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

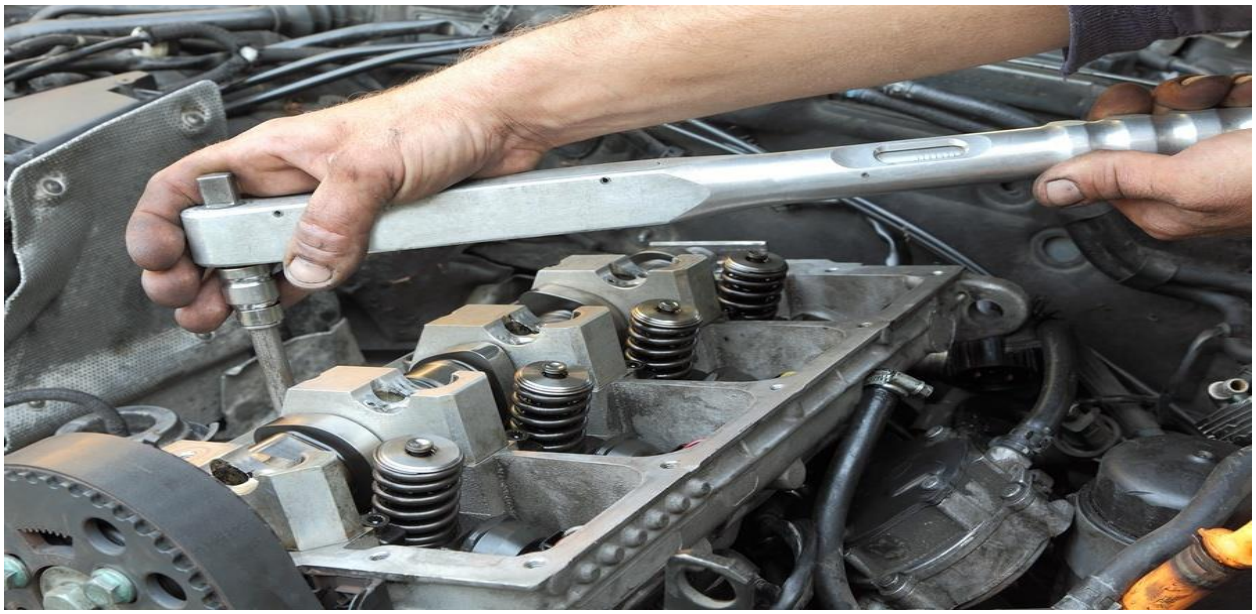
COMPETENCY BASED CURRICULUM

MECHANIC DIESEL

(Duration: One Year)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 3.5



SECTOR –AUTOMOTIVE

Directorate General of Training

MECHANIC DIESEL

(Engineering Trade)

(Revised in March 2023)

Version: 2.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL – 3.5

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

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1. COURSE INFORMATION

During the one-year duration of Mechanic Diesel trade a candidate is trained on professional skills & knowledge, and Employability skill related to job role. In addition to this a candidate is entrusted to undertake project work and extracurricular activities to build up confidence. The Broad components covered during the course are given below: -

The Trainees will cover the safety aspect in general and specific to the trade, identification of tools & equipment, raw materials used. The trainee will perform Measuring & marking by using various Measuring & Marking tools. The trainee will be able to plan and perform basic fastening and fitting operations. Familiarize with basics of electricity, test and measure the electrical parameter. Skilling practice on maintenance of batteries being done. Trace and identify various hydraulics and pneumatics components and identify components in Air and Hydraulic Brake system. Identify various types of vehicle.

The candidate will be able to perform practice on dismantling Diesel Engine of LMV as per given standard procedures. Able to achieve skill on Overhauling of Cylinder Head , valve train , Piston, connecting rod assembly, crankshaft, flywheel and mounting flanges, spigot and bearings, camshaft etc. practice reassembling all parts of engine in correct sequence as per workshop manual. Perform testing on engine. Also the trainee practice on repair and maintenance of Cooling, lubrication, Intake & Exhaust system of Engine. Perform maintenance of diesel fuel system, FIP, Governor and monitor emission of vehicle. Practice on repair, maintenance and overhaul of Starter, alternator and perform Execute troubleshooting in engine of LMV/HMV.

2. TRAINING SYSTEM

2.1 GENERAL

The Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers a range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under the aegis of Directorate General of Training (DGT). Craftsman Training Scheme (CTS) with variants and Apprenticeship Training Scheme (ATS) are two pioneer schemes of DGT for strengthening vocational training.

Mechanic Diesel trade under CTS is one of the popular courses delivered nationwide through a network of ITIs. The course is of one-year duration. It mainly consists of Domain area and Core area. The Domain area (Trade Theory & Practical) imparts professional skills and knowledge, while Core area (Employability Skills) imparts requisite core skill, knowledge and life skills. After passing out of the training programme, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

Candidates broadly need to demonstrate that they are able to:

- Read & interpret technical parameters/documentation, plan work, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional knowledge, core skills & employability skills while performing the job.
- Check the components as per workshop manual, identify and rectify errors and repair/replace components.
- Document the technical parameters related to the task undertaken.

2.2 PROGRESSION PATHWAYS

- Can join industry as Technician and will progress further as Senior Technician, Supervisor and can rise up to the level of Manager.
- Can become Entrepreneur in the related field.
- Can join Apprenticeship programme in different types of industries leading to National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.
- Can join Advanced Diploma (Vocational) courses under DGT as applicable.

2.3 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of one-year:

S No.	Course Element	Notional Training Hours
		1st Year
1	Professional Skill (Trade Practical)	840
2	Professional Knowledge (Trade Theory)	240
3	Employability Skills	120
	Total	**1200**

150 hours of mandatory OJT (On the Job Training) at nearby industry wherever not available then group project is mandatory.

4	On the Job Training (OJT)/ Group Project	150
5	Optional Courses (10th/ 12th class certificate along with ITI certification or add on short term courses)	240

Trainees of one-year or two-year trade can also opt for optional courses of up to 240 hours in each year for 10th/ 12th class certificate along with ITI certification, or, add on short term courses.

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through formative assessment and at the end of the training programme through summative assessment as notified by the DGT from time to time.

a) The **Continuous Assessment** (Internal) during the period of training will be done by **Formative Assessment Method** by testing for assessment criteria listed against learning outcomes. The training institute has to maintain an individual trainee portfolio as detailed in assessment guideline. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in

b) The final assessment will be in the form of summative assessment. The All India Trade Test for awarding NTC will be conducted by Controller of examinations, DGT as per the guidelines. The pattern and marking structure is being notified by DGT from time to time. **The learning outcome and assessment criteria will be the basis for setting question papers for final assessment. The examiner during final examination will also check** the individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

For the purposes of determining the overall result, weightage of 100% is applied for six months and one year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percent for Trade Practical and Formative assessment is 60% & for all other subjects is 33%.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking the assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising some of the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work
- Computer based multiple choice question examination
- Practical Examination

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming examination for audit and verification by examining body. The following marking pattern to be adopted for formative assessment:

Performance Level	Evidence

(a) Marks in the range of 60%-75% to be allotted during assessment	
For performance in this grade, the candidate should produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and due regard for safety procedures and practices	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. • 60-70% accuracy achieved while undertaking different work with those demanded by the component/job. • A fairly good level of neatness and consistency in the finish. • Occasional support in completing the project/job.
(b) Marks in the range of 75%-90% to be allotted during assessment	
For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and practices	• Good skill levels in the use of hand tools, machine tools and workshop equipment. • 70-80% accuracy achieved while undertaking different work with those demanded by the component/job. • A good level of neatness and consistency in the finish. • Little support in completing the project/job.
(c) Marks in the range of more than 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment. • Above 80% accuracy achieved while undertaking different work with those demanded by the component/job. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Mechanic, Diesel Engine; Oil Engine, Fitter repairs services and overhauls diesel or oil engines for efficient performance as prime mover to drive machinery and equipment. Examine engine to locate defects, using various tools and instruments. Dismantles or partly dismantles it to remove damaged or worn out parts and replaces or repairs them.

