7. TRADE SYLLABUS

SYLLABUS FOR MECHANIC DIESELTRADE			
Duration: One Year			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
Professional Skill 150Hrs; Professional Knowledge 42 Hrs	Check & perform Measuring & marking by using various Measuring & Marking tools (Vernier Calliper, Micrometer, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.) Following safety precautions.	1. Demonstration of Machinery used in the trade. (05 hrs) 2. Identify safety Gear/PPE (Personal Protective Equipments) and their uses (10 hrs) 3. Importance of maintenance and cleanliness of Workshop. (05 hrs) 4. Demonstration on safe handling and Periodic testing of lifting equipment, and Safety disposal of used engine oil. (10 hrs.) 5. Demonstration on health hazards, occupational safety &first Aid. (05 hrs) 6. Demonstration fire service station to provide demo on Fire safety. (05 hrs) 7. Perform use of fire extinguishers. (05 hrs) 8. Energy saving Tips of ITI electricity Usage. (05 hrs)	- Importance& scope of Mechanic Diesel Trade Training. - General discipline in the Institute - Elementary First Aid, Occupational Safety & Health - Knowledge of Personal Safety &Safety precautions in handling Diesel machine - Concept about House Keeping & 5S method. - Energy conservation process - Safety disposal of Used engine oil, - Electrical safety tips. - Safe handling of Fuel Spillage, - Knowledge of Fire Safety &Fire extinguishers used for different types of fire. - Safe disposal of toxic dust, - safe handling and Periodic testing of lifting equipment. (14 hrs)

		9. Perform marking using all marking aids, like steel rule with spring callipers, dividers, scriber, punches, chisel etc. on MS Flat/Sheet Metal. (17 hrs) 10. Measure a wheel base of a vehicle with measuring tape. (08 hrs) 11. Measure valve spring tension using spring tension tester (10 hrs) 12. Perform to remove wheel lug nuts with use of an air impact wrench (08 hrs) 13. Operate General workshop tools & power tools. (07 hrs)	**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. Callipers-inside and outside. Dividers, surface gauges, scriber, - Punches-prick punch, centre 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,

			Pipe flaring & cutting tool, pullers-Gear and bearing. (14 hrs)
		14. Perform measuring practice on Cam height, Camshaft Journal dia, crankshaft journal dia, Valve stem dia, piston diameter, and piston pin dia with outside Micrometres. (05 hrs) 15. Perform 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. (05 hrs) 16. Perform measuring practice on valve spring free length. (05 hrs) 17. Perform measuring practice on cylinder bore, Connecting rod bore, inside diameter (ID) of a camshaft bearing with Telescope gauges. (05 hrs) 18. Perform measuring practice on cylinder bore for taper and out-of-round with Dial bore gauges. (05 hrs) 19. Perform measuring practice to measure wear on crankshaft end play, crankshaft run out, and valve guide with dial indicator. (05 hrs) 20. Perform measuring practice	**Systems of measurement**, - Description, Least Count calculation, care & use of - Micrometers- Outside, and depth micrometer, - Micrometer adjustments, - Description, Least Count calculation, care & use of Vernier Calliper. - Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge. (14 hrs)

		to check the flatness of the cylinder head is warped or twisted with straightedge is used with a feeler gauge. (05 hrs) 21. Perform measuring practice to check the end gap of a piston ring, piston-to-cylinder wall clearance with feeler gauge. (05hrs) 22. Perform practice to check engine manifold vacuum with vacuum gauge. (05hrs) 23. Perform practice to check the air pressure inside the vehicle tyre is maintained at the recommended setting.(05hrs)	
Professional Skill 125Hrs; Professional Knowledge 35 Hrs	Plan & perform basic fastening & fitting operation by using correct hand tools, Machine tools &equipments.	25. Perform practice on general cleaning, checking and use of nut, bolts, & studs etc. (05hrs) 26. Perform removal of stud/bolt from blind hole. (05hrs) 27. Perform practice on cutting tools like Hacksaw, file, chisel, Sharpening of Chisels, center punch, safety precautions while grinding. (10hrs) 28. Perform practice on Hacksawing and filing to given dimensions. (15hrs) 29. Perform on Soldering & Brazing. (10hrs) 30. Perform practice on making various Gaskets like oil	- Different types of metal joint (Permanent, Temporary), methods of Bolting, Riveting, Soldering, Brazing, Seaming etc. **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. Types of Gaskets** – paper,

		sump, intake manifold, water pump, tappet cover etc.(05hrs)	multilayered metallic, liquid, rubber, copper and printed. - Thread Sealants-Various types like, locking, sealing, temperature resistance, antilocking, lubricating etc. **Cutting tools** - Study of different type of cutting tools like Hacksaw, File- Definition, parts of a 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 (14 hrs)
		31. Perform practice on Marking and Drilling clear and Blind Holes, Sharpening of Twist Drills Safety precautions to be observed while using a drilling machine. (10hrs) 32. Perform practice on Tapping a Clear and Blind Hole, Selection of tape drill Size, use of Lubrication, Use of stud extractor. (15 hrs) 33. Perform practice cutting Threads on a Bolt/ Stud.	**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**

