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

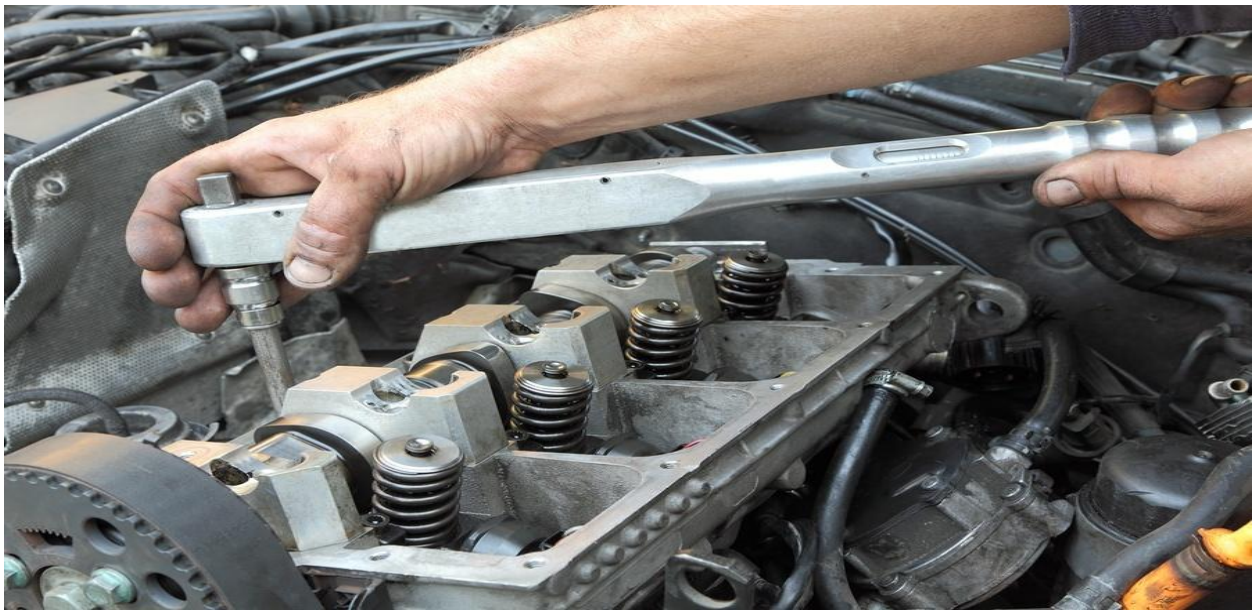
COMPETENCY BASED CURRICULUM

MECHANIC DIESEL

(Duration: One Year)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL: 3.5



SECTOR – AUTOMOTIVE

CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE

Kolkata-700091

MECHANIC DIESEL

(Engineering Trade)

(Revised in August 2025)

Version: 3.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL: 3.5

Developed By

CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE

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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 roles. 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 vehicles.

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 Mechanic Diesel 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
1.	Professional Skill (Trade Practical)	840
2.	Professional Knowledge (Trade Theory)	240
3.	Employability Skills	120
Total		**1200**
On the Job Training (OJT)/ Group Project *		150
Optional Courses**		240
Grand Total		**1590**

** The trainee has to undergo 150 hours of mandatory OJT (On the Job Training) at nearby industry or wherever industry not available then group project has to be done with the supervision of the trade instructor for every year.*

*** Trainees of one-year or two-year trade can also opt for optional courses of up to 240 hours in each year for obtaining 10th/ 12th class certificate from NIOS along with ITI certification, or, short term courses for extra skills/knowledge.*

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his/ her 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.cstaricalcutta.gov.in or 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 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 percentage 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 Occupational Safety, Health and Environment (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:

