CURRICULUM

FOR THE TRADE OF

MECHANIC MOTOR VEHICLE

(Dual Mode)

UNDER

DUAL TRAINING SYSTEM

BY

सत्यमेव जयते
Government of India

GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

PROPOSED TIME DISTRIBUTION FOR MECHANIC MOTOR VECHILCE TRADE UNDER INDUSTRY INSTITUTE - TRAINING SCHEME

BLOCK WITH DURATION	**THEORY**	**PRAC.**	**WSC/ CAL**	**ENGG. DRG.**	**EMP. SKILL**	**ECA, LIB. & OTHERS**	**REM.**
BLOCK – I (12 months/52 Weeks duration) Institute level trg.	510 hrs.	830 hrs.	170 hrs.	250 hrs.	110 hrs.	50 hrs.	160 hrs. Revision & Test
BLOCK – II (09 months /39 weeks duration) Industry level trg.	---	1560 HRS.	---	---	---	---	---
BLOCK – III (3 months/ 13 Weeks duration) Institute level trg.	100 hrs.	210 hrs. (Practical practice and submission of report related to industry training)	50 hrs.	60 hrs.	---	20 hrs.	Last 2 weeks revision & exam.
GRAND TOTAL	**610 HRS.**	**2600 HRS.**	**220 HRS.**	**310 HRS.**	**110 HRS.**	**70 HRS.**	**240 HRS.**
Total duration of training inclusive of Industry & Institute is 2 years (4160 HRS.)							

GENERAL INFORMATION FOR INSTITUTE (ITI)

1. **Name of the Trade** **: Mechanic Motor Vehicle (Dual mode)**

2. **N.C.O. Code No.** : **7231.10,** ASC/ Q 1401, ASC/ Q 1402, ASC/ Q 1408

3. **Duration of Craftsmen Training:** Two years (Three Blocks).

4. **Power norms** : 4.8KW

5. **Space norms** :.workshop Area – 130 Sq.m and Parking Area-20 Sqm

6. **Entry Qualification** : Passed 10th class examination with Maths and Science

7. **Trainees per unit** :16 (Max. supernumeraries seats: 5)

8a. **Qualification for Instructors**:

a) Degree in Automobile/ Mechanical Engg. (with specialization in Automobile) from recognised college/University with one year experience in the automobile industry and should possess valid LMV driving license.

OR

Diploma in Automobile/Mechanical (specialization in automobile) from recognized board of technical education with two years experience in the automobile industry and should posses valid LMV driving license.

OR

10th Passed + NTC/NAC in the Trade of "**Mechanic Motor Vehicle)**" with 3 years post qualification experience in the relevant field and should possess valid LMV driving license.

and

b) With "**National Crafts Instructor Certificate".**

8b. **Desirable qualification**: Preference will be given to a candidate with Craft Instructor Certificate (CIC) in MMV **Trade**.

Note:

(i) Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications.

(ii) Instructor qualification for WCS and E.D, as per the training manual.

Distribution of training on Hourly basis:

Total hours /week	Trade practical	Trade theory	Work shop Cal. &Sc.	Engg. Drawing	Employability skills	Extra curricular activity
40 Hours	25 Hours	6 Hours	2 Hours	3 Hours	2 Hours	2 Hours

SYLLABUS CONTENT WITH TIME STRUCTURE FOR MECHANIC MOTOR VEHCILE TRADE

Block – I

Duration- 12 Months (52 weeks)

Institute Level Training: -

Sl. No.	Practical Duration:- 830 hrs.	Theory Duration:- 510 hrs.
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:** Introductiontothe Courseduration, coursecontent, studyofthe syllabus. General rule pertainingto theInstitute, facilitiesavailable– Hostel, Recreation, Medicaland Libraryworking hours andtime table **AutoIndustry**- History, leading manufacturers, developmentin automobileindustry, trends,newproduct. 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.
2.	Practical related to Safety and Health, Importanceofmaintenanceandcleanliness ofWorkshop. 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** ImportanceofSafetyandgeneral Precautionstobeobservedintheshop. 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.	Measuring practice on Cam height, Camshaft Journal dia, crankshaft journal dia, Valve stem dia, piston diameter, and piston pin dia with outside Micrometers. 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. Measuring practice on valve spring free length.	**Systems of measurement:-** Description, care & use of - Micrometers- Outside and depth micrometer, Micrometer adjustments, Vernier calipers, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.

	Measuring practice on cylinder bore, Connecting rod bore,inside diameter (ID) of a camshaft bearing with Telescope gauges. Measuring practice on cylinder bore for taper and out-of-round with Dial bore gauges. Measuring practice to measure wear on crankshaft end play, crankshaft run out, and valve guide with dial indicator. Measuring practice to check the flatness of the cylinder head is warped or twisted with straightedge is used with a feeler gauge. Measuring practice to check the end gap of a piston ring, piston-to-cylinder wall clearance with feeler gauge. Practice to check engine manifold vacuum with vacuum gauge. Practice to check the air pressure inside the vehicle tires is maintained at the recommended setting.	
4.	Practice using all marking aids, like steel rule with spring calipers, dividers, scriber, 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, scriber, 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, Phillipsscrew driver, Ratchet screwdriver. Allenkey,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, Nippersor pincer pliers**,** Side cutters, Tin snips, Circlip pliers**,** external circlips pliers**.**Airimpactwrench, airratchet, wrenches- Torque wrenches, pipe wrenches, car jet washersPipeflaring&cutting tool, pullers-Gear and bearing.
5.	Practice on General cleaning, checking and use of nut, bolts, & studs etc., Removal of stud/bolt from blind hole. .	**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**.**
6.	Practice on cutting tools like Hacksaw, file, chisel, Sharpening of Chisels, center punch,safety precautions while grinding Practice on Hacksawing and filing to given dimensions	**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
7.	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 tape 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
8.	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.
9.	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:-** Electricityprinciples**,** Ground connections**,** Ohm's law, Voltage, Current, Resistance,Power, Energy. Voltmeter, ammeter, Ohmmeter Mulitmeter,Conductors & insulators**,** Wires**,** Shielding**,** Length vs. resistance**,** Resistor ratings
10.	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 circuitsandSeries-parallel circuits**,** Electrostatic effects**,** Capacitors and its applications, Capacitors in series and parallel.

11.	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 andDiagnosethe cause(s) of excessive Key-off battery drain (parasitic draw) and do corrective action. Testing of relay and solenoids and its circuit	**Batteries & cells**, Description of Chemical effects**,** Lead acid batteries& Stay Maintenance Free (SMF) batteries, Magnetic effects**,** Heating effects**,** Thermo-electric energy**,** Thermisters, Thermo couples, Electrochemical energy**,** Photo-voltaic energy**,** Piezo-electric energy**,** Electromagnetic induction**,** Relays**,** Solenoids, Primary & Secondary windings, Transformers, stator and rotor coils.
12.	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.	**Basic electronics**: Description of Semiconductors, 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.
13.	Practice to make straight beads and Butt, Lap & T joints Manual Metal Arc Welding. Setting of Gas welding flames, practice to make a straight beads and joints Oxy – Acetylene welding Film on Heat treatment process	**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;. **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.
14.	Practice on Liquid penetrant testing method and Magnetic particle testing method. Identification of Hydraulic and pneumatic components used in vehicle.	**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
15.	Tracing of hydraulic circuit on hydraulic jack, hydraulic power steering, and Brake circuit. Identification of components in Air brake systems**.**	**Introduction to Hydraulics &Pneumatics: -** Definition ofPascal 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. Pneumatic Symbols, Description and function of air Reciprocating Compressor. Function of Air service unit (FRL-Filter, Regulator & Lubricator).
16.	Identification of different type of Vehicle. Demonstration of vehicle specification data; Identification of vehicle information Number (VIN). Demonstration of Garage, Service station equipment.- Vehicle hoists – Two post and four post hoist, Engine hoists, Jacks**,**Stands.	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.
17.	Identificationofparts inadieselengine of LMV/ HMV Practiceonstarting and stoppingofdiesel engines. Observe and report the reading of Tachometer, Odometer, temp and Fuel gauge under ideal and on load condition. PracticeondismantlingDiesel engineof LMV/HMV asper procedure.	**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 typeof startingandstopping methodofDiesel Engine Procedure for dismantling of diesel engine from a vehicle..
18.	Overhaulingof cylinderheadassembly, Useofservice manualforclearance andotherparameters, Practiceonremoving rockerarmassembly manifolds. Practiceonremoving thevalvesandits parts fromthecylinder head, cleaning. Inspectionofcylinder head andmanifold surfacesforwarping, cracksand flatness. Checkingvalveseats&valveguide– Replacing the valve if necessary.Testing leaksofvalveseatsfor leakage– Dismantlerockershaft assembly-clean&checkrockershaft-and levers,forwearand cracksandreassemble.	**Diesel EngineComponents:** Descriptionand Constructional featureofCylinder head,Importanceof Cylinderhead design, Typeof Dieselcombustion chambers,Effecton sizeofIntake&exhaust passages, Headgaskets. Importanceof Turbulence **Valves &Valve Trains-** Descriptionand FunctionofEngine Valves,different types,materials, Typeofvalve operating mechanism, ImportanceofValve seats**,**Valveseats insertsincylinder heads**,** importance ofValverotation**,** Valve stemoilseals**,** sizeofIntakevalves**,** Valvetrains**,**Valve-