		Adjustment of two piece Die, Reaming a hole/ Bush to suit the given pin/ shaft, scraping a given machined surface. (25hrs)	- Different Type of hand reamers, Drill size for reaming, Lapping, Lapping abrasives, type of Laps. (14 hrs)
		34. Perform practice on making Rectangular Tray.(08 hrs) 35. Perform pipe bending, fitting nipples union in pipes (08 hrs) 36. Perform Soldering and Brazing of Pipes. (09 hrs)	**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. (07 Hrs)
Professional Skill 100Hrs; Professional Knowledge 28 Hrs	Trace and Test all Electrical & Electronic components & circuits and assemble circuit to ensure functionality of system.	37. Perform practice in joining wires using soldering Iron. (08 hrs) 38. Prepare simple electrical circuits, measuring of current, voltage and resistance using digital multimeter. (08 hrs) 39. Perform practice continuity test for fuses, jumper wires, fusible links and circuit breakers. (09hrs)	**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 (07 Hrs)
		40. Perform diagnose series, parallel, series-parallel circuits using Ohm’s law. (05 hrs) 41. Check electrical circuit with	- Fuses & circuit breakers, - Ballast resistor, - Stripping wire insulation, - cable colour codes and sizes,

		a test lamp. (05 hrs) 42. Perform voltage drop test in circuits using multimeter, measure current flow using multimeter /ammeter. (07hrs) 43. Check circuit using of service manual wiring diagram for troubleshooting (08 hrs)	- Resistors in Series circuits , - Parallel circuits and Series-parallel circuits, - Electrostatic effects, Capacitors and its applications, - Capacitors in series and parallel. (07 Hrs)
		44. Execute cleaning and topping up of a lead acid battery. (10 hrs) 45. Perform testing battery with hydrometer. (12 hrs) 46. Perform connecting battery to a charger for battery charging and checking & testing a battery after charging. (08 hrs) 47. Measure and Diagnose the cause(s) of excessive Key-off battery drain (parasitic draw) and do corrective action. (15 hrs) 48. Perform test of relay and solenoids and its circuit. (05 hrs)	- 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. (14 Hrs)
Professional Skill 75 Hrs; Professional Knowledge 21Hrs	Join components by using Arc & Gas welding.	49. Perform practice to make straight beads and Butt, Lap & T joints Manual Metal Arc Welding. (50hrs) 50. Set Gas welding flames and perform practice to make a straight beads and joints by Oxy – Acetylene welding (25hrs)	**Introduction to welding and Heat Treatment** **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;. - Basic knowledge about advance welding process &equipments like MIG, TIG, Spot Welding, Plasma Cutter. **Heat Treatment Process** - Introduction, Definition of heat treatment, - - Definition of Annealing, Normalizing, Hardening and tempering. – - Case hardening, Nitriding, Induction hardening - Flame Hardening process used in auto components with examples. (21 hrs)
Professional Skill 50Hrs; Professional Knowledge 14 Hrs	Trace & Test Hydraulic and Pneumatic components.	51. Perform liquid penetrant testing method and Magnetic particle testing method. (15 hrs) 52. Identify of Hydraulic and pneumatic components used in vehicle. (10 hrs) 53. Tracing of hydraulic circuit on hydraulic jack, hydraulic power steering, and Brake circuit. (15hrs) 54. Identify components in Air brake systems (10hrs)	**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 **Introduction to Hydraulics & Pneumatics** - Definition of Pascal law, pressure, Force, viscosity.

			Description, symbols and application in automobile of Gear pump-Internal & External, - 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. (14 hrs)
Professional Skill 25Hrs; Professional Knowledge 7Hrs	Check & Interpret Vehicle Specification data and VIN. Select & operate various Service Station Equipments.	55. Identify of different types of Vehicle. (05 hrs) 56. Demonstrate of vehicle specification data . (05 hrs) 57. Identify of vehicle information Number (VIN). (05 hrs). 58. Demonstrate of Garage, Service station equipments.- Vehicle hoists – Two post and four post hoist, Engine hoists, Jacks**,** Stands**.**(10 hrs)	- 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. - 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 - Uses of Vehicle hoists – Two post and four post hoist, Engine hoists, Jacks**,** **Stands.** (07 Hrs)