Marks Allotted During Assessment	Performance Level	Evidence
Marks between 60% to 75%	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 0achieved 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.
Marks above 75% to 90%	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.
Marks Above 90%	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) ASC/N9566
ii) CSC/N9590
iii) ASC/N9565
iv) ASC/N9569
v) ASC/N9567
vi) ASC/N9403
vii) ASC/N9404
viii) ASC/N9408
ix) ASC/N9406
x) ASC/N9402
xi) ASC/N9409
xii) ASC/N9407
xiii) ASC/N9436
xiv) ASC/N9568
xv) CSC/N9401
xvi) CSC/N9402

4. GENERAL INFORMATION

Name of the Trade	**MECHANIC DIESEL**
Trade Code	DGT/1006
NCO - 2015	7233.0400
NOS Covered	ASC/N9566, CSC/N9590, ASC/N9565, ASC/N9569, ASC/N9567, ASC/N9403, ASC/N9404, ASC/N9408, ASC/N9406, ASC/N9402, ASC/N9409, ASC/N9407, ASC/N9436, ASC/N9568, CSC/N9401, CSC/N9402
NSQF Level	Level: 3.5
Duration of the Trade	One Year
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 Engineering from AICTE/UGC recognized Engineering College/ university with **one-year of teaching or industry experience** in Automobile/ Mechanical Engineering field.. **OR** 03 years Diploma in Automobile/ Mechanical Engineering from AICTE recognized board of technical education with **two years' of teaching or industry experience** in Automobile/ Mechanical Engineering field **OR** NTC/NAC passed in the trade of "Mechanic Diesel" with **three years' of teaching or industry experience** in Automobile/ Transportation/ Construction/ Marine field. **Essential Qualification:** Regular/RPL variants of National Craft Instructor Certificate (NCIC)

	in Automobile trade under DGT. **Must Possess valid HMV 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.*
2. Workshop Calculation & Science	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with **one-year of teaching or industry experience.** **OR** 03 years Diploma in Engineering from AICTE / recognized board of technical education with **two years' of teaching or industry experience.** **OR** NTC/ NAC in any one of the engineering trades with **three years' of teaching or industry experience.** **Essential Qualification:** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade **OR** Regular / RPL variants NCIC in any one of the engineering trades or RoDA.
3. Engineering Drawing	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with **one-year of teaching or industry experience.** **OR** 03 years Diploma in Engineering from AICTE / recognized board of technical education with **two years' of teaching or industry experience.** **OR** NTC/ NAC in any one of the engineering/ Draughtsman group of trades with **three years' of teaching or industry experience.** **Essential Qualification:** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in any one of the engineering trades or RoDA.
4. Employability Skill	MBA/ BBA / Any Graduate/ Diploma in any discipline with **Two years' of teaching or industry experience** with short term ToT Course in Employability Skills conducted by DGT institutions. (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 conducted by DGT institutions.
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

Sl. No.	NOS CODE	Learning Outcome	Duration		
			Practical	Theory	Total
1.	ASC/N9566	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, V-block, surface plate usage) following safety precautions.	142	53	195
2.	CSC/N9590	Plan & perform basic fastening & fitting operation by using correct hand/power tools, Machine tools & equipment.	90	15	105
3.	ASC/N9565	Trace and Test all Electrical & Electronic components & circuits and assemble circuit to ensure functionality of system.	92	13	105
4.	ASC/N9569	Trace & Test Hydraulic and Pneumatic components.	35	10	45
5.	ASC/N9567	Check & Interpret Vehicle Specification data and VIN. Select & operate various Service Station equipment and use of diagnostic tool.	25	05	30
6.	ASC/N9403	Dismantling & Assembling of Diesel Engine (LMV/HMV)	160	20	180
7.	ASC/N9404	Overhauling and testing of diesel engine.	50	10	60
8.	ASC/N9408	Tracing, testing and servicing/ overhauling of engine cooling and lubrication system & fuel system.	50	10	60
9.	ASC/N9406	Tracing, testing and servicing of engine intake and exhaust system.	26	04	30
10.	ASC/N9402	Overhauling and testing of fuel feed system.	70	20	90
11.	ASC/N9409	Overhauling of stationary diesel engine	25	05	30
12.	ASC/N9407	Monitor Vehicle emission as per standard.	25	05	30
13.	ASC/N9436	Overhauling of Alternator and Starter Motor.	25	05	30
14.	ASC/N9568	Diagnose & rectify the defects in Diesel engine.	25	05	30
15.	CSC/N9401	Read and apply engineering drawing for different application in the field of work.		30	30
16.	CSC/N9402	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.		30	30