	Checkvalvesprings, tappets,pushrods, tappetscrewsand valvestemcap. Reassemblingvalve partsinsequence,refit cylinderheadand manifold&rockerarm assembly,adjustable valveclearances, startingengineafter adjustments.	timingdiagram**,** conceptofVariable valvetiming**.** Descriptionof Camshafts&drives**,** Descriptionof Overheadcamshaft**,** importanceofCam lobes**,**Timing belts &chains**,** Timing belts&tensioners.
19.	Overhaulingpistonand connectingrod Assembly. Useof servicemanualfor clearanceandother parameters:- Practiceonremoving oilsumpandoilpump – cleanthesump. Practiceonremoving the big endbearing, connectingrodwith thepiston. Practiceonremoving Thepistonrings; Dismantlethepison andconnectingrod. Checktheside clearanceofpiston ringsinthepiston groove&landsfor wear. Checkpistonskirtand crownfordamageand scuffing,cleanoil holes. Measure-thepiston ring close gapinthe cylinder, clearance betweenthepiston and the liner,clearance betweencrank pinand the connectingrodbig endbearing. Checkconnectingrod forbendandtwist. Assemblethepiston andconnectingrod assembly.	Description&functionsof different typesof **pistons**,piston rings and pistonpins and materials.Used recommended clearancesforthe ringsand its necessity precautionswhile fittingrings, commontroubles and remedy. Compressionratio. Description&function of**connectingrod,** importanceofbig- end splitobliquely, Materialsusedfor connectingrodsbig end&main bearings. Shells pistonpinsand lockingmethodsof pistonpins.
20.	Overhaulingof crankshaft, Useof servicemanualfor clearanceandother parameters:- Practiceonremoving damperpulley, timing gear/timingchain, flywheel,mainbearing caps,bearingshells andcrankshaftfrom engine checkingoilretainer andthrustsurfacesfor wear,Measurecrank shaftjournalforwear, taperandovality, Checkingcrankshaft forfilletradii,bend&twist.	Descriptionand functionof**Crank shaft**, camshaft, Enginebearings- classificationand location–materials used&composition ofbearing materials- Shellbearingand their advantages- specialbearings material fordiesel engineapplication bearingfailure&its causes- care&maintenance. Crank-shaft balancing,Firing orderofthe engine.
21.	Checkingofflywheel andmounting flanges, spigot,bearing. Checkvibration damperfordefects, Practiceonremoving camshaftfromengine block, Checkforbend&twist ofcamshaft. Inspectionofcam lobe,camshaftjournals andbearingsand measurecamlobelift. Fixingbearinginserts incylinderblock&cap check nip and spreadclearance& oil holes&locatingglugs fixcrank shafton block- torquebolts- checkendplayremove shaft-	Descriptionand functionofthe**fly wheel**andvibration damper.Crankcase &oilpump,gears timingmark,Chain sprockets,chain tensioneretc. Functionofclutch& couplingunits attachedtoflywheel.

	checkseating, repeatsimilarlyfor connectingrodand Checkseatingand refit.	
22.	CleaningandChecking ofcylinderblocks Surface foranycrack, flatness, Measurecylinderbore fortaper&ovality, cleanoilgallery passageand oilpipe line, Bore-descale waterpassagesand examine Removingcylinder linersfromscrap cylinderblock, practiceinmeasuring andrefittingnewliners aspermaker's recommendations precautionswhile fittingnewliners.	Descriptionof **Cylinderblock,** Cylinderblock construction, and Different typeof Cylinder sleeves (liner).
23.	Reassembleallpartsof engineincorrect Sequenceandtorque allboltsandnutsas per workshopmanualof theengine. Enginecomponent procedures- Testingcylinder compression**,**Checking idlespeed**,** Removing &replacingcambelt**,** Inspecting&adjusting anenginedrive belt**,** Replacinganengine drivebelt.	**Engineassembly** procedurewithaid ofspecialtoolsand gaugesusedfor engineassembling.-
24.	PracticeonChecking &Top upcoolant, Draining& refilling coolant, Checking / replacing a coolanthose, Testing coolingsystem pressure, PracticeonRemoving & replacing radiator/thermostat. Inspectthe radiator pressurecap,Testing ofthermostat. Cleaning &reverse flushing. Overhaulingwater pump andrefitting.	**NeedforCooling systems,** Heat transfer method, Boilingpoint& pressure,Centrifugal force,Vehicle coolantproperties andrecommended changeofinterval, Different typeof coolingsystems, **Basiccooling systemcomponents-** Radiator,Coolant hoses,Waterpump, Coolingsystem thermostat,Cooling fans,Temperature indicators,Radiator pressurecap, Recoverysystem, Thermo-switch.

25.	PracticeonChecking engineoil**,**Draining engineoil**,**Replacing oilfilter**,**Refilling engineoil**.** Overhaulingofoil pump,oil coolers,aircleaners and airfiltersand adjustoilpressure relief valves,repairsto oilflowpipe linesand unionsifnecessary.	**Needforlubrication system**,Functionsof oil,Viscosityand its gradeasperSAE **,** Oiladditives**,** Syntheticoils, The lubricationsystem**,** Splashsystem**,** Pressuresystem**,** Corrosion/noise reductioninthe lubricationsystem. Lubricationsystem components- Descriptionand functionofSump**,** Oilcollectionpan**,** Oiltank**,**Pickuptube**,**differenttype ofOilpump&Oil filtersOilpressure relief valve**,**Spurt holes&galleries**,** Oilindicators**,** Oil cooler.
26.	Practiceon Dismantlingair compressor nd exhausterandcleaning allparts-measuring wearinthecylinder, reassemblingallparts andfittingtheminthe engine. Dismantling&assemblingof turbocharger,check for axialclearanceasper servicemanual. 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 installation. Practice on Catalytic converter removal and installation.	**Intake&exhaust systems**– Descriptionof Diesel induction&Exhaust systems. Description&functionof aircompressor, exhauster,Super charger, Intercoolers,turbo charger,variable turbo charger mechanism. **Intakesystem components-** Descriptionand functionofAir cleaners,Different typeair cleaner, Descriptionof Intakemanifoldsand material**,** **Exhaustsystemcomponents-** Descriptionand functionofExhaust manifold**,** Exhaust pipe**,**Extractors**,** Mufflers- Reactive, absorptive, Combination.**,**Catalytic converters**,** Flexible connections**,** Ceramiccoatings**,** Back-pressure, Electronic mufflers**.**

