel base, wheel track, king pin inclination, Caster, Camber, Scrub radius, Toe-in & toe out, Toe-out on turns, Turning radius, Thrust angle & centerlines.</p>
<p>13-15</p>	<p>Following practical to be Practiced On Light & Heavy Vehicle</p> <p>Practice on visual Inspection of chassis frame for crack, bent and twists.</p> <p>Overhauling and Inspection of shackle, leaf spring, front & rear suspension.</p> <p>Practice on removing, inspection and assembling of shock absorber Lubricating a suspension system.</p> <p>Trouble shooting for Suspension system defects : wheel hop, ride height (unequal and low), noises under operation, fluid leakage, excessive travel, bounce, worn dampers, worn joints/damaged linkages, vehicle “crabbing”.</p>	<p>Suspension Systems:- Principles of suspension, Suspension force, Unsprung weight, Wheel unit location, Dampening. Types of suspension- Suspension systems, Solid axle, Dead axle, Description, function and advantages of non independent suspension Independent suspension, Rear independent suspension, Rear-wheel drive independent suspension, electronically controlled air suspension (ECAS), Adaptive air suspension operation.</p> <p>Types of springs - Description and function of Coil springs, Leaf springs, Torsion bars, Rubber springs.</p> <p>Shock absorber types- Description and function of Hydraulic shock absorbers, Gas-pressurized shock absorbers, Load-adjustable shock absorbers, Manual adjustable-rate shock absorbers, Electronic adjustable-rate shock absorbers, Automatic load-adjustable shock absorbers</p> <p>Front suspension types & components- Mc person Strut suspension, Short/long arm suspension, Torsion bar suspension</p> <p>Rear suspension types & components-Rigid axle leaf spring suspension, Rigid axle coil</p>

		spring suspension, Independent type suspension, Rigid non-drive suspension
16	<p>Practice on removing wheels from light & Heavy vehicle, dismantling tyres and tubes checking puncture.</p> <p>Assembling inflating to correct pressure.</p> <p>Checking & adjusting tire pressure by use of air or by Nitrogen</p> <p>Rotating the wheels in vehicle minor repairs to wheels and tyres, wheel balancing & alignment.</p> <p>Checking for tyre wear patterns.</p> <p>Caution: vehicle equipped with ABS while removing the wheel and using on vehicle balancing never ignition switch on (Follow the service manual procedure)</p>	<p>Wheels & Tyres-Wheel types & sizes Wheels, Rim sizes & designations, Types of wheels</p> <p>Tyre types & characteristics- Tyres, Radial ply tyres, Radial ply tyre sidewalls, Tyre pressure monitoring systems, Run flat tyres, Space-saver tyres, Tyre distortion, Center of gravity.</p> <p>Tyre construction-Tyre construction, Types of tyre construction, Tyre materials, Hysteresis, Tyre sizes & designations, Tyre information, Tyre tread designs, Tyre ratings for temperature & traction. Descriptions Tirewear Patterns and causes</p> <p>Nitrogen vs atmospheric air in tyres</p>
17-19	<p>Practice on Adjusting brake pedal play, Overhauling and inspection of tandem master cylinder assembly,</p> <p>Overhauling and inspection of front and rear brake assembly, overhauling and inspection of wheel cylinder assembly.</p> <p>Bleeding hydraulic brakes & Disk brakes.</p> <p>Overhauling and inspection of vacuum assisted brake assembly.</p> <p>Overhauling and inspection of disc brake.</p> <p>Adjusting Air brakes- repair to tank unit, air compressor, wheel brake adjuster- locating air leaks in the brake lines and rectifying – general maintenance and care.</p> <p>Brakes procedures-Checking & adjusting brake fluid, Replacing brake fluid, Checking brake pads, Replacing brake pads, Removing & replacing a rotor, Replacing brake linings, Adjusting a parking brake cable.</p> <p>Trouble tracing in braking system of a heavy vehicle adjusting brakes and balancing all four wheel brakes, precautions to be observed while testing brakes points to be remember while preparing the vehicle for brake certificate.</p> <p>Practice of maintaining of ABS system.</p>	<p>Braking Systems :- Principles of braking, Drum & disc brakes, Lever/mechanical advantage, Hydraulic pressure & force, Brake pad, Regenerative braking.</p> <p>Braking systems - Brake type - principles, Air brakes, Exhaust brakes, Electric brakes, Parking brakes, Engine brakes, Regenerative braking</p> <p>Braking system components-Park brake system, Brake pedal, Brake lines, Brake fluid, Bleeding, Master cylinder, Divided systems, Tandem master cylinder, Power booster or brake unit, Hydraulic brake booster, Electro hydraulic braking (EHB), Applying brakes, Brake force, Brake light switch</p> <p>Drum brakes & components -Drum brake system, Drum brake operation, Brake linings & shoes, Back plate, Wheel cylinders</p> <p>Disc brakes & components -Disc brake system, Disc brake operation, Disc brake rotors, Disc brake pads, Disc brake caliprs, Proportioning valves, Proportioning valve operation, Brake friction materials</p> <p>Antilock braking system & components-ABS brake system, Antilock braking system operation, Principles of ABS braking, ABS master cylinder, Hydraulic control unit, Wheel speed sensors, ABS with EBD electronic control unit.</p> <p>The construction and operation of heavy vehicle Anti-Slip Regulation / Traction Control (ASR) system.</p>