	Employability Skills		120	120
	Grand Total	**840**	**360**	**1200**

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
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, V-block, surface plate usage) Following safety precautions. (NOS: ASC/N9566)	• 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. • Role of V-block. • Role of surface plate.
2. Plan & perform basic fastening & fitting operation by using correct hand/power tools, Machine tools & equipment's. (NOS: CSC/N9590)	• 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. (NOS: ASC/N9565)	• 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 • Usage of hydrometer for battery specific gravity
4. Trace & test hydraulic and pneumatic components. (NOS: ASC/N9569)	• Demonstrate Brake System (Hydraulic). • Demonstrate Electrical assisted Power Steering.
5. Check & interpret vehicle specification data and VIN. Select & operate various service station equipment and use of diagnostic tool. (NOS: ASC/N9567)	• 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 equipment's. • Identify the problems in the vehicle. • Perform the periodic testing of lifting equipment's. • Judge whether this Engine needs overhaul or not. • Perform dispose the used engine oil and safety measures in disposal ISO standard. • Perform on vehicle Engine Tests to analyze need of Overall • Perform sequencing and identifying parts at the time of dismantle and assemble. • Dismantle of Engine & Overhaul is ok, refer below attached screen shot for your reference.
7. 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).
8. Tracing, testing & servicing/ overhauling of engine cooling and lubrication system & fuel system (NOS: ASC/N9408)	• 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).
9. 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.
10. 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
11. 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.

12. Monitor Vehicle emission as per standard. (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. • Purpose of BS6-Ad-blue. • Role of DPF.
13. 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. • Role of rectifier & its function.
14. Diagnose & rectify the defects in diesel engine. (NOS: ASC/N9568)	• 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. • Plan and diagnose the problem if engine not starting.
15. 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
16. 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.

SYLLABUS FOR MECHANIC DIESEL TRADE			
Duration: One Year			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Professional Skill 142 Hrs.; Professional Knowledge 53 Hrs.	1. Check & perform Measuring & marking by using various Measuring & Marking tools (Vernier Calipers, Micrometre, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, V-block, surface plate usage) following safety precautions.	1. Demonstration of Machinery used in the trade. 2. Identify safety Gear/PPE (Personal Protective Equipment) and their uses 3. Importance of 5S and ten principles of workmanship, waste segregations 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 calipers, dividers, scriber, punches, chisel etc. on MS Flat/Sheet Metal. 9. Measure a wheel base of a vehicle with measuring tape. 10. Remove wheel lug nuts with use of an air impact	- Importance & scope of Mechanic Diesel Trade Training. - General discipline in the Institute - Elementary First Aid, Occupational Safety & Health - Knowledge of Personal Safety & Safety precautions in handling Diesel machine - Concept about Housekeeping & 5S method. - 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. Calipers-inside and outside. Dividers, surface gauges, scriber, - Punches-prick punch, centre punch, pin punch, hollow punch, number and letter

		wrench 11. Operate General workshop tools & power tools	punch. 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. Cam lift measurement 13. Perform measuring practice on Camshaft Journal dia, crankshaft journal dia, Valve stem dia, piston diameter, and piston pin dia with outside Micrometres. 14. Perform measuring practice on cylinder bore for taper and ovality with Dial bore gauges. 15. Perform measuring practice to measure wear on crankshaft end play,	**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 Caliper. - Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge. - Measuring wrappage of