27.	Practiceonremoving &Cleaningfuel tanks, checking leaksinthe fuellines, Soldering& repairing pipe linesandUnions, brazingnipplestohigh pressurelinestudying thefuel feed systemin dieselengines, draining ofwater separators. Bleedingofairfrom thefuellines, Servicingprimary&secondaryfilters. Removingafuel injectionpumpfrom an engine-refitthe pumptotheenginere- set timing-fill lubricating-oilstart and adjustslowspeedof theengine. Practiceon overhaulingof injectors andtestingof injector. General maintenanceofFuel InjectionPumps(FIP).	**Diesel Fuel Systems-** Descriptionand functionofDiesel fuelinjection,fuel characteristics**,** conceptofQuiet dieseltechnology**&**Cleandiesel technology. **Dieselfuelsystem components–** Descriptionand functionofDiesel tanks&lines**,**Diesel fuelfilters**,**water separator,Liftpump**,** Plungerpump**,** Primingpump**,** Inlineinjection pump**,**Distributor-type injectionpump**,** Dieselinjectors**,** Glowplugs**,** Cummins&Detroit Diesel injection. **ElectronicDiesel control-**Electronic Dieselcontrol systems**,** Common RailDieselInjection (CRDI) system**,** Hydraulically actuated electronically controlledunit injector(HEUI) dieselinjection system. Sensors, actuatorsandECU (ElectronicControl Unit)usedinDiesel Engines.
28.	PracticeonStart engineadjustidling Speedanddamping deviceinpneumatic governorandventure controlunitchecking Performanceofengine withoff load adjusting timings. Startengine-adjusting Idlespeedofthe enginefittedwith mechanicalgovernor checking-highspeed operationofthe engine. Checkingperformance formissing cylinderby isolatingdefective injectorsandtest- dismantleand replace defectivepartsand reassembleandrefit backtothe engine Monitoring emissionsprocedures by use of Engine gas analyser or Diesel smoke meter. Checking& cleaninga Positivecrankcase ventilation(PCV) valve**.**Obtaining &interpretingscantool data. Inspection of EVAP canister purges system by use of scan Tool. EGR /SCR Valve Remove and installation	**Marine&Stationary Engine**:-Types, Doubleacting engines,opposed pistonengines, starting systems, coolingsystems, lubricatingsystems, supplying fueloil, hydraliccoupling, reductiongeardrive, electromagnetic coupling,electrical drive,generatorsand motors, supercharging. **EmissionControl:-** VehicleemissionsStandards- Euro and Bhart II, III, IV, V Sourcesofemission, Combustion**,** Combustion chamberdesign. **Typesofemissions**: Characteristicsand Effectof Hydrocarbons**,** Hydrocarbonsin exhaust gases**,** Oxides ofnitrogen**,** Particulates**,**Carbon monoxide**,**Carbon dioxide**,** Sulfur contentinfuels Descriptionof Evaporation emissioncontrol**,** Catalytic conversion**,**Closed loop**,**Crankcase emissioncontrol**,** Exhaustgas recirculation**(**EGR) valve**,** Controlling air-fuelratios**,** Charcoalstorage devices,Diesel particulatefilter (DPF). Selective Catalytic Reduction (SCR), EGR VS SCR

	for inspection.	
29.	Practiceonremoving alternatorfromvehicle dismantling,cleaning checking fordefects, assemblingandtesting formotoringactionof alternator&fittingto vehicles. Practiceonremoving startermotor Vehicle andoverhauling the startermotor,testing ofstartermotor	Description .of **charging circuit**operation of alternators, regulator unit, ignition warning lamp- troubles andremedy inchargingsystem. Description of **startermotorcircuit,** Constructional detailsof starter motor solenoid switches, common troubles andremedy in startercircuit.
30.	Practiceon troubleshooting in LMV/HMV for EngineNotstarting– Mechanical&Electricalcauses, Highfuel consumption, Engine overheating, LowPower Generation, Excessiveoil consumption, Low/HighEngineOil Pressure, EngineNoise.	**Troubleshooting:** Causesandremedy for EngineNotstarting – Mechanical&Electricalcauses, Highfuel consumption, Engineoverheating, LowPower Generation, Excessiveoil consumption, Low/HighEngine OilPressure, EngineNoise.
31.		**Introduction**: Study of different major components & assemblies of heavy vehicle, and different make (indigenous). Name plate-constructional differences and their merits. leading manufacturers in Heavy vehicle Industry
32.		**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. **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**.**
33.		**Automatic Transmissions** - Torque converters, Torque converter principles, drive plate, Converter operation, Torque multiplication, Fluid flow, Heat exchanger, Lock-up converters, clutches. **Planetary gearing**- Planetary gears, Simple planetary gear sets, Compound planetary gear sets, Automatic transmission brake bands, Multi-disc clutches, **Electronic control transmission** -Electronic control Unit, Fully hydraulically controlled transmission, Electronic shift programs, Manual

		selection. Layout & operation for P,R,N&D (1^{st}& 2^{nd}) Selector positions, Planetary gear set, High range power flow, Low range power flow **Continuously variable transmission (C.V.T**.)- Continuously variable transmission, Drive or reverse, The steel belt, Secondary pulley shaft.
34.		**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. **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 **Steering arms & components**- Forward control vehicle steering, Steering linkages, Joints, Bushes/bushings **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.
35.		**Suspension Systems:-** Principles of suspension, Suspension force, Un-sprung 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. **Types of springs** - Description and function of

		Coil springs, Leaf springs, Torsion bars, Rubber springs. **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 **Front suspension types & components**- Mc person Strut suspension, Short/long arm suspension, Torsion bar suspension **Rear suspension types & components**-Rigid axle leaf spring suspension, Rigid axle coilspring suspension**,** Independent type suspension**,** Rigid non-drive suspension
36.		**Wheels & Tyres**-Wheel types & sizes Wheels, Rim sizes & designations, Types of wheels **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. **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 Nitrogen vs atmospheric air in tyres
37.		**Braking Systems :-** Principles of braking, Drum & disc brakes, Lever/mechanical advantage, Hydraulic pressure & force, Brake pad, Regenerative braking. **Braking systems** - Brake type - principles, Air brakes, Exhaust brakes, Electric brakes, Parking brakes, Engine brakes, Regenerative braking **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 **Drum brakes & components** -Drum brake system, Drum brake operation, Brake linings & shoes, Back plate, Wheel cylinders **Disc brakes & components**-Disc brake system, Disc brake operation, Disc brake rotors, Disc brake pads, Disc brake calipprs, Proportioning valves, Proportioning valve operation, Brake friction materials **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. The construction and operation of heavy vehicle Anti-Slip Regulation / Traction Control (ASR) system.
38.		**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. **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.