Grinds valve and assembles parts, doing supplementary tooling and other functions as necessary to ensure accuracy of fit. Installs assembled or repaired engine in position and connects pulley or wheel to propulsion system. Starts engine, tunes it up and observes performance noting different meter readings such as temperature, fuel level, oil pressure, etc. and sets it to specified standard for optimum performance. Checks, adjusts and lubricates engine periodically and performs such other functions to keep engine in good working order. May solder or braze parts and service diesel fuel pumps and injectors.

Additionally, since diesel engines are starting to incorporate electronic components, programs usually give students a chance to take courses in electrical systems and computer diagnostic software.

Plan and organize assigned work and detect & resolve issues during execution in his own work area within defined limit. Demonstrate possible solutions and agree tasks within the team. Communicate with required clarity and understand technical English. Sensitive to environment, self-learning and productivity.

Reference NCO-2015:

i) 7233.0400 –Mechanic, Diesel Engine

Reference NOS: --

i) CSC/N1435
ii) CSC/N9465
iii) ASC/N1404
iv) ASC/N1405
v) ASC/N1438
vi) CSC/N9401
vii) CSC/N9402
viii) ASC/N9403
ix) ASC/N9404
x) ASC/N9402
xi) ASC/N9406
xii) ASC/N9407
xiii) ASC/N9436
xiv) ASC/N9408
xv) ASC/N9409

4. GENERAL INFORMATION

Name of the Trade	**MECHANIC DIESEL**
NCO - 2015	7233.0400
NOS Covered	CSC/N9465, ASC/N1404, ASC/N1405, ASC/N1435, CSC/N9401, CSC/N9402, ASC/N9403, ASC/N9404, ASC/N9406, ASC/N9407, ASC/N9408, ASC/N9409, ASC/N9436, ASC/N9402, ASC/N1438
NSQF Level	Level-3.5
Duration of Craftsmen Training	One Years (1200 hours + 150 hours OJT/Group Project)
Entry Qualification	Passed 10th class examination with Science and Mathematics or with vocational subject in same sector or its equivalent.
Minimum Age	14 years as on first day of academic session.
Eligibility for PwD	LD, LC, DW, AA, LV, DEAF
Unit Strength (No. Of Student)	24 (There is no separate provision of supernumerary seats)
Space Norms	210 Sq. m (Including parking area)
Power Norms	4.8 KW
Instructors Qualification for	
1. Mechanic Diesel Trade	B.Voc/Degree in Automobile/ Mechanical Engg. (with specialization in Automobile) from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Automobile/ Mechanical (specialization in automobile) from AICTE/ recognized board of technical education with two years' experience in the relevant field. **OR** NTC/NAC passed in the trade of "**Mechanic Diesel"** with three years' experience in the relevant field. **Essential Qualification:** Relevant regular/RPL variants of National Craft Instructor Certificate (NCIC) under DGT. **Must possess valid LMV driving license.** ***NOTE: - Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However, both of them must possess NCIC in any of its variants.***
2. Workshop Calculation & Science	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field.

	OR 03 years Diploma in Engineering from AICTE / recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. OR NTC/ NAC in any one of the engineering trades with three years' experience. Essential Qualification: Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade OR Regular / RPL variants NCIC in RoDA or any of its variants under DGT
3. Engineering Drawing	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Engineering from AICTE / recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/ NAC in any one of the engineering/ Draughtsman group of trades with three years' experience. **Essential Qualification:** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade OR Regular/RPL variants NCIC in RoDA or any of its variants under DGT
4. Employability Skill	MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience **w**ith **short term ToT Course in** Employability Skills. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above) **OR** **Existing Social Studies Instructors in ITIs with short term ToT Course in** Employability Skills.
3. Minimum Age for Instructor	21 Years
List of Tools and Equipment	As per Annexure – I

5. LEARNING OUTCOME

Learning outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.

5.1 LEARNING OUTCOMES

1. Check & perform Measuring & marking by using various Measuring & Marking tools (Vernier Callipers, Micrometre, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.)Following safety precautions.(NOS: ASC/N1404)
2. Plan & perform basic fastening & fitting operation by using correct hand tools, Machine tools & equipment.(NOS: ASC/N1405)
3. Trace and Test all Electrical & Electronic components & circuits and assemble circuit to ensure functionality of system.(NOS: ASC/N1435)
4. Trace & Test Hydraulic and Pneumatic components.(NOS: CSC/N9465)
5. Check & Interpret Vehicle Specification data and VIN. Select & operate various Service Station equipment.(NOS: ASC/N1404)
6. Dismantling & Assembling of Diesel Engine (LMV/HMV) (NOS: ASC/N9403)
7. Overhauling and Testing of Diesel Engine.(NOS: ASC/N9404)
8. Tracing, testing and servicing/ overhauling of engine cooling and lubrication system.(NOS: ASC/N9408)
9. Tracing, testing and servicing of engine intake and exhaust system(NOS: ASC/N9406)
10. Overhauling and testing of fuel feed system (NOS: ASC/N9402)
11. Overhauling of stationary diesel engine (NOS: ASC/N9409)
12. Monitor emission of vehicle pollution.(NOS: ASC/N9407)
13. Overhauling of Alternator and Starter Motor.(NOS: ASC/N9436)
14. Diagnose & rectify the defects in LMV/HMV to ensure functionality of vehicle.(NOS: ASC/N1438)
15. Read and apply engineering drawing for different application in the field of work.(NOS: CSC/N9401)
16. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.(NOS: CSC/N9402)

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
1. 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. (NOS: ASC/N1404)	Plan the working principles of measuring instruments and special tools required for auto workshop.
	Select, care and use of measuring instrument.
	Set up the measured value with workshop manual and quality concepts and proper safety.
	Carry out decision on whether to replace or not.
2. Plan & perform basic fastening & fitting operation by using correct hand tools, Machine tools &equipments. (NOS: ASC/N1405)	Describe the purpose, use of auto hand tools.
	List the safety rules for hand tools.
	Select the correct tool for the job.
	Set up the tacked pieces in specific position.
	Joint components by Brazing, Soldering, Riveting as per given drawing.
	Produce components by different operation (Drilling, Reaming, Taping, Dieting)
3. Trace and Test all Electrical & Electronic components & circuits and assemble circuit to ensure functionality of system. Charge and test batteries used in vehicle.(NOS: ASC/N1435)	Plan and prepare as per procedure and safety methods of soldering the cable ends using an electric soldering iron.
	Use crimping tool to make a circuit joint.
	Explain the connection of an ammeter, voltmeter, and ohmmeter in a circuit trouble shooting.
	State open & short circuit, series and parallel circuits.
	Verify DC series & parallel circuits and its characteristics.
	Check out the open and short circuits in the lighting circuits.
	Verify ohm's law and measure resistance using rheostat.
	Check the voltage drop in the auto electrical system by using multimeter.
	Trace the auto electrical components by using vehicle wiring circuits.
	Check the condition of the solenoid switch in the starting system.
	Determine the forward to reverse resistance ratio of diodes and identify good / bad diodes.
	Perform battery charging and check