20 & 21.	Trouble shooting Practice with Heavy vehicle for Engine Not starting – Mechanical & Electrical causes, High fuel consumption, Engine overheating, Low Power Generation, Excessive oil consumption, Low/High Engine Oil Pressure, Engine Noise.	Study of Motor Vehicle act Rules & Regulation-Laws governing to use of motor vehicle & vehicle transport, Licensing of drivers & conductors, Registration of vehicle, Traffic rules, Signals & controls, Accidents, Causes & analysis, Responsibility of driver, Offences, penalties & procedures, Different types of forms, Government administration structure, Personnel, Authorities & duties, Rules regarding construction of motor vehicles, Tax exemption & tax renewal, Insurance types & significance -Comprehensive Third party insurance, Duty of driver in case of accident
22-23	In plant training	
24-25	Revision and Test	
26	NCVT Exam	

Syllabus for the trade of Mechanic Motor Vehicle
Fourth Semester (Semester code No.)
Duration: Six Months.

Syllabus for Trade practical and Trade Theory

Week No.	Trade Practical (27 Hrs/week)	Trade Theory (5 Hrs/week)
1 & 2	<p>Identification of petrol Engine components. Practice on starting and stopping of petrol engines. Observe and report the reading of Tachometer, Odometer, temp and Fuel gauge under ideal and on load condition. Removing a petrol engine from a motor vehicle. Dismantling cylinder head for Inspection.</p> <p>Practice on Removing of piston and connecting rods from engine checking Cylinder bore wear for ovality and taper. Piston ring, Piston as per service manual. Checking valves - replacing worn guides and weak springs, assembling valves and cylinder head and adjusting tappet clearance in engine.</p>	<p>Petrol Engine Basics: 4-stroke spark-ignition engines- Basic 4-stroke principles. Spark-ignition engine components- Basic engine components, Engine cams & camshaft, Engine power transfer, Scavenging, Counter weights, Piston components.</p> <p>Intake & exhaust systems -Carbureted systems, Electronic fuel injection systems, Exhaust systems. Intake system components, Air cleaners, Carburetor air cleaners, EFI air cleaners, Intake manifolds, Intake air heating. Gasoline Fuel Systems : Description of Gasoline fuel, Gasoline fuel characteristics, Controlling fuel burn, Stoichiometric ratio, Air density, Fuel supply system, Pressure & vacuum.</p>
3	<p>Simple repairs in fuel feed system – overhauling of fuel pump, carburetors, fuel Filters and air cleaners. Repair to a car carburetors – adjusting float level and slow speed adjustments – studying the fuel flow circuit in carburetor Practice in engine tune up in a vehicle – testing vacuum and compression of engine,</p>	<p>Carburetor operation-Carburation, Carburetor systems, Metering jets, Accelerating, Carburetor barrels Carbureted system components The carburetor, Mechanical fuel pumps, Electric fuel pumps, Tanks & lines, Fuel lines, Charcoal canister, Carburetor filters.</p>
4&5	<p>Practice on Cleaning fuel tank, checking for leaks in Fuel tank. Identification of various components of MPFI system. Testing of MPFI components and replacement if necessary. Check delivery from fuel Pump. Replacing a fuel filter.</p>	<p>Introduction to Electronic fuel injection (EFI) fuel supply system , Basic EFI principles, Air supply, Air volume, Multi-point injection systems (MPI/MPFI), Simultaneous injection, Efficient combustion EFI fuel supply system components - Fuel pumps, Fuel filters, Tanks & lines, Fuel lines, Fuel rail, Fuel pressure regulator, Injectors, Tachometric relay, Thermostat switch, EFI sensors, Potentiometer, Auxiliary air valves, Idle speed control devices, Inertia sensors.</p>
6 & 7	<p>Identification of Electronic control Unit. Set up for testing, Testing of Electronic</p>	<p>Introduction to EFI Engine Management - EFI operation Modes of EFI, Electronic fuel</p>