39.		**Carburetor operation**-Carburation**,** Carburetor systems**,** Metering jets**,** Accelerating**,** Carburetor barrelsCarbureted system components, The carburetor**,** Mechanical fuel pumps**,** Electric fuel pumps**,** Tanks & lines**,** Fuel lines**,** Charcoal canister**,** Carburetor filters
40.		**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, Thermotime switch, EFI sensors, Potentiometer, Auxiliary air valves, Idle speed control devices, Inertia sensors
41.		**Introduction to** EFI Engine Management - EFI operation Modes of EFI, Electronic fuel injection, Idle speed control systems, Feedback & looping, Cold start systems, Air measurement, Air-flow monitoring, Variable intake manifold system, Electrical functions, EFI wiring diagram **Electronic control unit (ECU**) - EFI system ECU, Electronic control unit settings, Engine speed limiting, Malfunction indicator lamp. Importance of Diagnostic Trouble Code (DTC) & its general format. Use of scan tool and retrievals of codes. **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.
42.		**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**,** Induction**,** Inductive system

		operation**,** Induction wiring**,** Hall effect sensors**,** Hall effect operation**,** Optical type sensors, Distributor less ignition systems**,** Insulated coils**,** Distributor less ignition system timing**.**
43.		**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
44.		**Starting system**-purpose of starting system, Staring system components, Starter motor principles, study of starter control circuits**.** Starter motor construction**,** Starter magnet types**,** Starter motor engagement**,** Commutation**,** Switching**,** solenoid construction.
45.		**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, **t**urn signal circuit, Cornering lights, Fog lights circuit**,** interior lights- courtesy, reading and instrument panel lights, Smart lighting , Reverse lights
46.		**Heating Ventilation Air Conditioning (HVAC)** legislation**,** Vehicle heating, ventilation & cooling systems**,** Basic air-conditioning principles**,** Air-conditioning capacity**,** Air-conditioning refrigerant**,** HumidityDescription and function ofFixed 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 Air-conditioning ECU**,** Ambient air temperature sensor**,** Servo motors**,** Electric servo motors**,** Automatic climate control sensors**,** Evaporator temperature sensor**,** Blower speed control**,** Ventilation systems
47.		**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, Carradio andcassetteplayer, car videos. Description and function of Airbags, Seatbelt, Vehicle safety systems, Crash sensors, Seat belt pre-tensioners, Tire pressure monitoring systems Integrated communications, Proximity sensors, Reflective displays, Global positioning satellites, Triangulation/trilateration, Telematics. Networking & multiplexing
48.		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
49.	**Revision & Examination**	

NOTE: - Maximum uses of video demonstration and other IT based teaching aids may be adopted to deliver the theoretical knowledge.

Syllabus for

EMPLOYABILITY SKILLS

GENERAL INFORMATION
(Employability Skill)

1. **Name of the subject: EMPLOYABILITY SKILLS**

2. **Hours of Instruction:** 110 Hrs.

3. **Examination:** The examination will be held at the end of the training.

4. **Instructor Qualification:**

   MBA OR BBA with two years experience OR Graduate in Sociology/ Social Welfare/ Economics with Two years experience OR Graduate/ Diploma with Two years experience and trained in Employability Skills from DGET institutes

   AND

   Must have studied English/ Communication Skills and Basic Computer at 12^{th} / Diploma level and above

   OR

   Existing Social Studies Instructors duly trained in Employability Skills from DGET institutes

5. **Instructor:**

   One full time regular instructor shall be engaged on every 240 numbers of trainees for teaching the subject "Employability Skills". One additional full time regular instructor would be required on increase in every 240 trainees. Wherever the trainees are less than 240 or part thereof, a part-time instructor may be engaged to teach the subject.

ALLOTMENT OF TIME AND MARKS AMONG THE TOPICS

Sl. No.	Topics	Allotted Hours	Marks Allotted	To be covered in
1.	English Literacy	20 hrs.	9	Block – I
2.	I.T. Literacy	20 hrs.	9	
3.	Communication Skills	15 hrs.	7	
4.	SUB TOTAL:	55	25	
5.	Entrepreneurship Skills	15 hrs.	6	
6.	Productivity	10 hrs.	5	
7.	Occupational safety , health and Environment Education	15 hrs.	6	
8.	Labour Welfare Legislation	05 hrs.	3	
9.	Quality Tools	10 hrs.	5	
	Sub Total:	55	25	
TOTAL		**110** hrs.	50	

Detail of Syllabus

1. English Literacy **Hours of Instruction: 20 Hrs.**	**Marks Allotted: 09**
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
Speaking / Spoken English	Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.
2. I.T. Literacy **Hours of Instruction: 20 Hrs.**	**Marks Allotted: 09**
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
Computer Operating System	Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.
Word processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets
Computer Networking and INTERNET	Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.

3. Communication Skills Hour of Instruction: 15 Hrs. Marks Allotted: 07	
Topic	Contents
Introduction to Communication Skills	Communication and its importance
	Principles of Effective communication
	Types of communication - verbal, non verbal, written, email, talking on phone.
	Non verbal communication -characteristics, components- Para-language
	Body - language
	Barriers to communication and dealing with barriers.
	Handling nervousness/ discomfort.
Listening Skills	Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening.
	Triple- A Listening - Attitude, Attention & Adjustment.
	Active Listening Skills.
Motivational Training	Characteristics Essential to Achieving Success
	The Power of Positive Attitude
	Self awareness
	Importance of Commitment
	Ethics and Values
	Ways to Motivate Oneself
	Personal Goal setting and Employability Planning.
Facing Interviews	Manners, Etiquettes, Dress code for an interview
	Do's & Don'ts for an interview
Behavioral Skills	Problem Solving
	Confidence Building
	Attitude
4. Entrepreneurship Skills Hour of Instruction: 15 Hrs. Marks Allotted: 06	
Concept of Entrepreneurship	Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. management, Entrepreneurial motivation. Performance & Record, Role & Function of
	entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.
Project Preparation & Marketing analysis	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
Institutions Support	Preparation of Project. Role of Various Schemes and Institutes

	for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.

5. Productivity

Hour of Instruction: 10 Hrs. Marks Allotted: 05

Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard. Industry Nation.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation How improves or slows down.
Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.

7. Occupational Safety, Health and Environment Education Hour of

Instruction: 15 Hrs. Marks Allotted: 06

Safety & Health	Introduction to Occupational Safety and Health importance of safety and health at workplace.
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.
Accident & safety	Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.
First Aid	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person
Basic Provisions	Idea of basic provision of safety, health, welfare under legislative of India.

Ecosystem	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
Energy Conservation	Conservation of Energy, re-use and recycle.
Global warming	Global warming, climate change and Ozone layer depletion.
Ground Water	Hydrological cycle, ground and surface water, Conservation and Harvesting of water
Environment	Right attitude towards environment, Maintenance of in -house environment
7. Labour Welfare Legislation Hour of Instruction: 05 Hrs. **Marks Allotted: 03**	
Welfare Acts	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act.
Hour of Instruction: 10 Hrs. **8. Quality Tools** **Marks Allotted: 05**	
Quality Consciousness	Meaning of quality, Quality characteristic.
Quality Circles	Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles.
Quality Management System	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
House Keeping	Purpose of House keeping, Practice of good Housekeeping.
Quality Tools	Basic quality tools with a few examples

Tools & Equipments for Employability Skills:

Sl. No.	Name of the Equipment	Quantity
1	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 nos.
2	UPS - 500Va	10 nos.
3	Scanner cum Printer	1 no.
4	Computer Tables	10 nos.
5	Computer Chairs	20 nos.
6	LCD Projector	1 no.
7	White Board 1200mm x 900mm	1 no.

* Note: Above Tools & Equipments not required, if Computer LAB is available in the institute.

Syllabus for

ENGINEERING DRAWING

GENERAL INFORMATION
(Engineering Drawing)

1. **Name of the Subject :** ENGINEERING DRAWING

2. **Hours of Instruction:** 310 hrs.

3. **Instructor Qualification:** Degree in Engineering with one year experience
   OR
   Diploma in Engineering with two years experience
   OR
   NCVT / NAC in the Draughtsman (Mechanical / Civil) with three years experience.

4. **Desirable:** Craft Instructor Certificate in RoD & A course under NCVT.

5. **Instructor:**
   - One full time instructor is required for 144Engineering seats sanctioned in the institute. Additional instructor will be required on increase in every 144 students.
   - For seats less than 144, the instructor may be out sourced/ hired on contract basis.