4. Trace & Test Hydraulic and Pneumatic components.(NOS: ASC/N9465)	Demonstrate Brake System (Hydraulic& Air).
	Demonstrate Hydraulic Power Steering.
5. Check & Interpret Vehicle Specification data and VIN. Select & operate various Service Station Equipments.(NOS: ASC/N1404)	Identify of different type of vehicle.
	Identify the different vehicle specification data and information
	Demonstrate the garage, service station different equipment
6. Dismantling & Assembling of Diesel Engine (LMV/HMV.) (NOS: ASC/N9403)	Demonstrate safe handling of lifting equipments.
	Identify the problems in the vehicle
	Perform the periodic testing of lifting equipments.
	Judge whether this Engine needs overhaul or not
	Perform dispose the used engine oil and safety measures in disposal.
	Perform on vehicle Engine Tests to analyze need of Overall
	Perform sequencing and identifying parts at the time of dismantle and assemble.
	Then Dismantle of Engine & Overhaul is ok, refer below attached screen shot for your reference
8. Overhauling and Testing of Diesel Engine (NOS: ASC/N9404)	Remove accessories fitted to the engine prior to engine removal.
	Align the left hook of the crane with engine lifting bracket.
	Remove the engine mountings
	Remove the engine from vehicle.
	Mount the engine on the vehicle.
	Align and fit the gear box to the engine.
	Refit the accessories to the engine.
	Set the Timing of the Engine
	Overhaul Valve Actuating Mechanism (Hydraulic latch actuator).
9. Tracing, Testing & Servicing/ Overhauling of Engine Cooling	Overhauling of Radiator/ Recovery tank water pump, oil pump, air cleaner

	Check the engine oil pressure at different r.p.ms.
	Overhaul the Oil Pump.
	Set Checking &Top up coolant, Draining & refilling coolant.
	Testing cooling system pressure & Thermostat
	Cleaning & reverse flushing. Overhauling water pump and refitting and repairs to oil flow pipe lines and unions if necessary.
	Check proper functioning of radiator fan (Mechanical/ Electrical / viscous / belt drive).
10. Tracing, Testing and Servicing of Engine Intake and Exhaust system (NOS: ASC/N9406)	Overhauling of manifolds, silencer and tail pipe, air compressor, air exhauster and inspect parts of air exhauster, turbo charger from vehicle.
	Overhauling of air filter, clean & refit air cooler, fuel filter assembly and replace filter elements
	Remove and replace EGR valve, Use Smoke meter to test emission from engine.
11. Overhauling and testing of Fuel feed System (NOS: ASC/N9402)	Overhauling fuel feed pump, fuel injector pump.
	Test injectors, check the injection timing by the spill cut off method
12. Overhauling of stationary Diesel Engine. (NOS: ASC/N9409)	Start engine, adjust idling speed.
	Overhaul the Governor (Mechanical & Pneumatic)
	Set the Engine Timing.
	Check performance of engine off load.
	Servicing of the cylinder and replace the defective parts.
13. Monitor emission of vehicle pollution (NOS: ASC/N9407)	Check vacuum pump for its functioning.
	Perform troubleshooting of EVAP Canister.
	Inspect PCV hose, inspect PCV Valve and check for vacuum.
	Clean the PCV valve and replace if required.
	Inspect & clean EGR.
14. Overhauling of Alternator and Starter Motor. (NOS: ASC/N9436)	Trace the circuit from the alternator to the battery.
	Perform servicing of starter motor.
	Perform servicing of alternator and test its performance.
	Check belt condition and replace as per requirement.

15. Diagnose & rectify the defects in LMV/HMV to ensure functionality of vehicle. (NOS: ASC/N1438)	Plan and diagnose the problem if engine not starting.
	Diagnose high fuel consumption and engine overheating.
	Diagnose for excessive oil consumption and low/high engine oil pressure.
	Diagnose for abnormal engine noise.
	Diagnose for engine's poor performance.
16. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: CSC/N9402)	Solve different mathematical problems
	Explain concept of basic science related to the field of study
17. Read and apply engineering drawing for different application in the field of work. (NOS: CSC/N9401)	Read & interpret the information on drawings and apply in executing practical work.
	Read &analyze the specification to ascertain the material requirement, tools and assembly/maintenance parameters.
	Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.

7. TRADE SYLLABUS

SYLLABUS FOR MECHANIC DIESELTRADE			
Duration: One Year			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
ProfessionalSkill142 Hrs; ProfessionalKnowledge34 Hrs	1. Check & perform Measuring & marking by using various Measuring& Marking tools (Vernier Calipers, 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. 2. Identify safety Gear/PPE(Personal Protective Equipments) and their uses 3. Importance of maintenance of safety equipment used in Workshop. 4. Demonstration on safe handling and Periodic testing of lifting equipment, and Safety disposal of used engine oil. 5. Demonstration on health hazards, occupational safety & first Aid. 6. Demonstration fire service station to provide demo on Fire safety. 7. Perform use of fire extinguishers. 8. Perform marking using all marking aids, like steel rule with spring callipers, dividers, scriber, punches, chisel etc. on MS Flat/Sheet Metal. 9. Measure a wheel base of a vehicle with measuring	- Importance & scope of Mechanic Diesel Trade Training. - General discipline in the Institute - Elementary First Aid, Occupational Safety & Health - KnowledgeofPersonalSafety& SafetyprecautionsinhandlingDieselmachine - ConceptaboutHouseKeeping& 5Smethod. - Safety disposal of Used engine oil, - Electrical safety tips**.** - Safe handling of Fuel Spillage, - Safe disposal of toxic dust, safe handling and Periodic testing of lifting equipment. **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

		tape. 10. Perform to remove wheel lug nuts with use of an air impact wrench 11. Operate General workshop tools & power tools	punch, number andletterpunch.Chisel-flat,cross-cut.Hammer-ballpein,lump,mallet.Screwdrivers-blade - Screwdriver, Phillips screw driver, Ratchet screwdriver. Allenkey, bench vice & C-clamps, - Spanners-ring spanner, open end spanner & the combination spanner, universal adjustable open ends spanner. Sockets & accessories, - Pliers - Combination pliers, multi grip, long nose, flat-nose, Nippers or pincer pliers, Side cutters, Tinsnips, Circlip pliers, external circlips pliers. - Air impact wrench, air ratchet, wrenches-Torque wrenches, pipe wrenches, Pipe flaring & cutting tool, pullers-Gear and bearing.
		12. Perform measuring practice on Cam height, Camshaft Journal dia, crankshaft journal dia, Valve stem dia, piston diameter, and piston pin dia with outside Micrometres. 13. Perform measuring practice on cylinder bore for taper and out-of-round with Dial bore gauges. 14. Perform measuring	**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