		crankshaft run out, and valve guide with dial indicator and magnetic stand 16. Inspect Cylinder block, cylinder head, manifold for warpage with straightedge is used with a feeler gauge. 17. Perform measuring practice to check the end gap groove clearance of a piston ring, piston-to-cylinder wall clearance with feeler gauge. 18. Perform practice to check engine manifold vacuum with vacuum gauge.	Intake & Exhaust side of the cylinder head. - Measuring a Piston ring side gap. • Role of V-block & its holding method. • Role of plastigauge measuring.
Professional Skill 90 Hrs.; Professional Knowledge 15 Hrs.	2. Plan & perform basic fastening & fitting operation by using correct hand/power tools, Machine tools & equipment.	19. Perform removal of stud/bolt using stud extractor 20. Perform practice of valve measurement, spring diameter, valve clearance 21. Perform practice on cutting tools like Hacksaw, file, chisel, Sharpening of Chisels, center punch, safety precautions while grinding. 22. Perform practice on Hacksawing and filing to given dimensions. 23. Perform practice on Marking and Drilling clear and Blind Holes, Sharpening of Twist Drills Safety precautions to be observed while using a	- 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 they are used. Washers & chemical compounds can be used to help secure these fasteners. Function of **Gaskets,** Selection of materials for gaskets and packing, **oil seals. Types of Gaskets** – paper, multilayered metallic, liquid, rubber, copper and printed. - Thread Sealants-Various

		drilling machine. 24. Perform practice on Tapping a Clear and Blind Hole, Selection of tape drill Size, use of Lubrication, Use of stud extractor. 25. Perform practice 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.	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. **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 Diestock. Screw extractors. **Hand Reamers** - Different Type of hand reamers, Drill size for reaming, Lapping, Lapping abrasives, type of Laps.
Professional Skill 92 Hrs.; Professional Knowledge 13 Hrs.	3. Trace and test all electrical & electronic components & circuits and assemble circuit to ensure	26. Perform practice in joining wires using soldering Iron. 27. Prepare simple electrical circuits, measuring of current, voltage and resistance using digital multimeter.	**Basic electricity** - Electricity principles, - Ground connections, - Ohm's law, - Voltage, Current, Resistance, Power, Energy. - Voltmeter, ammeter,

	functionality of system.	28. Perform practice continuity test for fuses, relay and diodes	Ohmmeter, Multimeter, - Conductors & insulators, Wires, Shielding, Length vs. resistance, Resistor ratings
		29. Check circuit using of service manual wiring diagram for trouble shooting	- Fuses & circuit breakers, - Ballast resistor, - Stripping wire insulation, - Cable color codes and sizes, Resistors in Series circuits, - Parallel circuits and Series-parallel circuits
		30. Execute cleaning and topping up of a lead acid battery. 31. Perform testing battery with hydrometer and refractometer. 32. Perform connecting battery to a charger for battery charging and checking & testing a battery after charging. 33. Perform test of relay and solenoids and its circuit.	- Description of Chemical effects, Batteries & cells, Lead acid batteries & Stay Maintenance Free (SMF) batteries, Use of refractometer - 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 Skill 35 Hrs.; Professional Knowledge 10 Hrs.	4. Trace & test hydraulic and pneumatic components.	34. Identify of Hydraulic and pneumatic components used in vehicle. 35. Tracing of hydraulic circuit on hydraulic jack.	**Introduction to Hydraulics & Pneumatics** - Introduction to Pascal's law 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 Skill 25 Hrs.; Professional Knowledge 05 Hrs.	5. Check & interpret vehicle specification data and VIN. Select & operate various service station equipment and use of diagnostic tool.	36. Identify different types of engines. 37. Demonstrate engine specification data. 38. Practice using workshop equipment's. Service station equipment. - Vehicle hoists -Two post and four post hoists, 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 hoists, Engine hoists, Jacks, Stands.
Professional Skill 50 Hrs.; Professional Knowledge 10 Hrs.	6. Dismantling & assembling of diesel engine (LMV/HMV).	39. Identify the different parts of Diesel Engine. 40. 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. 41. 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 160 Hrs.; Professional Knowledge 20 Hrs.	7. Overhauling and testing of diesel engine.	42. Perform Over hauling of cylinder head assembly, Use of service manual for 43. Clearance and other parameters. 44. Perform practice on removing rocker arm assembly manifolds. 45. Perform practice on removing the valves and its parts from the cylinder head. 46. Inspection of cylinder head and manifold surfaces for warping, cracks and flatness. Checking valve seats & valve guide– Replacing the valve if necessary. 47. Check leaks of valve seats for leakage–Dismantle rocker shaft assembly- clean & check rocker shaft- and levers, for wear and cracks and reassemble. 48. Check valve springs, tappets, pushrods, tappet screws and valve stem cap.	- Criteria for Engine overhauling **Diesel Engine Components:** - Descriptionand 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 - importance of Valve rotation, Valve stem oil seals, size of Intake valves, Valve trains, Valve- timing diagram, concept of Variable valve timing.