Details of syllabus

Sl. No.	Topics (Total duration – 310 hrs.)
1.	Engineering Drawing: Introduction and its importance - Relationship to other technical drawing types - Conventions - Viewing of engineering drawing sheets. - Method of Folding of printed Drawing Sheet as per BIS SP:46-2003
2.	Drawing Instruments : their Standard and uses - Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.
3.	Lines : - Definition, types and applications in Drawing as per BIS SP:46-2003 - Classification of lines (Hidden, centre, construction, Extension, Dimension, Section) - Drawing lines of given length (Straight, curved) - Drawing of parallel lines, perpendicular line - Methods of Division of line segment
4.	Drawing of Geometrical Figures: Definition, nomenclature and practice of - Angle: Measurement and its types, method of bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.
5.	Lettering and Numbering as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case.
6.	Dimensioning: - Definition, types and methods of dimensioning (functional, nonfunctional and auxiliary) - Types of arrowhead - Leader Line with text
7.	Free hand drawing of - Lines, polygons, ellipse, etc. - geometrical figures and blocks with dimension - Transferring measurement from the given object to the free hand sketches.
8.	Sizes and Layout of Drawing Sheets - Basic principle of Sheet Size - Designation of sizes - Selection of sizes - Title Block, its position and content - Borders and Frames (Orientation marks and graduations) - Grid Reference - Item Reference on Drawing Sheet (Item List)
9.	Method of presentation of Engineering Drawing - Pictorial View - Orthogonal View - Isometric view
10.	Symbolic Representation (as per BIS SP:46-2003) of : Fastener (Rivets, Bolts and Nuts) - Bars and profile sections - Weld, brazed and soldered joints.

	- Electrical and electronics element - Piping joints and fittings
11.	Construction of Scales and diagonal scale
12.	Practice of Lettering and Title Block
13.	Dimensioning practice: - Position of dimensioning (unidirectional, aligned, oblique as per BIS SP:46-2003) - Symbols preceding the value of dimension and dimensional tolerance. - Text of dimension of repeated features, equidistance elements, circumferential objects.
14.	Construction of Geometrical Drawing Figures: - Different Polygons and their values of included angles. Inscribed and Circumscribed polygons. - Conic Sections (Ellipse & Parabola)
15.	Drawing of Solid figures (Cube, Cuboids, Cone, Prism, Pyramid, Frustum of Cone and Pyramid.) with dimensions.
16.	Free Hand sketch of hand tools and measuring tools used in respective trades.
17.	Projections: - Concept of axes plane and quadrant. - Orthographic projections - Method of first angle and third angle projections (definition and difference) - Symbol of 1^{st} angle and 3^{rd} angle projection as per IS specification.
18.	Drawing of Orthographic projection from isometric/3D view of blocks
19.	Orthographic Drawing of simple fastener (Rivet, Bolts, Nuts & Screw)
20.	Drawing details of two simple mating blocks and assembled view.
21.	- Machined components; concept of fillet & chamfer; surface finish symbols.
22.	- Screw thread, their standard forms as per BIS, external and internal thread, conventions on the features for drawing as per BIS.
23.	- Free hand Sketches for bolts, nuts, screws and other screwed members.
24.	- Free hand Sketching of foundation bolts and types of washers.
25.	- Standard rivet forms as per BIS (Six types).
26.	- Riveted joints-Butt & Lap (Drawing one for each type).
27.	- Orthogonal views of keys of different types
28.	- Free hand Sketches for simple pipe, unions with simple pipe line drawings.
29.	- Concept of preparation of assembly drawing and detailing. Preparation of simple assemblies & their details of trade related tools/job/exercises with the dimensions from the given sample or models.
30.	-Free hand sketch of trade related components / parts (viz., single tool post for the lathe, etc.)
31.	- Study of assembled views of Vee-blocks with clamps.
32.	- Study of assembled views of shaft and pulley.
33.	- Study of assembled views of bush bearing.
34.	- Study of assembled views of a simple coupling.
35.	- Free hand Sketching of different gear wheels and nomenclature.
36.	- Free hand Details and assembly of simple bench vice.
37.	- Reading of drawing. Simple exercises related to missing lines, dimensions. How to make queries.
38.	- Simple exercises relating missing symbols. - Missing views

39.	- Simple exercises related to missing section.
40.	-Free hand sketching of different types of bearings and its conventional representation.
41.	- Free hand sketching of different gear wheels and nomenclature/ Simple duct (for RAC). Free hand sketch of Reciprocating compressor - open type (for RAC)
42.	- Solution of NCVT test. - Simple exercises related to trade related symbols. - Basic electrical and electronic symbols
43.	- Study of drawing & Estimation of materials.
44.	- Solution of NCVT test papers.
45.	Revision
46.	Examination

LIST OF TOOLS & EQUIPMENTS

Sl. No.	NAME OF TOOLS / EQUIPMENTS	QUANTITY
1.	Drawing Board	20
2.	Models : Solid & cut section	as required
3.	Table for trainees	20
4.	Stool for trainees	20
5.	Cupboard (big)	01
6.	White Board (size: 8ft. x 4ft.)	01
7.	Trainer's Table	01
8.	Trainer's Chair	01

Syllabus for

Workshop Calculation & Science

GENERAL INFORMATION
(Workshop Calculation & Science)

1. **Name of the subject :** WORKSHOP CALCULATION & SCIENCE

2. **Hours of Instruction:** 220 hrs.

3. **Examination:** The examination for the subject will be held at the end of training.

4. **Instructor Qualification:** Degree in Engineering with two years experience OR
   Diploma in Engineering with one year experience

5. **Desirable:** Craft Instructor Certificate in RoD & A course under NCVT.

6. Instructor:

One full time instructor is required for 144Engineering seats sanctioned in the institute. Additional instructor will be required on increase in every 144 students.
For seats less than 144, the instructor may be out sourced/ hired on contract basis.

SYLLABUS FOR WORKSHOP CALCULATION AND SCIENCE

(Total duration – 220 hrs.)

Topic No	Workshop Calculation	Workshop Science
1.	**Unit:** Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	**Material Science** : properties -Physical & Mechanical, Types -Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals, introduction of Iron, Cast Iron, Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous metals, Non-Ferrous Alloys.
2.	**Fractions** : Fractions, Decimal fraction, L.C.M., H.C.F., Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems using Scientific Calculator.	**Mass .Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals.
3.	**Square Root**:Square and Square Root, method of finding out square roots, Simple problem using calculator.	**Speed and Velocity:** Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation, equations of motions, simple related problems.
4.	**Ratio & Proportion** : Simple calculation on related problems.	**Work, Power and Energy:** work, unit of work, power, unit of power, Horse power of engines,
5.	**Percentage** : Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy.
6.	**Algebra** : Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	**Heat & Temparature:** Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, scale of temperature, relation between different scale of temperature, Thermometer, pyrometer, transmission of heat, conduction, convection, radiation.
7.	**Mensuration :** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Volume of solids - cube, cuboid, cylinder and Sphere. Surface area of solids -cube, cuboid, cylinder and Sphere.	**Basic Electricity:** Introduction, use of electricity, how electricity is produced, Types of current_ AC, DC, their comparison, voltage, resistance, their units. Conductor, insulator, Types of connections - series, parallel, electric power, Horse power, energy, unit of electrical energy.
8.	**Trigonometry:** Trigonometrical ratios, measurement of angles. Trigonometric tables	**Levers and Simple Machines:** levers and its types. Simple Machines, Effort and Load, Mechanical Advantage, Velocity Ratio, Efficiency of machine, Relationship between Efficiency, velocity ratio and Mechanical Advantage.
9.	- Geometrical construction & theorem: division of line segment, parallel lines, similar angles, perpendicular lines, isosceles triangleand right angled triangle.	- Forces definition. - Compressive, tensile, shear forces and simple problems. -Stress,strain, ultimate strength, factor of safety. -Basic study of stress-strain curve for MS.
10.	- Area of cut-out regular surfaces: circle and segment and sector of circle.	- Temperature measuring instruments. Specific heats of solids & liquids.
11.	- Area of irregular surfaces. - Application related to shop problems.	- Thermal Conductivity, Heat loss and heat gain.
12.	- Volume of cut-out solids: hollow cylinders, frustum of cone, block section. - Volume of simple machine blocks.	- Average Velocity, Acceleration & Retardation. - Related problems.