		practice to measure wear on crankshaft end play, crankshaft run out, and valve guide with dial indicator and magnetic stand 15. Perform measuring practice to check the flatness of the cylinder head is warped or twisted with straightedge is used with a feeler gauge. 16. Perform measuring practice to check the end gap of a piston ring, piston-to- cylinder wall clearance with feeler gauge. 17. Perform practice to check engine manifold vacuum with vacuum gauge. 18. Perform practice to check the air pressure inside the vehicle tyre is maintained at the recommended setting.	gauge, tire pressure gauge.
Professional Skill90 Hrs; Professional Knowledge; 17 Hrs	2. Plan & perform basic fastening & fitting operation by using correct hand tools, Machine tools & equipments.	19. Perform removal of stud/bolt using stud extractor 20. Perform practice on cutting tools like Hacksaw, file, chisel, Sharpening of Chisels, center punch, safety precautions while grinding. 21. Perform practice on Hacksawing and filing to given dimensions.	- Different types of metal joint (Permanent, Temporary), methods of, Soldering, etc. **Fasteners** - Study of different types of screws, nuts, studs & bolts, locking devices, Such as locknuts, cotter, split pins, keys, circlips, lockrings, lock washers and locating where the yare 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, 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, part sofa file, specification, Grade, shape, different type of cut and uses., OFF-hand grinding with sander, bench and pedestal grinders, safety precautions while grinding.
		22. Perform practice on Marking and Drilling clear and Blind Holes, Sharpening of Twist Drills Safety precautions to be observed while using a drilling machine. 23. Perform practice on Tapping a Clear and Blind Hole, Selection of tape drill Size, use of Lubrication, Use of stud extractor. 24. Perform practice cutting Threads on a Bolt/ Stud. Adjustment of two piece Die, Reaming a hole/ Bush to suit the given pin/ shaft,	**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 Dieand Diestock. Screw extractors. - **Hand Reamers** Different Type of hand reamers, Drill size for reaming, Lapping, Lapping abrasives, type of

		scraping a given machined surface.	Laps.
Professional Skill92Hrs; Professional Knowledge; 14 Hrs	3. Trace and Test all Electrical & Electronic components & circuits and assemble circuit to ensure functionality of system.	25. Perform practice in joining wires using soldering Iron. 26. Prepare simple electrical circuits, measuring of current, voltage and resistance using digital multimeter. 27. Perform practice continuity test for fuses, relay and diodes	**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
		28. Check circuit using of service manual wiring diagram for trouble shooting	- Fuses & circuit breakers, - Ballast resistor, - Stripping wire insulation, - Cable colour codesand sizes, Resistors in Series circuits, - Parallel circuits and Series-parallel circuits
		29. Execute cleaning and topping up of a lead acid battery. 30. Perform testing battery with hydrometer. 31. Perform connecting battery to a charger for battery charging and checking & testing a battery after charging. 32. Perform test of relay and solenoids and its circuit.	- 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.
Professional	4. Trace & Test	33. Identify of Hydraulic and	**Introduction to Hydraulics**

Skill35 Hrs; Professional Knowledge; 9 Hrs	Hydraulic and Pneumatic components.	pneumatic components used in vehicle. 34. Tracing of hydraulic circuit on hydraulic jack, hydraulic, and Brake circuit. 35. Identify components in Air brake systems	**&Pneumatics** - Description, symbols and application in automobile of Gear pump-Internal & External, single acting, double acting & Double ended cylinder; Directional control, Pressure relief valve, Non return valve, Flow control valve used in automobile.
Professional Skill25Hrs; Professional Knowledge; 5 Hrs	5. Check & Interpret VehicleSpecification dataandVIN.Select& operatevariousServiceStationEquipments.	36. Identify of different types of Vehicle. 37. Demonstrate of vehicle specification data. 38. Identify of vehicle information Number (VIN). 39. Demonstrate of Garage, Service station equipments.- Vehicle hoists-Two post and four post hoist, Engine hoists, Jacks**,** Stands**.**	- 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 trans mission, body and load. Brief description - Uses of Vehicle hoists–Two post and four post hoist, Engine hoists, Jacks, Stands.
Professional Skill50Hrs; Professional Knowledge; 8 Hrs	6. Dismantling & Assembling of Diesel Engine (LMV/HMV)	40. Identify the different parts of IC Engine. 41. Identify the different parts in a diesel engine of LMV/ HMV 42. Perform practice on starting and stopping of diesel engines. Observe and report the reading of Tachometer, Odometer, temp and Fuel gauge under ideal and onload condition. 43. Practice on dismantling Diesel engine of LMV/HMV as per 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, - 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.
Professional Skill;160Hrs; Professional Knowledge; 25Hrs	7. Overhauling and Testing of Diesel Engine.	44. Perform Over hauling of cylinder head assembly, Use of service manual for 45. Clearance and other parameters. 46. Perform practice on removing rocker arm assembly manifolds. 47. Perform practice on removing the valves and its parts from the cylinder head, cleaning. 48. Inspection of cylinder head and manifold surfaces for warping, cracks and flatness. Checking valve seats & valve guide– Replacing the valve if necessary. 49. Check leaks of valve seats	**Diesel Engine Components:** - Description and Constructional feature of Cylinder head, Importance of Cylinder head design, - Type of Diesel combustion chambers, - Effect on size of Intake & exhaust passages, Head gaskets. - Importance of Turbulence. 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,

		for leakage–Dismantle rocker shaft assembly- clean & check rocker shaft- and levers, for wear and cracks and reassemble. 50. Check valve springs, tappets, pushrods, 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.	- 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.
		51. Perform Overhauling piston and connecting rod assembly. Use of service manual for clearance and other parameters. 52. Perform Practice on removing oil sump and oil pump – clean the sump. 53. Perform removing the big end bearing, connecting rod with the piston. 54. 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. 55. Measure -the piston ring close gap in the cylinder, clearance between the	- Description & functions of different types of pistons, piston rings and piston pins and materials. - Used recommended clearances for the rings and its necessity precautions while fitting rings, common troubles and remedy. - Compression ratio. - Description & function of connecting rod, - importance of big- end split obliquely - Materials used for connecting rods big end & main bearings. Shells piston pins and locking methods of piston pins.

		piston and the liner, clearance between crank pin and the connecting rod big end bearing. 56. Check connecting rod for bend and twist. Assemble the piston and connecting rod assembly.	
		57. Perform Over hauling of crankshaft, Use of service manual for clearance and other parameters 58. Perform removing damper pulley, timing gear/timing chain, fly wheel, main bearing caps, bearing shells and crank shaft from engine 59. Inspect oil retainer and thrust surfaces for wear. 60. Measure crank shaft journal for wear, taper and ovality. 61. Demonstrate crank shaft for fillet radii, bend & twist.	- Description and function of Crank shaft, camshaft, - Engine bearings-classification and location – materials used & composition of bearing materials- Shell bearing and their advantages- special bearings material for diesel engine - Application bearing failure & its causes-care & maintenance. - Crank-shaft balancing, firing order of the engine.
		62. Inspect fly wheel and mounting flanges, spigot and bearing. 63. Check vibration ampe for defect. 64. Perform removing camshaft from engine block, Check for bend & twist of camshaft. Inspection of camlobe, camshaft journals and bearings and measure cam	- 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.