Professional Skill 50Hrs; Professional Knowledge 14 Hrs	Dismantle & assemble of Diesel Engine from vehicle (LMV/HMV) along with other accessories.	59. Identify the different parts of IC Engine(10 hrs) 60. Identify the different parts in a diesel engine of LMV/ HMV (10 hrs) 61. Perform practice on starting and stopping of diesel engines. Observe and report the reading of Tachometer, Odometer, temp and Fuel gauge under ideal and on load condition. (10 hrs) 62. Practice on dismantling Diesel engine of LMV/HMV as per procedure. (20 hrs)	**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, - Main Parts of IC 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. (14 hrs)
Professional Skill 175 Hrs; Professional	Overhaul & service Diesel Engine, its parts and check functionality.	63. Perform Overhauling of cylinder head assembly, Use of service manual for clearance and other	**Diesel Engine Components:** - Description and Constructional feature of Cylinder head, Importance

Knowledge 49 Hrs		parameters,(10 hrs) 64. Perform practice on removing rocker arm assembly manifolds. (07 hrs) 65. Perform practice on removing the valves and its parts from the cylinder head, cleaning. (07 hrs) 66. Inspection of cylinder head and manifold surfaces for warping, cracks and flatness. Checking valve seats & valve guide – Replacing the valve if necessary. (07 hrs) 67. Check leaks of valve seats for leakage – Dismantle rocker shaft assembly - clean & check rocker shaft-and levers, for wear and cracks and reassemble. (07 hrs) 68. 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. (12 hrs)	of Cylinder head design, - Type of Diesel combustion chambers, - Effect on size of Intake & exhaust passages, Head gaskets. - Importance of Turbulence. **Valves & Valve Actuating Mechanism -** - 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 (SOHC and DOHC), importance of Cam lobes, Timing belts & chains, Timing belts & tensioners. (14 hrs)
		69. Perform Overhauling piston and connecting rod assembly. Use of service	- Description & functions of different types of pistons, piston rings and piston pins

		manual for clearance and other parameters. (05 hrs) 70. Perform Practice on removing oil sump and oil pump – clean the sump. (04 hrs) 71. Perform removing the big end bearing, connecting rod with the piston. (04 hrs) 72. Perform 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. (05 hrs) 73. 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. (03 hrs) 74. Check connecting rod for bend and twist. Assemble the piston and connecting rod assembly. (04 hrs)	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. (07 Hrs)
		75. Perform Overhauling of crankshaft, Use of service manual for clearance and other parameters (05 hrs) 76. Perform removing	- Description and function of Crank shaft, camshaft, - Engine bearings- classification and location – materials used &

		damper pulley, timing gear/timing chain, flywheel, main bearing caps, bearing shells and crankshaft from engine(05 hrs) 77. Inspect oil retainer and thrust surfaces for wear. (05 hrs) 78. Measure crank shaft journal for wear, taper and ovality. (05 hrs) 79. Demonstrate crank shaft for fillet radii, bend & twist. (05 hrs)	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. (07 Hrs)
		80. Inspect flywheel and mounting flanges, spigot and bearing.(05 hrs) 81. Check vibration damper for defect. (02 hrs) 82. Perform 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. (07 hrs) 83. 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	- 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. (07 Hrs)

		Check seating and refit. (11 hrs)	
		84. Perform cleaning and checking of cylinder blocks. (04 hrs) 85. Surface for any crack, flatness measure cylinder bore for taper &ovality, clean oil gallery passage and oil pipe line. (05 hrs) 86. Perform bore – de-scale water passages and examine. (05 hrs) 87. Removing cylinder liners from scrap cylinder block. (04 hrs) 88. Perform practice in measuring and refitting new liners as per maker's recommendations precautions while fitting new liners. (07 hrs)	- Description of Cylinder block, - Cylinder block construction, - Different type of Cylinder sleeves (liner). (07 Hrs)
		89. Perform reassembling all parts of engine in correct sequence and torque all bolts and nuts as per workshop manual of the engine. (12 hrs) 90. Perform testing cylinder compression**,** Check idle speed**.** (08 hrs) 91. Perform removing & replacing a cam belt**,** and adjusting an engine drive belt**,** replacing an engine drive belt. (05 hrs)	- **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. (07 Hrs)
Professional	Trace, Test & Repair Cooling and Lubrication	92. Perform practice on checking &top up coolant,	**Need for Cooling systems** - Heat transfer method,