13.	- Material weight and cost problems related to trade.	- Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force
14.	- Finding the value of unknown sides and angles of a triangle by Trigonometrical method.	
15.	- Finding height and distance by trigonometry.	
16.	- Application of trigonometry in shop problems. (viz. taper angle calculation).	
17.	**Graph:** - Read images, graphs, diagrams - bar chart, pie chart. - Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.	- Friction- co-efficient of friction, application and effects of friction in Workshop practice. **Centre of gravity** and its practical application.
18.	Simple problem on Statistics: - Frequency distribution table - Calculation of Mean value. - Examples on mass scale productions. - Cumulative frequency -Arithmetic mean	- Magnetic substances- natural and artificial magnets. - Method of magnetization. Use of magnets.
19.	Acceptance of lot by sampling method (within specified limit size) with simple examples (not more than 20 samples).	- Electrical insulating materials. - Basic concept of earthing.
20.		- Transmission of power by belt, pulleys & gear drive. - Calculation of Transmission of power by belt pulley and gear drive.
21.		- Heat treatment and advantages.
22.		Concept of pressure - units of pressure, atmospheric pressure, absolute pressure, gauge pressure -gauges used for measuring pressure
23.		Introduction to pneumatics & hydraulics systems.

BLOCK – II

DURATION: 09MONTHS (39 weeks)

Industry level training

BROAD LEARNING TO BE COVERED IN INDUSTRY FOR MECHANIC MOTOR VEHICLE TRADE:

1. **Safety and best practices /Basic Industrial Culture (5S, KAIZEN, etc.)**
2. **Record keeping and documentation**
3. **Repair, maintenance and Overhauling of Diesel engine (CRDI)**
4. **Repair, maintenance and Overhauling of petrol engine (MPFI)**
5. **Maintenance & overhauling of vehicle (Light & Heavy)**
6. **Diagnosis/Troubleshooting of Engine**
7. **Carryout repair & maintenance work of different aggregates of vehicle.**
8. **Inspection & testing of Engine and vehicle**

DETAILS OF PRACTICAL SKILLS TO BE COVERED DURING INDUSTRY TRAINING FOR MECHANIC MOTOR VEHICLE TRADE

Duration of training: - 09 Months

Actual training will depend on the existing facilities available in the establishments.

The candidate should be competent to execute following operation/ skills after completion of the industrial training: -

1. Apply safe working practices in an automotive work shop
2. Comply environment regulations and housekeeping in the work shop.
3. Identify and check functionality of major components and assemblies of heavy vehicle.
4. Carry Out overhauling light vehicle /Heavy vehicle transmission system and record the information
5. Trouble shooting of transmission system
6. Identify and check functionality of auto transmission components and to Carry out automatic transmission adjustments.
7. Carryout overhauling of light vehicle /Heavy vehicle chassis system including steering, suspension and braking system and record the information
8. Carry out steering and Brake adjustments.
9. Trouble shooting of Steering, suspension and braking system
10. Carry out removal and replacement activities of tyres and tubes of light & Heavy vehicle
11. Balance wheels and carry out final checks on the vehicle and record the information
12. Trouble shooting of wheel and tyres
13. Identify and check functionality of MPFI Components
14. Overhaul the Petrol Engine

15. Perform engine tune up
16. Identify and check functionality of various sensors installed in engine, Gauges and instruments on dashboard
17. Find the trouble in electronic circuit and rectify using scan tool
18. Diagnose and Troubleshoot Petrol Engines
19. Troubleshoot the Charging System
20. Troubleshoot the Starting System
21. Troubleshoot the Lighting circuit
22. Diagnose and Troubleshoot the AC system
23. Diagnose and Troubleshoot the electrical system accessories

NOTE: -

1. In addition to the above mentioned skills/ operations industry may impart training on any other skills/ operations related to the trade.
2. Assignment should be planned so that the trainees may spend 20% of the total time of production/service type of work (using gauges, instruments etc.) for developing their skill and confidence about manufacturing/servicing which will help ever in self-employment, if found necessary in the future.

BLOCK – III
DURATION: 3 months (13 weeks)
Institute level training

For last three months candidates will be engaged in following works: -

1. Revision of theoretical components covered during Block – I.
2. Practical practice and report submission
3. Preparing candidate to face interview, preparation of bio-data, awareness about different jobs in the related field and grooming to be an entrepreneur.
4. Self study and final AITT examination

Note:-

1. The training may be conducted in Block mode i.e. few months in ITI & few in Industry.
2. The training may be conducted in flexible mode i.e. few days of a week in ITI& few days in Industry.
3. Nine months industrial training is mandatory.
4. Last three months of training in ITI is mandatory.
5. No admission of trainees without signing MOU with industry by the Institute (ITI).
6. To sign MOU with ITI, industry must ensure that, training facility is available to impart all skill sets as indicated in Block-II. Industry should make arrangements to provide all the Skill set as in Block-II for MMV Diesel in the Industry either by itself or through its ancillary units or in association with some other Industries.
7. If the industry ensures delivery of skill training as per Sl. 6 then 2nd MOU is not necessary.
8. However, Industry should ensure 100% skill training indicated in Block-II & necessary arrangement to be made to cover training on rest skill set (beyond the % indicated in sl.6) in collaboration with any other related industries. Extensive use of E-learning process may also be adopted.

TRADE: Mechanic Motor Vehicle (Dual mode)

LIST OF TOOLS & EQUIPMENTS FOR 16 TRAINEES

A. TRAINEESTOOLKIT per 4 Trainees

Sl.No.	Item with specification	Qty (Nos.)
1.	Allen Key set of 12 pieces (2mm to 14mm)	5
2.	Caliper inside 15 cm Spring	6
3.	Calipers outside 15 cm spring	6
4.	Center Punch 10 mm. Dia. x 100 mm.	6
5.	Dividers 15 cm Spring	6
6.	Electrician Screw Driver 250mm	6
7.	Hammer ball peen 0.5 kg with handle	6
8.	Hands file 20 cm. Second cut flat	6
9.	Philips Screw Driver set of 5 pieces (100 mm to 300 mm)	6
10.	Pliers combination 20 cm.	6
11.	Screw driver 20cm.X 9mm. Blade	6
12.	Screw driver 30 cm. X 9 mm. Blade	6
13.	Scriber 15 cm	6
14.	Spanner D.E. set of 12 pieces (6mm to 32mm)	6
15.	Spanner, ring set of 12 metric sizes 6 to 32 mm.	6
16.	Spanners socket with speed handle, T-bar, ratchet and universal upto 32 mm set of 28 pieces with box	6
17.	Steel rule 30 cm inch and metric	6
18.	Steeltoolboxwithlockandkey(foldingtype) 400x200x150mm	6
19.	Wire cutter and stripper	6

B. Tools Instruments and General Shop outfits (at ITI)

Sl.No.	Itemwith specification	Qty. (Nos)
1.	AC alternator slip ring puller	1
2.	Adjustable spanner (pipe wrench 350 mm)	2
3.	Air blow gun with standard accessories	1
4.	Air impact wrench with standard accessories	4
5.	Air ratchet with standard accessories	4
6.	Allen Key set of 12 pieces (2mm to 14mm)	4
7.	Alternator assembly used for LMV	2
8.	Ammeter 300A/ 60A DC with external shunt	4
9.	Angle plate adjustable 250x150x175	1
10.	Angle plate size 200x100x200mm	2
11.	Anti theft device	1
12.	Anvil 50 Kgs with Stand	1
13.	Auto Electrical test bench	1
14.	Battery –charger	2
15.	Belt Tensioner gauge	1
16.	Blow Lamp 1 litre	2
17.	Caliper inside 15 cm Spring	4
18.	Calipers outside 15 cm spring	4
19.	Car Jet washer with standard accessories	1
20.	Carburetor – Solex, Mikuny for dismantling and assembling	1 each
21.	Carburetor repair tool kit	1