		lobe lift. 65. Fixing bearing insert sin cylinder block & cap checknip and spread clearance & oil holes &locatinglugsfixcrankshaft onblock-torquebolts-checkendplayremoveshaft-checkseating, repeat similarly for connecting rod and Check seating and refit.	
		66. Perform cleaning and checking of cylinder blocks. 67. Surface for any crack, flatness measure cylinder rbore for taper & ovality, clean oil gllery passage and oil pipe line. 68. Perform reassembling all parts of engine in correct sequence and torque all bolts and nuts as per work shop manual of the engine. 69. Perform testing cylinder compression**,** Check idle speed**.** 70. Perform removing & replacing a cam belt**,** and adjusting an engine drivebelt**,** replacing an engine drivebelt.	- Description of Cylinder block, - Cylinder block construction, - Different type of Cylinder sleeves (liner).
Professional Skill50Hrs; Professional Knowledge; 10 Hrs	8. Tracing, testing and servicing/ overhauling of engine cooling and lubrication system	71. Perform practice on checking & top up coolant, draining & refilling coolant, checking / replacing a coolant hose. 72. Perform test cooling	**Need for Cooling systems** - Heat transfer method, - Boiling point & pressure, - Centrifugal force, - Vehicle coolant properties and recommended change of

		system pressure. 73. Execute on removing & replacing radiator/ thermostat check the radiator pressure cap. 74. Test of thermostat. 75. Perform cleaning &reverse flushing. 76. Perform overhauling water pump and refitting. 77. Perform checking engine oil, draining engine oil, replacing oil filter, & refilling engine oil 78. 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.	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.
Professional Skill 26Hrs; Professional Knowledge 06 Hrs	9. Tracing, testing and servicing of engine intake and exhaust system	79. Execute dismantling air compressor and exhauster and cleaning all parts - measuring wear in the cylinder, reassembling all parts and fitting the min the engine.	**Intake & exhaust systems**– - Description of Diesel induction & Exhaust systems. Description & function of air compressor, exhauster, Super charger, Intercoolers, turbo charger, variable turbo

		80. Executed is mantling & assembling of turbocharger, check for axial clearance as per service manual. 81. Examine exhaustt system for rubber mounting for damage, deterioration and out of position; for leakage, loose connection, dent and damage; 82. Perform practice on exhaust manifold removal and installation, practice on Catalytic converter removal and installation.	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.
Professional Skill 70Hrs; Professional Knowledge 12Hrs	10. Overhauling and testing of fuel feed system	83. Perform work on removing & cleaning fuel tanks, checking leaks in the fuel lines. 84. Execute over hauling of Feed Pumps (Mechanical & Electrical). 85. Perform bleeding of air from the fuel lines, servicing primary & secondary filters. 86. 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. 87. Execute over hauling of injectors and testing of injector.	**Fuel Feed System in IC Engine (Petrol & Diesel)** - Gravity feed system, Forced feed system, main parts, Fuel Pumps- Mechanical & Electrical - Feed Pumps. - Knowledge about function, working &types of Carburetor. **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,

		88. General maintenance of Fuel Injection Pumps (FIP).	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.
Professional Skill 25 Hrs; Professional Knowledge 05Hrs	11. Overhauling of stationary diesel engine.	89. Execute Start engine adjust idling speed and damping device in pneumatic governor and venture control unit checking. 90. Verify performance of engine with offload adjusting timings. Start engine-adjusting idle speed of the engine fitted with mechanical governor checking-high speed operation of the engine. 91. Check performance for missing cylinder by isolating defective injectors and test-dismantle and replaced effective parts and reassemble and refit back to the engine.	**Marine & Stationary Engine Types:-** - Double acting engines, - opposed piston engines, starting systems, cooling systems, lubricating systems, supplying fuel oil, hydraulic coupling, - Reduction gear drive, electromagnetic coupling, - Electrical drive, generators and motors, supercharging.

Professional Skill 25 Hrs; Professional Knowledge 05Hrs	12. Monitor emission of vehicle pollution.	92. Monitor emissions procedures by use of Engine gas analyseror Diesel smoke meter. 93. Checking & cleaning Positive crank casventilation (PCV) valve**.** Obtaining & interpreting scan tool data. Inspection of EVAP canister purges system by use of scan Tool. 94. EGR/SCRV alve Remove and installation for inspection.	**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
Professional Skill 25 Hrs; Professional Knowledge 05 Hrs	13. Overhauling of Alternator and Starter Motor.	95. Perform removing alternator from vehicle dismantling, cleaning checking for defects, assembling and testing for motoring action of alternator & fitting to vehicles. 96. Practice on removing starter motor Vehicle and overhauling the starter motor, testing of starter motor	- 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.
Professional Skill 25 Hrs; Professional Knowledge 05 Hrs	14. Diagnose & rectify the defects in LMV/HMV to ensure functionality of vehicle.	97. 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.	- 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.
ENGINEERING DRAWING:(40 Hrs.)			
Professional Knowledge ED- 40 Hrs.	15. Read and apply engineering drawing for different application in the field of work.	**ENGINEERING DRAWING:** **Introduction to Engineering Drawing and Drawing Instruments** • Conventions • Sizes and layout of drawing sheets • Title Block, its position and content • Drawing Instrument **2. Lines- Types and applications in drawing** Free hand drawing of – • Geometrical figures and blocks with dimension • Transferring measurement from the given object to the free hand sketches. • Free hand drawing of hand tools and measuring tools. **3. Drawing of Geometrical figures:** • Angle, Triangle, Circle, Rectangle, Square, Parallelogram. • Lettering & Numbering – Single Stroke. **4. Dimensioning** • Types of arrowhead • Leader line with text • Position of dimensioning (Unidirectional, Aligned) **5. Symbolic representation** – • Different symbols used in the related trades of Mechanic Auto Body Repair / Electrical and Electronics / Diesel / Tractor / Two and Three-wheeler. **6. Concept and reading of Drawing in** • Concept of axes plane and quadrant • Concept of Orthographic and Isometric projections	

		• Method of first angle and third angle projections (definition and difference) **7. Reading of Job drawing related to** Mechanic Auto Body Repair / Electrical and Electronics / Diesel / Tractor / Two and Three-wheeler trades.
WORKSHOP CALCULATION & SCIENCE: (40 Hrs)		
Professional Knowledge WCS- 40 Hrs.	16. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	**<u>WORKSHOP CALCULATION & SCIENCE</u>** **Unit, Fractions** Classification of unit system Fundamental and Derived units F.P.S, C.G.S, M.K.S and SI units Measurement units and conversion Factors, HCF, LCM and problems Fractions - Addition, substraction, multiplication & division Decimal fractions - Addition, subtraction, multiplication& division Solving problems by using calculator **Square root, Ratio and Proportions, Percentage** Square and square root Simple problems using calculator Applications of Pythagoras theorem and related problems Ratio and proportion Ratio and proportion - Direct and indirect proportions Percentage Percentage - Changing percentage to decimal and fraction **Material Science** Types metals, types of ferrous and non ferrous metals Physical and mechanical properties of metals Introduction of iron and cast iron Difference between iron & steel, alloy steel and carbon steel Properties and uses of rubber, timber and insulating materials **Mass, Weight, Volume and Density** Mass, volume, density, weight and specific gravity, **numerical related to L,C,O section only** Related problems for mass, volume, density, weight and specific gravity **Speed and Velocity, Work, Power and Energy** Speed and velocity - Rest, motion, speed, velocity, difference between speed and velocity, acceleration and retardation Speed and velocity - Related problems on speed & velocity Work, power, energy, HP, IHP, BHP and efficiency **Heat & Temperature and Pressure** Concept of heat and temperature, effects of heat, difference between heat and temperature, boiling point &melting point of different metals and non-metals