		Reassembling valve parts in sequence, refit cylinder head and manifold & rocker arm assembly, adjust valve clearances, starting engine after adjustments. 49. Perform Overhauling piston and connecting rod assembly. Use of service manual for clearance and other parameters. 50. Perform Practice on removing oil sump and oil pump – clean the sump. 51. Perform removing the big end bearing, connecting rod with the piston. 52. 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. 53. Measure -the piston ring close gap in the cylinder, clearance between the piston and the liner, clearance between crank pin and the connecting rod big end bearing. 54. Check connecting rod for bend and twist. Assemble the piston and connecting rod assembly.	- Description of Camshafts & drives - Description of Overhead camshaft (SOHC and DOHC), importance of Cam lobes, Timing belts & chains, Timing belts &tensioners. - Valve lead, valve lag & Overlap - Study different type of cylinder head mounting bolt - 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. - 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

		55. Perform Over hauling of crankshaft, Use of service manual for oil clearance with plastigauge and other parameters 56. Perform removing damper pulley, timing gear/timing chain, fly wheel, main bearing caps, bearing shells and crank shaft from engine 57. Inspect oil retainer and thrust surfaces for wear. 58. Measure crank shaft journal for wear, taper and ovality. 59. Demonstrate crank shaft for fillet radii, bend & twist. 60. Perform crankshaft static balancing. 61. Inspect fly wheel and mounting flanges, spigot and bearing. 62. Check vibration damper for defect. 63. Perform removing camshaft from engine block, Check for bend & twist of camshaft. Inspection of Cam lobe, camshaft journals and bearings and measure cam lobe lift. 64. Fixing bearing insert sin cylinder block & cap check nip and spread clearance & oil holes & locating lugs fix	engine - Application bearing failure & its causes-care & maintenance. - Crank-shaft balancing, firing order of the engine. - 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. - Description of Cylinder block, - Cylinder block construction, - Different type of Cylinder sleeves (liner).

		crankshaft on block-torque bolts-check end play removes shaft-check seating, repeat similarly for connecting rod and Check seating and refit. 65. Perform cleaning and checking of cylinder blocks. 66. Surface for any crack, flatness measure cylinder bore for taper & ovality, clean oil gallery passage and oil pipe line. 67. Perform reassembling all parts of engine in correct sequence and torque all bolts and nuts as per work shop manual of the engine. 68. Perform testing cylinder compression**,** Check idle speed**.** 69. Perform removing & replacing a cam belt**,** and adjusting an engine drivebelt**,** replacing an engine drivebelt.	
Professional Skill 50 Hrs.; Professional Knowledge 10 Hrs.	8. Tracing, testing and servicing/ overhauling of engine cooling and lubrication system & fuel system	70. Perform practice on checking & top up coolant, draining & refilling coolant, checking / replacing a coolant hose. 71. Test cooling system pressure. 72. Execute on removing & replacing radiator/ thermostat check the radiator pressure cap. 73. Test of thermostat.	**Need for Cooling systems** - Heat transfer method, - Boiling point & pressure, - Centrifugal force, - Vehicle coolant properties and recommended change of interval, - Different type of cooling systems, **Basic cooling system components** - Radiator, Coolant hoses, -