Skill 50 Hrs; Professional Knowledge 14 Hrs	System of engine.	draining & refilling coolant, checking / replacing a coolant hose. (05 hrs) 93. Perform test cooling system pressure. (03 hrs) 94. Execute on removing & replacing radiator/ thermostat check the radiator pressure cap. (07 hrs) 95. Test of thermostat. (02 hrs) 96. Perform cleaning &reverse flushing. (08hrs) 97. Perform overhauling water pump and refitting. (08 hrs) 98. Perform checking engine oil**,** draining engine oil**,** replacing oil filter**,** & refilling engine oil (07 hrs) 99. Execute 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. (10 hrs)	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. (14 hrs)
Professional	Trace & Test Intake and	100. Execute dismantling air	**Intake & exhaust systems** –

Skill 25 Hrs; Professional Knowledge 07 Hrs	Exhaust system of engine.	compressor and exhauster and cleaning all parts - measuring wear in the cylinder, reassembling all parts and fitting them in the engine. (6 hrs) 101. Execute dismantling & assembling of turbocharger, check for axial clearance as per service manual. (05 hrs) 102. Examine exhaust system for rubber mounting for damage, deterioration and out of position; for leakage, loose connection, dent and damage; (05 hrs) 103. Perform practice on exhaust manifold removal and installation, practice on Catalytic converter removal and installation. (05 hrs) 104. Check Exhaust system for rubber mounting for damage, deterioration and out of position; for leakage, loose connection, dent and damage. (04 hrs)	- 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 and function of Exhaust manifold**,** Exhaust pipe**,** Extractors**,** Mufflers- Reactive, absorptive, Combination of Catalytic converters**,** Flexible connections**,** Ceramic coatings**,** Back-pressure, - Electronic mufflers**.** (07Hrs)
Professional Skill 75 Hrs; Professional Knowledge 21 Hrs	Service Diesel Fuel System and check proper functionality.	105. Perform work on removing &cleaning fuel tanks, checking leaks in the fuel lines. (10 hrs) 106. Perform soldering & repairing pipe lines and Unions, brazing nipples to	**Fuel Feed System in IC Engine(Petrol & Diesel)** - Gravity feed system, Forced feed system, main parts, Fuel Pumps-Mechanical & Electrical Feed Pumps.

		high pressure line studying the fuel feed system in diesel engines, draining of water separators. (10 hrs) 107. Execute overhauling of Feed Pumps (Mechanical & Electrical). (10 hrs) 108. Perform bleeding of air from the fuel lines, servicing primary & secondary filters. (10 hrs) 109. Execute 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. (15 hrs) 110. Execute overhauling of injectors and testing of injector. (10 hrs) 111. General maintenance of Fuel Injection Pumps (FIP). (10 hrs)	- Knowledge about function, working & types of Carburettor. **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. (14 hrs)
Professional Skill 25 Hrs;	Plan & overhaul the stationary engine and Governor and check	112. Execute Start engine adjust idling speed and damping device in	**Marine & Stationary Engine:-** **Types,** - double acting engines,

Professional Knowledge 07 Hrs	functionality.	pneumatic governor and venture control unit checking. (06 hrs) 113. Verify 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. (07 hrs) 114. Check performance for missing cylinder by isolating defective injectors and test-dismantle and replace defective parts and reassemble and refit back to the engine. (12 hrs)	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. (07 Hrs)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Monitor emission of vehicle and execute different operation to obtain optimum pollution as per emission norms.	115. Monitor emissions procedures by use of Engine gas analyser or Diesel smoke meter. (10 hrs) 116. Checking & cleaning a Positive crank case ventilation (PCV) valve**.** Obtaining & interpreting scan tool data. Inspection of EVAP canister purges system by use of scan Tool. (10 hrs) 117. EGR /SCR Valve Remove and installation for inspection. (05 hrs)	**Emission Control:- Vehicle emissions** - Standards- Euro and Bharat 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**,** Sulphur content in fuels Description of Evaporation emission control**,** Catalytic conversion**,** Closed loop**,** 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 (07 Hrs)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Carryout overhauling of Alternator and Starter Motor.	118. Perform removing alternator from vehicle dismantling, cleaning checking for defects, assembling and testing for motoring action of alternator & fitting to vehicles. (15 hrs) 119. Practice on removing starter motor Vehicle and overhauling the starter motor, testing of starter motor (10 hrs)	Basic Knowledge about DC Generator & AC Generator. - Constructional details of Alternator - 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. (07 Hrs)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Diagnose & rectify the defects in LMV/HMV to ensure functionality of vehicle.	120. Execute 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. (25 hrs)	**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. (07 hrs)
In-plant training / Project work Projects viz. b. Overhauling of Pressure Lubrication system			

c. Maintenance of cooling system.
d. Overhauling of FIP.
e. Cleaning & Testing of Injectors.
f. Overhauling of Alternator
g. Overhauling of Starter Motor
h. Study on Diagnosis Tool/Scanner Tool for ECU of CRDI engine