		Concept of pressure - Units of pressure, atmospheric pressure, absolute pressure, gauge pressure and gauges used for measuring pressure **Basic Electricity** Introduction and uses of electricity, electric current AC,DC their comparison, voltage, resistance and their units Conductor, insulator, types of connections - series and parallel Ohm's law, relation between V.I.R & related problems **Mensuration** Area and perimeter of square, rectangle and parallelogram Surface area and volume of solids - cube, cuboid, cylinder, sphere and hollow cylinder Finding the lateral surface area, total surface area and capacity in litres of hexagonal, conical and cylindrical shaped vessels **Levers and Simple machines** Simple machines - Effort and load, mechanical advantage, velocity ratio, efficiency of machine, relationship between efficiency, velocity ratio and mechanical advantage Lever & Simple machines - Lever and its types **Trigonometry** Measurement of angles Trigonometrical ratios Trigonometrical tables
In-plant training/Project work viz. a) Overhauling of Pressure Lubrication system b) Maintenance of cooling system. c) Overhauling of FIP. d) Cleaning & Testing of Injectors. e) Overhauling of Alternator f) Overhauling of Starter Motor g) Study on Diagnosis Tool/Scanner Tool for ECU of CRDI engine		

SYLLABUS FORCORE SKILLS
1. Employability Skills (Common for all CTS trades) (120 Hrs.)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for a group of trades, provided separately inwww.bharatskills.gov.in/dgt.gov.in

ANNEXURE-I

LIST OF TOOLS AND EQUIPMENT			
MECHANIC DIESEL(For the Batch of 24Candidates)			
S. No.	**Name of the Tool & Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT			
1.	Allen Key set of 12 pieces	2mm to 14mm	6+1Nos.
2.	Calliper inside with spring	15 cm	6+1Nos.
3.	Callipers outside with spring	15 cm	6+1Nos.
4.	Center Punch.	10 mm. Dia. x 100 mm	6+1Nos.
5.	Dividers with spring	15 cm	6+1Nos.
6.	Electrician Screw Driver	250mm	6+1Nos.
7.	Hammer ball peen with handle	0.5 kg	6+1Nos.
8.	Hands file for Second cut flat	20 cm.	6+1Nos.
9.	Philips Screw Driver set of 5 pieces	100 mm to 300 mm	6+1Nos.
10.	Pliers combination	20 cm.	6+1Nos.
11.	Screw driver Blade	20cm. x 9mm.	6+1Nos.
12.	Screw driver Blade	30 cm. x 9 mm.	6+1Nos.
13.	Scriber	15 cm	6+1Nos.
14.	Spanner D.E. set of 12 pieces	6mm to 32mm	6+1Nos.
15.	Spanner, ring set of 12	6 to 32 mm. (metric)	6+1Nos.
16.	Spanners socket with speed handle, T-bar, ratchet and universal set of 28 pieces with box	up to 32 mm	6+1Nos.
17.	Steel rule	30 cm inch and metric	6+1Nos.
18.	Steel tool box with lock and key (folding type)	400x200x150 mm	6+1Nos.
19.	Wire cutter and stripper		6+1Nos.
B. INSTRUMENTS AND GENERAL SHOP OUTFIT - For 2 (1+1) units no additional items are required			
TOOLS & EQUIPMENT			
20.	Adjustable spanner (pipe wrench)	350 mm	2 Nos.
21.	Air blow gun with standard accessories		1 No.
22.	Ammeter DC with external shunt	300A/ 60A	4 Nos.
23.	Air ratchet with standard accessories		4 Nos.
24.	Air impact wrench with standard accessories		4 Nos.
25.	Angle plate adjustable	250x150x175mm	1 No.
26.	Angle plate size	200x100x200mm	2 Nos.
27.	Anvil with Stand	50 Kgs	1 No.
28.	Auto Electrical test bench		1 No.
29.	Battery –charger	5 meters flexible in case	2 Nos.
30.	Blow Lamp	1 litre	2 Nos.
31.	Belt Tensioner gauge		1 No.

32.	Calliper inside with Spring	15 cm	4 Nos.
33.	Callipers outside with spring	15 cm	4 Nos.
34.	Car Jet washer with standard accessories		1 No.
35.	Chain Pulley Block capacity with tripod stand	3 ton	1 No.
36.	Chisel flat	10 cm	4 Nos.
37.	Chisels cross cut	200 mm x 6mm	4 Nos.
38.	Circlip pliers Expanding and contracting	15cm and 20cm	4 each
39.	Clamps C	100mm	2 Nos.
40.	Clamps C	150mm	2 Nos.
41.	Clamps C	200mm	2 Nos.
42.	Cleaning tray	45x30 cm.	4 Nos.
43.	Compression testing gauge suitable for diesel Engine with standard accessories		2 Nos.
44.	Connecting rod alignment fixture		1 No.
45.	Copper bit soldering iron	0.25 Kg	4Nos.
46.	Cylinder bore gauge capacity	20 to 160 mm	4 Nos.
47.	Cylinder liner- Dry & wet liner, press fit &slidefit liner		1 Each
48.	DC Ohmmeter	0 to 300 Ohms	2 Nos.
49.	Depth micrometer	0-25mm	4 Nos.
50.	Dial gauge type 1 Gr. A (complete with clamping devices and with magnetic stand)		4 Nos.
51.	Different type of Engine Bearing model		1 set
52.	Different type of piston model		1 set
53.	Dividers with Spring	15 cm	4 Nos.
54.	Drift Punch Copper	15 Cm	4 Nos.
55.	Drill point angle gauge		1 No.
56.	Drill twist (various sizes)	1.5 mm to 15 mm by 0.5mm	4 Nos.
57.	Electric Soldering Iron	230 V, 60 watts 230 V, 25 watts	2 Each
58.	Electric testing screw driver		4 Nos.
59.	Engineer's square	Blade size 15 cm	4 Nos.
60.	Engineers stethoscope		1 No.
61.	Feeler gauge 20 blades (metric)		4 Nos.
62.	File flat , bastard	20 cm	4 Nos.
63.	File, half round ,second cut	20 cm	4 Nos.
64.	File, Square second cut	20 cm	4 Nos.
65.	File, Square round	30 cm	4 Nos.
66.	File, triangular , second cut	15 cm	4 Nos.
67.	Files assorted sizes and types including safe		2Each

	edge file (20 Nos)		
68.	Flat File , second cut	25 cm	4 Nos.
69.	Flat File , bastard	35 cm	4 Nos.
70.	Fuel feed pump for Diesel		1 No.
71.	Fuel injection pump (Diesel) inline		1 No.
72.	Fuel injection pump dismantling tool kit /Universal Vice		1 No.
73.	Fuel injection pump VE pump / Distributor fuel rotary pump (DPC) pumps / along with special tools and accessories		1 Each
74.	Glow plug tester		2 Nos.
75.	Granite surface plate with stand and cover	1600 x 1000mm	1 No.
76.	Grease Gun		2 Nos.
77.	Grease Gun heavy duty trolley type	10 kg capacity	1 No.
78.	Growler		2 Nos.
79.	Hacksaw frame	Adjustable 20-30 cm	12 Nos.
80.	Hammer Ball Peen	0.75 Kg	4 Nos.
81.	Hammer Chipping	0.25 Kg	5 Nos.
82.	Hammer copper with handle	1 Kg	4 Nos.
83.	Hammer Mallet		4 Nos.
84.	Hammer Plastic		4 Nos.
85.	Hand operated crimping tool	(i) up to 4mm (ii) up to 10mm	2 Each
86.	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	2 Set
87.	Hand Shear Universal	250mm	2 Nos.
88.	Hand vice	Up to 37 mm	2 Nos.
89.	Hollow Punch set of seven pieces	6mm to 15mm	2Set
90.	Injector – Multi hole type, Pintle type		4 each
91.	Injector cleaning unit		1 No.
92.	Injector testing set (Hand tester)		1 No.
93.	Insulated Screw driver	20 cm x 9mm blade	4 Nos.
94.	Insulated Screw driver	30 cm x 9mm blade	4 Nos.
95.	Left cut snips	250mm	4 Nos.
96.	Lifting jack screw	3 Ton, 5Ton & 20 Ton	1 Each
97.	Magneto spanner set with 8 spanners		1Set
98.	Magnifying glass	75mm	2 Nos.
99.	Marking out table	90 x 60 x 90 cm.	1 No.
100.	Multimeter digital	DC 200mv - 500 V,0 – 10A & AC 200mv- 500V , 0-10A, resistance 0-20 MΩ and 3	5 Nos.