	<p>Control Circuit. Fault finding in Electronic circuit and remedies using scan tool.</p> <p>Identification of various sensors installed in engine & it's mounting. Checking instruments & Gauges on dash board.</p> <p>Rectify replace defective gauges.</p> <p>Testing of Temperature sensor, Pressure sensor, potentiometer, magnetic induction sensor, cam shaft sensor, crankshaft position sensor.</p>	<p>injection, Idle speed control systems, Feedback & looping, Cold start systems, Air measurement, Air-flow monitoring, Variable intake manifold system, Electrical functions, EFI wiring diagram</p> <p>Electronic control unit (ECU) - EFI system ECU, Electronic control unit settings, Engine speed limiting, Malfunction indicator lamp.</p> <p>Importance of Diagnostic Trouble Code (DTC) & its general format. Use of scan tool and retrievals of codes.</p> <p>EFI sensors- Intake Temperature sensor, Mass airflow sensor, Manifold absolute pressure sensor, Air vortex sensor, Fuel system sensor, Throttle position sensor, Exhaust gas oxygen sensor, Crank angle sensor, Hall effect voltage sensor,</p>
8	<p>Diagnosis- Possible causes and remedy for Engine cranks, but will not or hard to start, Poor fuel economy or engine performance.</p> <p>Checking ignition timing, Checking & changing a spark plug, Identification and testing of Hall effect sensor, Optical sensor. Tracing and testing of sensor circuits.</p>	<p>Ignition principles and Faraday's laws, Primary and secondary winding of transformer, Ignition components, Spark plugs, Spark plug components, Vacuum & centrifugal units, Plug firing voltage,</p> <p>Induction, Inductive system operation, Induction wiring, Hall effect sensors, Hall effect operation, Optical type sensors</p> <p>Distributor less ignition systems, Insulated coils, Distributor less ignition system timing.</p>
9 & 10	<p>Checking a charging system for the cause of undercharge, No charge, and over charge conditions. Removing & replacing an alternator, Inspection of rotor for ground, open circuit – field coil resistance, slip ring surface, Fan, bearing. Inspection of stator for ground, open circuit, Inspection of Drive end bearing rotation, Rectifier, brush length compare with service manual. slip ring surface. Inspecting & adjusting an engine drive belt, Replacing an engine drive belt / pulleys / Tensioners and their alignments.</p> <p>Trouble shooting, possible causes and remedy for warning lamp does not glow when ignition switch is on, Warning lamp glows dim when ignition switch is on, warning lamp 'on' while the alternator is running, Warning lamp glows 'dim' while the alternator is running, warning lamp flickers considerably.</p>	<p>Charging system- The purpose of Charging system, charging system components, charging system circuit, Alternator principles, Alternating current, Alternator components, Rectification, Phase winding connections, Rotor circuit, Voltage regulation, System operating voltage, High voltage charging systems, Rotor, Stator, Alternator end frames, Slip ring & brush assembly, Rectifier assembly, Alternator cooling fan.</p>
11 & 12	<p>Removing starter motor from vehicle, and Performance test for pull-in test, Hold-in test, pinion (plunger) return test, No-load</p>	<p>Starting system- purpose of starting system, Starting system components, Starter motor principles, study of starter control circuits.</p>

	<p>performance test. Solenoid test for Hold in coil open circuit, Armature test – Ground test, Open circuit test, pull-in coil open circuit test, field coil test. Inspections of brush length wear as per service manual.</p> <p>Trouble shooting , possible causes and remedy for starter motor not running, Starting motor running but too slow (small torque), starting motor running, but not cranking engine. Noise, starting motor does not stop running. -Growler testing for rotors. Checking a starting system, Jump-starting a vehicle</p>	<p>Starter motor construction, Starter magnet types, Starter motor engagement, Commutation, Switching, solenoid construction.</p>
<p>13 & 14</p>	<p>Trace the light circuit - test bulbs, align head lamps, Aiming headlights. Changing a headlight bulb, Checking of a head light switch and to replace if faulty.</p> <p>Trouble shooting and remedy for Headlight - headlight do not light up, only one headlight does not light up, Only one beam (“Hi” or “Lo”) does not light..</p> <p>Trouble shooting and remedy for turn signal and hazard warning lights -Flash rate high or one side only flashes, No Flashing, flash rate low.</p> <p>Trouble shooting and remedy for clearance, tail and license plate lights - All lights do not light up, some lights do not light up.</p> <p>Trouble shooting and remedy for Back-up light - Back-up lights do not light up.</p> <p>Trouble shooting and remedy for Brake lights -Brake lights do not light up, Brake light stay on.</p> <p>Trouble shooting and remedy for fuel meter and fuel gauge unit - Fuel meter shows no operation or incorrect operation.</p> <p>Trouble shooting and remedy for Engine coolant Temp (ECT) meter and ECT Sensor – Engine coolant temp meter shows no operation or incorrect operation.</p> <p>Trouble shooting and remedy for oil pressure light – Oil pressure warning light does not light up when ignition switch is on at engine off.</p> <p>Trouble shooting and remedy for brake and parking brake warning light- Brake warning light does not light up when fluid flow level, Brake warning light does not light up when</p>	<p>Lighting system, Lamps/light bulbs, Lamp/light bulb information, LED lighting, Headlights-description of standard sealed beam, halogen sealed beam, composite and High intensity discharge (HID) headlights. Headlight & dimmer circuits, Park & tail light circuits, Brake light circuits, turn signal circuit, Cornering lights, Fog lights circuit, interior lights- courtesy, reading and instrument panel lights, Smart lighting , Reverse lights</p>