22.	Chain Pulley Block-3 ton capacity with tripod stand	1
23.	Chisel 10 cm flat	4
24.	Chisels cross cut 200 mm X 6mm	4
25.	Circlip pliers Expanding and contracting type 15cm and 20cm each	4
26.	Clamps C 100mm	2
27.	Clamps C 150mm	2
28.	Clamps C 200mm	2
29.	Cleaning tray 45x30 cm.	4
30.	Coil spring compressor for suspension spring	1
31.	Compression testing gauge suitable for diesel Engine with standard accessories	2
32.	Copper bit soldering iron 0.25 Kg	4
33.	Cut section models of shock absorbers	1
34.	Cut section of cross ply and radial tyres	1
35.	Cut section working model of automatic transmission Gear box	1
36.	Cut section working model of centrifugal clutch assembly.	1
37.	Cut section working model of Diaphragm clutch assembly.	1
38.	Cut section working model of Single plate clutch assembly.	1
39.	Cylinder bore gauge capacity 20 to 160 mm	4
40.	DC Ohmmeter 0 to 300 Ohms, mid scales at 20 Ohms	2
41.	Depth micrometer 0-25mm	4
42.	Dial gauge type 1 Gr. A (complete with clamping devices and with magnetic stand)	4
43.	Different type of Engine Bearing model	1 set
44.	Dividers 15 cm Spring	4
45.	Drift Punch Copper 15 Cm	4
46.	Drill point angle gauge	1
47.	Drill twist 1.5 mm to 15 mm (various sizes) by 0.5 mm	4
48.	Electric Soldering Iron 230 V 60 watts 230 V 25 watts	2 each
49.	Electric testing screw driver	4
50.	Engineer's square 15 cm. Blade	4
51.	Executive Auto Electrical tool kit	1
52.	Feeler gauge 20 blades (metric)	4
53.	File flat 20 cm bastard	4
54.	File, half round 20 cm second cut	4
55.	File, Square 20 cm second cut	4
56.	File, Square 30 cm round	4
57.	File, triangular 15 cm second cut	4
58.	Files assorted sizes and types including safe edge file (20 Nos)	2 set
59.	Flat File 25 cm second cut	4
60.	Flat File 35 cm bastard	4
61.	Fuel feed pump for diesel	1
62.	Garage stand	4
63.	Gloves for Welding (Leather and Asbestos)	5 sets
64.	Glow plug tester	2
65.	Granite surface plate 1600 x 1000 with stand and cover	1
66.	Grease Gun	2
67.	Grease Gun heavy duty trolley type 10 kg capciaty	1
68.	Growler	2
69.	Hacksaw frame adjustable 20-30 cm	10
70.	Hammer Ball Peen 0.75 Kg	4

71.	Hammer Chipping 0.25 Kg	5
72.	Hammer copper 1 Kg with handle	4
73.	Hammer Mallet	4
74.	Hammer Plastic	4
75.	Hand operated crimping tool (i) for crimping up to 4mm and (ii) for crimping up to 10mm	2
76.	Hand reamers adjustable 10.5 to 11.25 mm, 11.25 to 12.75 mm, 12.75 to 14.25 mm and 14.25 to 15.75 mm	1 sets
77.	Hand Shear Universal 250mm	2
78.	Hand vice – 37 mm	2
79.	Hollow Punch set of seven pieces 6mm to 15mm	2 sets each
80.	Horn and Horn relay	2
81.	Impact screw driver	2
82.	Injector – Multi hole type, Pintle type	4 each
83.	Injector cleaning unit	1
84.	Injector testing set (Hand tester)	1
85.	Insulated Screw driver 20 cm x 9mm blade	4
86.	Insulated Screw driver 30 cm x 9mm blade	4
87.	Left cut snips 250mm	4
88.	Lifting jack screw type 3 ton, 5ton & 20 Ton capacity	1 each
89.	Magneto spanner set with 8 spanners	1 set
90.	Magnifying glass 75mm	2
91.	Marking out table 90X60X90 cm.	1
92.	Multimeter digital	5
93.	Multi-point fuel injection pump	2
94.	Oil can 0.5/0.25 liter capacity	4
95.	Oil pump for dismantling and assembling.	2
96.	Oil Stone 15 cm x 5 cm x 2.5 cm	1
97.	Oscilloscope 20MHz	1
98.	Outside micrometer 0 to 25 mm	4
99.	Outside micrometer 25 to 50 mm	4
100.	Outside micrometer 50 to 75 mm	1
101.	Outside micrometer 75 to 100 mm	1
102.	Petrol nozzle	2
103.	Philips Screw Driver set of 5 pieces (100 mm to 300 mm)	2
104.	Pipe cutting tool	2
105.	Pipe flaring tool	2
106.	Piston ring compressor	2
107.	Piston Ring expander and remover.	2
108.	Piston Ring groove cleaner.	2
109.	Pliers combination 20 cm.	2
110.	Pliers flat nose 15 cm	2
111.	Pliers round nose 15 cm	2
112.	Pliers side cutting 15 cm	2
113.	Portable electric drill Machine	1
114.	Prick Punch 15 cm	4
115.	Punch Letter 4mm (Number)	2 set
116.	Right cut snips 250mm	2
117.	Rivet sets snap and Dolly combined 3mm, 4mm, 6mm	2
118.	Scraper flat 25 cm	2

119.	Scraper half round 25 cm	2
120.	Scraper Triangular 25 cm	2
121.	Scriber 15 cm	2
122.	Scriber with scribing black universal	2
123.	Set of stock and dies – Metric	2 sets
124.	Shear Tin Man's 450 mm x 600mm	2
125.	Sheet Metal Gauge	2
126.	Sher Tinmans 300mm	4
127.	Soldering Copper Hatchet type 500gms	2
128.	Solid Parallels in pairs (Different size) in Metric	2
129.	Spanner Clyburn 15 cm	1
130.	Spanner D.E. set of 12 pieces (6mm to 32mm)	4
131.	Spanner T. flocks for screwing up and up-screwing inaccessible	2
132.	Spanner, adjustable 15cm.	2
133.	Spanner, ring set of 12 metric sizes 6 to 32 mm.	4
134.	Spanners socket with speed handle, T-bar, ratchet and universal upto	2
135.	Spark lighter	2
136.	Spark plug spanner 14mm x 18mm x Size	2
137.	Starter motor axial type, pre-engagement type & Co-axial type	1each
138.	Steel measuring tape 10 meter in a case	4
139.	Steel rule 15 cm inch and metric	4
140.	Steel rule 30 cm inch and metric	4
141.	Straight edge gauge 2 ft.	2
142.	Straight edge gauge 4 ft.	2
143.	Stud extractor set of 3	2 sets
144.	Stud remover with socket handle	1
145.	Surface gauge with dial test indicator plunger type i.e. 0.01 mm	4
146.	Synchronous Gear box with stand for Dismantling and assembly.	1
147.	Tachometer (Counting type)	1
148.	Tandem master cylinder with booster	4
149	Taps and Dies complete sets BSF	1 set
150	Taps and wrenches - metric	2 sets
151	Telescope gauge	4
152	Temperature gauge with sensor 0-100 deg c	2
153	Tester sparking plug 'NEON' Type	1
154	Thermostat	2
155	Thread pitch gauge metric, BSW	2
156	Timing lighter	2
157	Toe-in, toe-out gauge	1set
158	Torque wrenches 5-35 Nm, 12-68 Nm & 50-225 Nm	1 each
159	Trammel 30 cm	2
160	Tread wear indicator	1
161	Tubed tyre of car, trucks & motorcycle	1
162	Tubeless tyre of cars & trucks	1
163	Tubeless tyre repair kit	
164	Tyre & split rim wheel assembly	1
165	Tyre pressure gauge with holding nipple	2
166	Universal puller for removing pulleys, bearings	1
167	V' Block 75 x 38 mm pair with Clamps	2
168	Vacuum gauge to read 0 to 760 mm of Hg.	2
169	Valve Lifter	1