		1/2 digit	
101.	Oil can	0.5/0.25 liter capacity	4 Nos.
102.	Oil pump for dismantling and assembling.		2 Nos.
103.	Oil Stone	15 cm x 5 cm x 2.5 cm	1 No.
104.	Oscilloscope	20MHz	2 Nos.
105.	Outside micrometer	0 to 25 mm	2 Nos.
106.	Outside micrometer	25 to 50 mm	2 Nos.
107.	Outside micrometer	50 to 75 mm	1 No.
108.	Outside micrometer	75 to 100 mm	1 No.
109.	Philips Screw Driver set of 5 pieces	100 mm to 300 mm	2 Nos.
110.	Pipe cutting tool		2 Nos.
111.	Pipe flaring tool		2 Nos.
112.	Piston ring compressor		2 Nos.
113.	Piston Ring expander and remover.		2 Nos.
114.	Piston Ring groove cleaner.		1 No.
115.	Pliers combination	20 cm.	2 Nos.
116.	Pliers flat nose	15 cm	2 Nos.
117.	Pliers round nose	15 cm	2 Nos.
118.	Pliers side cutting	15 cm	2 Nos.
119.	Portable electric drill Machine	15 mm drill bit capacity	1 No.
120.	Prick Punch	15 cm	4 Nos.
121.	Punch Letter 4mm (Number)		2 Sets
122.	Radiator cut section-cross flow		1 No.
123.	Radiator cut section-down flow		1 No.
124.	Radiator pressure cap		2 Nos.
125.	Right cut snips	250mm	2 Nos.
126.	Rivet sets snap and Dolly combined	3mm, 4mm, 6mm	2 Nos.
127.	Scraper flat	25 cm	2 Nos.
128.	Scraper half round	25 cm	2 Nos.
129.	Scraper Triangular	25 cm	2 Nos.
130.	Scriber	15 cm	2 Nos.
131.	Scriber with scribing black universal		2 Nos.
132.	Set of stock and dies -Metric		2Sets
133.	Tinnman's Shear	450 mm x 600mm	2 Nos.
134.	Sheet Metal Gauge		2 Nos.
135.	Tinnman'sShear	300mm	4 Nos.
136.	Soldering Copper	Hatchet type 500gms	2 Nos.
137.	Solid Parallels in pairs (Different size) in Metric		2 Nos.
138.	Spanner Clyburn	15 cm	1 No.
139.	Spanner D.E. set of 12 pieces	6mm to 32mm	4 Nos.
140.	Spanner T. flocks for screwing up and up-		2 Nos.

	screwing inaccessible		
141.	Spanner, adjustable	15cm	2 Nos.
142.	Spanner, ring set of 12 metric sizes	6 to 32 mm.	4 Nos.
143.	Spanners socket with speed handle, T-bar, ratchet and universal		2 Nos.
144.	Spark lighter		2 Nos.
145.	Spark plug spanner 14mm x 18mm x Size		2 Nos.
146.	Starter motor axial type, pre-engagement type & Co-axial type		1Each
147.	Steel measuring tape in a case	10 meter	4 Nos.
148.	Steel rule 15 cm inch and metric		4 Nos.
149.	Steel rule 30 cm inch and metric		4 Nos.
150.	Straight edge gauge 2 ft.		2 Nos.
151.	Straight edge gauge 4 ft.		2 Nos.
152.	Stud extractor set of 3		2Sets
153.	Stud remover with socket handle		1 No.
154.	Surface gauge with dial test indicator plunger type	0.01 mm	4 Nos.
155.	Tachometer (Counting type)		1 No.
156.	Tandem master cylinder with booster		4 Nos.
157.	Taps and Dies complete sets (5 types)		1Set
158.	Taps and wrenches - Metric		2Sets
159.	Telescope gauge		4 Nos.
160.	Temperature gauge with sensor	0-100 ^{0}C	2 Nos.
161.	Thermostat		2 Nos.
162.	Thread pitch gauge Metric		2 Nos.
163.	Timing lighter		2 Nos.
164.	Torque wrenches	5-35 Nm, 12-68 Nm & 50-225 Nm	1Each
165.	Trammel	30 cm	2 Nos.
166.	Turbocharger cut sectional view		1 No.
167.	Tyre pressure gauge with holding nipple		2 Nos.
168.	Universal puller for removing pulleys, bearings		1 No.
169.	V' Block 75 x 38 mm pair with Clamps		2 Nos.
170.	Vacuum gauge	0 to 760 mm of Hg.	2 Nos.
171.	Valve Lifter		1 No.
172.	Valve spring compressor universal		1 No.
173.	Vernier calliper	0-300 mm with least count 0.02mm	4 Nos.
174.	Vice grip pliers		2 Nos.
175.	Water pump for dismantling and		4 Nos.

	assembling		
176.	Wire Gauge (metric)		2 Nos.
177.	Work bench	250 x 120 x 60 cm with 4 vices 12cm Jaw	4 Nos.
GENERAL SHOP OUTFIT			
178.	Air conditioned CRDI Vehicle in running condition -LMV		1 No.
179.	Arbor press hand operated 2 ton capacity		1 No.
180.	Automotive Diesel Smokemeter (for Diesel engine)		1 No.
181.	Bench lever shears	250mm Blade x 3mm	1 No.
182.	Diesel Engine – CRDI - 4 stroke	Dismantling and assembling with Swivelling stand	1No.
183.	Diesel engine (Running condition) Stationary type		1 No.
184.	Discrete Component Trainer / Basic Electronics Trainer		1 No.
185.	Drilling machine bench to drill up to 12mm dia along with accessories		1 No.
186.	Dual Magnetization Yoke	AC / HWDC, 230 VAC, 50Hz	01 Set
187.	Grinding machine (general purpose) D.E. pedestal with 300 mm dia. wheels rough and smooth		1 No.
188.	Heavy Commercial vehicle type (without body on frame)		1 No.
189.	Hydraulic jack HI-LIFT type -3 ton capacity, and 5 Ton capacity		1Each
190.	Liquid penetrate Inspection kit		1Set
191.	Multi Scan Tool with oscilloscope		1 No.
192.	Pipe Bending Machine (Hydraulic type)	12mm to 30mm	1 No.
193.	Pneumatic rivet gun with standard accessories		2 Nos.
194.	Spring tension tester		1 No.
195.	Tin smiths bench folder	600 x 1.6mm	1 No.
196.	Trolley type portable air	compressor single cylinder with 45 litres capacity Air tank, along with accessories & with working pressure 6.5 kg/sq. cm	1 No.
197.	Working Condition of Diesel Engine – CRDI		1 No.