	<p>parking brake pull up, Brake warning lights stay on.</p> <p>Trouble shooting and remedy for interior light- Interior light do not light up.</p> <p>Trace the wiring circuit of traffic signal flashers light circuit-tracing defects in the flasher circuits, replacing fuse bulb.</p>	
15 & 16	<p>Identification of Air conditioning components, Performance test on A/c unit, Checking Charged state of refrigerant, Inspecting & adjusting an engine drive belt, Replacing an engine drive belt.</p> <p>Checking a heating system, Compressor rotation test, air Gap check,</p> <p>Refrigerant recovery –evacuating –charging of A/c system. Replenishing compressor oil level. Troubles diagnose and remedy for No cooling or warm air, Cool air comes out only intermittently, Insufficient cooling, Abnormal noise from compressor, Magnetic clutch, condenser, evaporator, Blower motor. Diagnosis test for High pressure gauge –pressure high and low, Low pressure gauge for pressure high and low.</p>	<p>Heating Ventilation Air Conditioning (HVAC) legislation, Vehicle heating, ventilation & cooling systems, Basic air-conditioning principles, Air-conditioning capacity, Air-conditioning refrigerant, Humidity</p> <p>Description and function of Fixed orifice, Control devices, Thermostatic expansion valve system, Thermal expansion valves, Air-conditioning compressors, Condensers & evaporators, Receiver drier, Lines & hoses, TX valve construction, Temperature monitoring thermostat, Refrigerants, Pressure switches, Heating elements</p> <p>Air-conditioning ECU, Ambient air temperature sensor, Servo motors, Electric servo motors, Automatic climate control sensors, Evaporator temperature sensor, Blower speed control, Ventilation systems.</p>
17 & 18	<p>Trouble shooting and remedy for Horn- No horn operation, poor sound quality, horn sounds continuously and to replace the horn if faulty.</p> <p>Remove and install wiper motors and wiper switches. Checking & replacing wiper blades.</p> <p>Trouble shooting and remedy for windshield wiper and washer - no operation, intermittent operation, continuous operation, and wipers will not park.</p> <p>Diagnose causes for improper operation of the windshield washer system and to replace the pump if faulty.</p> <p>Diagnose the power window system for – all power window motors do not operate, some switches do not operate.</p> <p>Diagnose the power door lock control for – All power door locks do not operate, only one power door lock not operate.</p> <p>Diagnose for remote keyless entry and immobilizer system.</p> <p>Familiarization of car radio wiring and</p>	<p>Accessories: Horn circuit, wiper circuit, power window components and circuit. Power door lock circuit, automatic door lock circuit, remote keyless entry system circuit, antitheft system, immobilizer system. Navigation system, Car radio and cassette player, car videos.</p> <p>Description and function of Airbags, Seatbelt, Vehicle safety systems, Crash sensors, Seat belt pre-tensioners, Tire pressure monitoring systems</p> <p>Integrated communications, Proximity sensors, Reflective displays, Global positioning satellites, Triangulation/trilateration, Telematics. Networking & multiplexing</p>

	speaker circuits Diagnose automatic seat belt systems, Diagnose air bag system and service warnings.	
19-21	Driving Practice. Practice in straight driving on wide roads. Driving through lanes and curves. Practice in reversing. Practice overtaking another vehicle. Practice in driving through sand and wet surfaces. Practice in parking and Diagonal parking.	Locating vehicle information, Obtaining & interpreting scan tool data, Using a repair manual, Using a shop manual, Using an owner's manual, Using a labor guide, Using a parts program, Using a service information program
22-23	Project work	
24-25	Revision and Test	
26	NCVT Exam	