		74. Perform cleaning &reverse flushing. 75. Perform overhauling water pump and refitting. 76. Perform checking engine oil, draining engine oil, replacing oil filter, & refilling engine oil 77. 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.	- Water pump, - Cooling system thermostat, Cooling fans, - Temperature indicators, - Radiator pressure cap, Recovery system, Thermo-switch. - Usage of refractometer. **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 26 Hrs.; Professional Knowledge 04 Hrs.	9. Tracing, testing and servicing of engine intake and exhaust system	78. Execute dismantling air compressor and exhauster and cleaning all parts - measuring wear in the cylinder, reassembling all parts and fitting in the engine. 79. Execute disassembly & assembling of turbocharger, check for axial clearance as per service manual.	**Intake & exhaust systems** – - Description of Diesel induction & Exhaust systems. Description & function of air compressor, exhauster, Super charger, Intercoolers, turbo charger, variable turbo charger mechanism. **Intake system components-** - Description and function of Air cleaners, Different type air cleaner, Description of

		80. Examine exhaust system for rubber mounting for damage, deterioration and out of position; for leakage, loose connection, dent and damage; 81. Perform practice on exhaust manifold removal and installation, practice on Catalytic converter removal and installation.	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. - 3-way catalytic & 2-way catalytic difference.
Professional Skill 70 Hrs.; Professional Knowledge 20 Hrs.	10. Overhauling and testing of fuel feed system.	82. Perform work on removing & cleaning fuel tanks, checking leaks in the fuel lines. 83. Execute over hauling of Feed Pumps (Mechanical & Electrical). 84. Perform bleeding of air from the fuel lines, servicing primary & secondary filters. 85. 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. 86. Execute over hauling of injectors and testing of injector. 87. General maintenance of Fuel Injection Pumps (FIP).	**Fuel Feed System in Diesel engine** - Gravity feed system, Forced feed system, main parts, Fuel Pumps- Mechanical & Electrical - Feed Pumps. **Diesel Fuel Systems** - Description and function of Diesel fuel injection, fuel characteristics, concept of Quiet diesel technology & Clean diesel technology. - Bio-diesel, flexi fuel, alternative fuel. **Diesel fuel system components** - Description and function of Diesel tanks & lines, Diesel fuel filters, water separator, Lift pump, Plunger pump, Priming pump, - Inline injection pump, Distributor-type injection pump, Diesel injectors and its types with multiphase

			injection technologies, 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) - Piezo electric injector - used in Diesel Engines.
Professional Skill 25 Hrs.; Professional Knowledge 05 Hrs.	11. Overhauling of stationary diesel engine.	88. Start engine, adjust idling speed and damping device. 89. 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. 90. 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 05 Hrs.	12. Monitor vehicle emission as per standard.	91. Monitor emissions procedures by use of Engine gas analyzer or Diesel smoke meter. 92. EGR/SCR Valve Remove and installation for	**Emission Control: - Vehicle emissions** - Standards- Euro and Bharat II, III, IV, V Sources of BS-VI basic knowledge. - Emission, Combustion,

		inspection.	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, 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.	93. Perform removing alternator from engine dismantling, cleaning checking for defects, assembling and testing for motoring action of alternator & fitting to engine. 94. Practice on removing starter motor Engine 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. - Basic knowledge of DC to AC & AC to DC conversion in Engine
Professional	14. Diagnose &	95. Execute troubleshooting in	- Troubleshooting:

Skill 25 Hrs.; Professional Knowledge 05 Hrs.	rectify the defects in diesel engine.	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. 96. Energy losses	- 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			
Professional Knowledge ED- 30 Hrs.	15. Read and apply engineering drawing for different application in the field of work.	**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 arrow head • 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		
Professional Knowledge WCS- 30 Hrs.	16. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	**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, subtraction, 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 FOR CORE SKILLS
1. Employability Skills (Common for all CTS trades) (120 Hrs.)