	- 4 stroke Engine, Assembly with fault simulation board		
198.	Cut section of 4/6 cylinder diesel engine with moving condition to show momentum of internal parts		1 No.
199.	Fuel injection test bench for calibration of fuel pump		1 No.
200.	Electrical test bench		1 No.
201.	Diesel Engine six Cylinder in running condition		1 No.
CONSUMABLE			
202.	Battery- SMF		As required
203.	Brake fluids		As required
204.	Chalk, Prussian blue		As required
205.	Chemical compound for fasteners		As required
206.	Diesel		As required
207.	Different type gasket material		As required
208.	Different type of oil seal		As required
209.	Drill Twist (assorted)		As required
210.	Emery paper - 36–60 grit , 80–120		As required
211.	Engine oil & Engine coolant		As required
212.	Gear oils		As required
213.	Hacksaw blade (consumable)		As required
214.	Hand rubber gloves tested for 5000 V		5 Pairs
215.	Holders, lamp teakwood boards, plug sockets,		As required
216.	Hydrometer		8 Nos.
217.	Lapping abrasives		As required
218.	Leather apron		5 Nos.
219.	Petrol		As required
220.	Power steering oil		As required
221.	Radiator Coolants		As required
222.	Safety glasses		As required
223.	Steel wire Brush 50mmx150mm		5 Nos.
CLASS ROOM FURNITURE FOR TRADE THEORY			
224.	Instructor's table and Chair (Steel)		1 Set
225.	Students chairs with writing pads		24 Nos.
226.	White board size 1200mm X 900 mm		1 No.
227.	Instructors lap top with latest(vista & above) configuration pre-loaded with operating system. and MS Office package.		1 No.
228.	LCD projector with screen		1 No.

229.	Lockers with drawers		1 for Each Trainee

NOTE:

1. *No additional items are required to be provided for unit or batch working in the Second shift except the items under trainee's tool kit and steel lockers.*
2. Internet facility is desired to be provided in the class room.

ANNEXURE-II

The DGT sincerely acknowledges contributions of the Industries, State Directorates, Trade Experts, Domain Experts, trainers of ITIs, NSTIs, faculties from universities and all others who contributed in revising the curriculum. Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

List of Expert members contributed/ participated for finalizing the course curriculum of Mechanic Diesel trade held on 16.05.17 at Govt. ITI- Aundh, Pune			
S No.	**Name & Designation Shri/Mr./Ms.**	**Organization**	**Remarks**
Industry Experts			
1.	Dr. K C Vora Sr. Dy. Director & Head Arai Academy	The Automotive Research Association Of India. S.No.102, Vetal Hill, Off Paud Road, Kothrud, Pune	Chairman
2.	Jayanta Patra Sr. Manager	Micromatic Machine Tools (P) Ltd. 240/241,11th Main , 3rd Phase, Peenya Industrial Area, Bangalore.	Member
3.	Kashinath M. Patnasetty Head - Application Support Group	Ace Designers Ltd. Plot No. 7&8, Ii Phase Peenya Industrial Area, Bangalore	Member
4.	Suyog Fulbadave, Executive HR	Piaggio Vehicles Pvt. Ltd, Pune	Member
5.	Sunil Khodke Training Manager	Bobst India Pvt Ltd Pirangut, Mulashi, Pune	Member
6.	Lokesh Kumar Manager Training Academy	Volkswagen India Pvt Ltd Pune	Member
7.	Shriram Tatyaba Khaire Executive Engineering.	Sulzer India Pvt Ltd. Kondhapuri, Shirur, Pune	Member
8.	Milind P Desai Sr. Shift Engineer	Atlas Copco (I) Ltd Dapodi, Pune	Member
9.	Shrikant Mujumdar DGM	John Deere India Pvt Ltd. Pune - Nagar Road, Sanaswadi, Pune	Member
10.	Milind Sanghai Team Manager	Alfa Laval India Ltd. Dapodi, Pune.	Member
11.	Rajesh Menon Unit Manager	Alfa Laval India Ltd. Dapodi, Pune.	Member
12.	N K A Madhubalan DGM - QC, QA & SMPS	Sandvik Asia Pvt. Ltd. Dapodi, Pune.	Member
13.	Irkar Balaji, Sr. Engineer Mfg.	Premium Transmission Ltd. Chinchwad, Pune.	Member

14.	Rajendra Shelke Sr. Engineer Mfg.	Premium Transmission Ltd. Chinchwad, Pune - 19	Member
15.	Bhagirath Kulkarni Manager Maintenance	Tata Ficosa Auto Sys Ltd Hinjawadi, Pune	Member
16.	Rohan More Hr& Admin	Tata Ficosa Auto Sys Ltd Hinjawadi, Pune	Member
17.	G. Venkateshwaran	Cummins India Ltd	Member
18.	Mahesh Dhokale Engineer	Tata Toyo Radiator Ltd	Member
19.	Pankaj Gupta DGM- HR & IR	Tata Toyo Radiator Ltd	Member
20.	S K Joshi Head - Business Development.	Radheya Machining Ltd Pune- Nagar Road, Sanaswadi, Pune.	Member
21.	A L Kulkarni DGM Mfg.	Pmt Machines Ltd Pimpri, Pune	Member
22.	S V Karkhanis DGM Planning	Pmt Machines Ltd Pimpri, Pune	Member
23.	Kiran Shirsath Asso. Manager M.E.	Burckhardt Compressioni Pvt Ltd, Ranjangaon, Pune	Member
24.	Ajay Dhuri Manager	Tata Motors Ltd Pimpri, Pune	Member
25.	Arnold Martin	Godrej & Boyce Mfg Co Ltd, Mumbai	Member
26.	Ravindra L. More	Mahindra CIE Automotive Ind. Ltd. Ursc-Pune	Member
27.	Kushagra P. Patel	NRB Bearings Ltd., Chiklthana Aurongabad	Member
28.	M. M. Kulkarni	NRB Bearings Ltd., Chiklthana Aurongabad	Member
DGT & Training Institute			
29.	Nirmalya Nath Asst. Director of Trg.	CSTARI, Kolkata	Member cum Co-coordinator
30.	Akhilesh Pandey	ATI, Mumbai	Expert
31.	Amar Prabhu, Principal	Don Bosco, Mumbai	Expert
32.	Indranil Mukherjee, Instructor	ITI, Tollygaunj	Expert

ABBREVIATIONS

CTS	Craftsmen Training Scheme
ATS	Apprenticeship Training Scheme
CITS	Craft Instructor Training Scheme
DGT	Directorate General of Training
MSDE	Ministry of Skill Development and Entrepreneurship
NTC	National Trade Certificate
NAC	National Apprenticeship Certificate
NCIC	National Craft Instructor Certificate
LD	Locomotor Disability
CP	Cerebral Palsy
MD	Multiple Disabilities
LV	Low Vision
HH	Hard of Hearing
ID	Intellectual Disabilities
LC	Leprosy Cured
SLD	Specific Learning Disabilities
DW	Dwarfism
MI	Mental Illness
AA	Acid Attack
PwD	Person with disabilities


कौशलं बलम्