170	Valve spring compressor universal.	1
171	vernier caliper 0-300 mm with least count 0.02mm	4
172	Vice grip pliers	2
173	Water pump for dismantling and assembling	4
174	Wheel cylinder	4
175	Wire Gauge (metric)	2
176	Work bench 250 x 120 x 60 cm with 4 vices 12cm Jaw	4
177	4 Point relays	2
178	5 Point relays	2

C. General Installation/Machineries at ITI

Sl.No.	Item with specification	Qty (Nos.)
1.	Air conditioned CRDI Vehicle in running condition -LMV	1
2.	Arbor press hand operated 2 ton capacity	1
3.	Automotive exhaust 5 gas analyzer (petrol & Diesel) or Diesel Smoke Meter	1
4.	Bench lever shears 250mm Blade x 3mm Capacity	1
5.	Drilling machine bench to drill up to 12mm dia along with accessories	1
6.	Grinding machine (general purpose) D.E. pedestal with 300 mm dia wheels rough and smooth	1
7.	Hydraulic jack HI-LIFT type -3 ton capacity, and 5 Ton capacity	1 each
8.	MPFI petrol engine with swiveling stand along with special tools for dismantling and assembling	1
9.	Pneumatic rivet gun with standard accessories	2
10.	Tin smiths bench folder 600 x 1.6mm	1
11.	Trolley type portable air compressor single cylinder with 45 liters capacity Air tank, along with accessories & with working pressure 6.5 kg/sq cm	1
12.	Working Condition of Diesel Engine – CRDI - 4 stroke Engine Assembly with fault simulation board	1
13.	Working Condition of Petrol MPFI Engine Assembly with fault simulation board	1

D. List of consumable:

Sl. No.	Description	Quantity
1.	Automatic Transmission oils	As required
2.	Battery- SMF	As required
3.	Brake fluids	As required
4.	Chalk, Prussian blue.	As required
5.	Chemical compound for fasteners	As required
6.	Diesel	As required
7.	Different type gasket material	As required
8.	Different type of oil seal	As required
9.	Drill Twist (assorted)	As required
10.	Emery paper - 36–60 grit , 80–120	As required
11.	Engine coolant	As required
12.	Engine oil	As required
13.	Gear oils	As required

14.	Gloves for Welding (Leather and Asbestos)	5 sets
15.	Hacksaw blade (consumable)	As required
16.	Hand rubber gloves tested for 5000 V	5 pair
17.	Holders, lamp teakwood boards, plug sockets, solders, flux wires and cables batteries round consumable blocks and other consumables as required	As required
18.	Hydrometer	4
19.	Lapping abrasives	As required
20.	Leather Apron	5
21.	Petrol	As required
22.	Power steering oil	As required
23.	Radiator Coolants	As required
24.	Safety goggles	As required
25.	Steel wire Brush 50mmx150mm	5

E. Workshop Furniture

Sl. No.	Description	Quantity
1.	Book shelf(glasspanel) 6½ ‘ x 3’ x 1½’	As required
2.	ComputerChair	1+1
3.	ComputerTable	1+1
4.	Desktopcomputerand relatedMSofficesoftware	1+1
5.	Discussion Table 8’ x 4’ x 2½ ‘	2
6.	FireExtinguishers,first-aidbox	As required
7.	Instructional Material – NIMI Books/Ref.books	As required
8.	Internet connection with all accessories	As required
9.	Laserprinter	1
10.	LCDprojector/LED/LCDTV(42”)	1
11.	Multimedia DVD for Automotive application/subjects	As required
12.	OnlineUPS2KVA	1
13.	Stools	21
14.	Storage Rack 6½ ‘ x 3’ x 1½’	As required
15.	Storage shelf 6½ ‘ x 3’ x 1½’	Asrequired.
16.	Suitable class room furniture	As required
17.	Suitable Work Tables with vices	As required
18.	Tool Cabinet - 6½ ‘ x 3’ x 1½’	2
19.	Traineeslocker 6½ ‘ x 3’ x 1½’	2Nos.toaccommodate20 Lockers

ALLOTMENT OF TIME &MARKS AMONG THE SUBJECTS FOR EXAMINATION

Sl. No.	SUBJECTS	Duration of exam (in Hrs.)	Full Marks	Pass Marks
1.	Trade Theory + E/S (150+50)	3	200	80
2.	Workshop Cal. & Sc.	3	50	20
3.	Engineering Drawing	4	50	20
4.	Internal Marks (ITI)	--	50	30
5.	Trade Practical –I*	4	50	30
6.	Internal Marks (Industry)	--	50	30
7.	Trade Practical-II** + Project work (200+50)	8	250	150
GRAND TOTAL			**700**	**360**

Note:-

1. "*" represents practical conducted at ITI
2. "**" represents practical conducted at Industry at the end of training
3. 40% pass marks for theory subjects and 60% pass marks for practical
4. The project work will be conducted at industry and industry will allot marks for the same.

Format for Internal Assessment

Name & Address of the Assessor :		**Year of Enrollment :**
Name & Address of ITI (Govt./Pvt.) :		**Date of Assessment :**
Name & Address of the Industry :		**Assessment location: Industry / ITI**
Trade Name :	**Block:**	**Duration of the Trade/course:**
Operation/Skill:		

Sl. No	**Maximum Marks (Total 100 Marks)**		**15** Safety consciousness	**5** Workplace hygiene	**10** Attendance/ Punctuality	**5** Ability to follow Manuals/ Written instructions	**10** Application of Knowledge	**10** Skills to handle tools & equipment	**5** Economical use of materials	**10** Speed in doing work	**15** Quality in workmanship	**15** VIVA	**Total internal assessment Marks**	**Result (Y/N)**
	Candidate Name	**Father's/Mother's Name**												
1														
2														

LIST OF TRADE COMMITTEE MEMBERS

Sl. No.	Name & Designation	Organization
1.	Shri.R.Senthil Kumar, Director	ATI, Chennai
2.	Shri S.Mathivanan, Joint Director of Training	ATI, Chennai
3.	Shri.M.Thamizharasan, Joint Director of Training	CSTARI, Kolkata
4.	Shri.K.Srinivasa Rao, Joint Director of Training	NIMI Chennai
5.	Shri.Amrit Pal Singh, Dy. Director of Trg.	DGT, New Delhi
6.	Shri.C.Yuvaraj, Deputy Director of Training	ATI, Chennai
7.	Shri.R.Rajesh Kanna, Training Officer	ATI, Chennai
8.	Shri D. Sankar, V.I.	CTI, Chennai
9.	Shri.K.K.Bhuvaneswaran, Manager	G.D.Naidu Technical Trg. Institute, Coimbatore
10.	Shri.S.Manohar, Training Officer	SRMU I.T.I., Coimbatore
11.	Shri.P.Thangapazham, AGM/HR/Trg	Daimler India Comm. Vehicle (P) Ltd., Chennai
12.	Shri.V.Krishnashankar, DGM	Ashok Leyland Chennai
13.	Shri.K.Aravind, Regional Manager	Bosch Ltd., Chennai
14.	Dr.K.Annamalai, Associate Professor	M.I.T., Anna University Chennai
15.	Shri.R.Durairaj, Associate Manager	Lanson Toyota, Chennai
16.	Shri.S.M.Abdul Gani, Instructor	Lanson Toyota, Chennai
17.	Shri.S.Muthuraman, Dealer Training Manager	Cars India, Ambattur, Chennai
18.	Shri.J.F.Vasanth Kumar, Head- Service	VSTGrandeur, Chennai