Learning outcomes, assessment criteria, syllabus and Tool List of Employability Skills is provided separately in www.cstaricalcutta.gov.in / www.bharatskills.gov.in / www.dgt.gov.in.

LIST OF TOOLS AND EQUIPMENT			
MECHANIC DIESEL (For the Batch of 24 Candidates)			
S. No.	**Name of the Tool & Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT			
1.	Allen Key set of 12 pieces	2mm to 14mm	6+1 Nos.
2.	Caliper inside with spring	15 cm	6+1 Nos.
3.	Calipers outside with spring	15 cm	6+1 Nos.
4.	Center Punch.	10 mm. Dia. x 100 mm	6+1 Nos.
5.	Dividers with spring	15 cm	6+1 Nos.
6.	Electrician Screw Driver	250mm	6+1 Nos.
7.	Hammer ball peen with handle	0.5 kg	6+1 Nos.
8.	Hands file for Second cut flat	20 cm.	6+1 Nos.
9.	Star Head Screw Driver set of 5 pieces	100 mm to 300 mm	6+1 Nos.
10.	Pliers' combination	20 cm.	6+1 Nos.
11.	Screw driver Blade	20cm. x 9mm.	6+1 Nos.
12.	Screw driver Blade	30 cm. x 9 mm.	6+1 Nos.
13.	Scriber	15 cm	6+1 Nos.
14.	Spanner D.E. set of 12 pieces	6mm to 32mm	6+1 Nos.
15.	Spanner, ring set of 12	6 to 32 mm. (metric)	6+1 Nos.
16.	Spanners socket with speed handle, T-bar, ratchet and universal set of 28 pieces with box	up to 32 mm	6+1 Nos.
17.	Steel rule	30 cm inch and metric	6+1 Nos.
18.	Steel tool box with lock and key (folding type)	400x200x150 mm	6+1 Nos.
19.	Wire cutter and stripper		6+1 Nos.
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.	Ammeter DC with external shunt	300A/ 60A	4 Nos.
22.	Air ratchet with standard accessories		4 Nos.
23.	Air impact wrench with standard accessories		4 Nos.
24.	Angle plate adjustable	250x150x175mm	1 No.
25.	Angle plate size	200x100x200mm	2 Nos.
26.	Anvil with Stand	50 Kgs	1 No.
27.	Battery –charger	5 meters flexible in case	2 Nos.
28.	Blow Lamp	1 litre	2 Nos.
29.	Belt Tensioner gauge		1 No.
30.	Calliper inside with Spring	15 cm	4 Nos.
31.	Callipers outside with spring	15 cm	4 Nos.
32.	Car Jet washer with standard accessories		1 No.

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

68.	Fuel feed pump for Diesel		1 No.
69.	Fuel injection pump (Diesel) inline		1 No.
70.	Fuel injection pump dismantling tool kit /Universal Vice		1 No.
71.	Fuel injection pump VE pump / Distributor fuel rotary pump (DPC) pumps / along with special tools and accessories		1 Each
72.	Glow plug tester		2 Nos.
73.	Granite surface plate with stand and cover	1600 x 1000mm	1 No.
74.	Grease Gun		2 Nos.
75.	Grease Gun heavy duty trolley type	10 kg capacity	1 No.
76.	Growler		2 Nos.
77.	Hacksaw frame	Adjustable 20-30 cm	12 Nos.
78.	Hammer Ball Peen	0.75 Kg	4 Nos.
79.	Hammer Chipping	0.25 Kg	5 Nos.
80.	Hammer copper with handle	1 Kg	4 Nos.
81.	Hammer Mallet		4 Nos.
82.	Hammer Plastic		4 Nos.
83.	Hand operated crimping tool	(i) up to 4mm (ii) up to 10mm	2 Each
84.	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
85.	Hand Shear Universal	250mm	2 Nos.
86.	Hand vice	Up to 37 mm	2 Nos.
87.	Hollow Punch set of seven pieces	6mm to 15mm	2 Set
88.	Injector – Multi hole type, Pintle type		4 each
89.	Injector cleaning unit		1 No.
90.	Injector testing set (Hand tester)		1 No.
91.	Insulated Screw driver	20 cm x 9mm blade	4 Nos.
92.	Insulated Screw driver	30 cm x 9mm blade	4 Nos.
93.	Left cut snips	250mm	4 Nos.
94.	Lifting jack screw	3 Ton, 5Ton & 20 Ton	1 Each
95.	Magneto spanner set with 8 spanners		1 Set
96.	Magnifying glass	75mm	2 Nos.
97.	Multimeter digital	DC 200mv - 500 V,0 – 10A & AC 200mv- 500V, 0-10A, resistance 0-20 MΩ and 3 1/2 digit	5 Nos.
98.	Oil can	0.5/0.25-liter capacity	4 Nos.
99.	Oil pump for dismantling and assembling.		2 Nos.
100.	Oil Stone	15 cm x 5 cm x 2.5 cm	1 No.

101.	Outside micrometer	0 to 25 mm	2 Nos.
102.	Outside micrometer	25 to 50 mm	2 Nos.
103.	Outside micrometer	50 to 75 mm	1 No.
104.	Outside micrometer	75 to 100 mm	1 No.
105.	Star Head Screw Driver set of 5 pieces	100 mm to 300 mm	2 Nos.
106.	Pipe cutting tool	As per requirement	2 Nos.
107.	Pipe flaring tool	As per requirement	2 Nos.
108.	Piston ring compressor		2 Nos.
109.	Piston Ring expander and remover.		2 Nos.
110.	Piston Ring groove cleaner.		1 No.
111.	Pliers combination	20 cm.	2 Nos.
112.	Pliers flat nose	15 cm	2 Nos.
113.	Pliers round nose	15 cm	2 Nos.
114.	Pliers side cutting	15 cm	2 Nos.
115.	Portable electric drill Machine	15 mm drill bit capacity	1 No.
116.	Prick Punch	15 cm	4 Nos.
117.	Punch Letter 4mm (Number)		2 Sets
118.	Radiator cut section-cross flow		1 No.
119.	Radiator cut section-down flow		1 No.
120.	Radiator pressure cap		2 Nos.
121.	Right cut snips	250mm	2 Nos.
122.	Rivet sets snap and Dolly combined	3mm, 4mm, 6mm	2 Nos.
123.	Scraper flat	25 cm	2 Nos.
124.	Scraper half round	25 cm	2 Nos.
125.	Scraper Triangular	25 cm	2 Nos.
126.	Scriber	15 cm	2 Nos.
127.	Scriber with scribing black universal		2 Nos.
128.	Spanner D.E. set of 12 pieces	6mm to 32mm	4 Nos.
129.	Spanner T. flocks for screwing up and up-screwing inaccessible		2 Nos.
130.	Spanner, adjustable	15cm	2 Nos.
131.	Spanner, ring set of 12 metric sizes	6 to 32 mm.	4 Nos.
132.	Spanners socket with speed handle, T-bar, ratchet and universal		2 Nos.
133.	Starter motor axial type, pre-engagement type & Co-axial type		1 Each
134.	Steel measuring tape in a case	10 meters	4 Nos.
135.	Steel rule 15 cm inch and metric		4 Nos.
136.	Steel rule 30 cm inch and metric		4 Nos.
137.	Straight edge gauge 2 ft.		2 Nos.
138.	Straight edge gauge 4 ft.		2 Nos.
139.	Stud extractor set of 3		2 Sets
140.	Stud remover with socket handle		1 No.

141.	Surface gauge with dial test indicator plunger type	0.01 mm	4 Nos.
142.	Tachometer (Counting type)		1 No.
143.	Taps and Dies complete sets (5 types)		1 Set
144.	Taps and wrenches - Metric		2 Sets
145.	Telescope gauge		4 Nos.
146.	Temperature gauge with sensor	0-100 ^{0}C	2 Nos.
147.	Thermostat		2 Nos.
148.	Thread pitch gauge Metric		2 Nos.
149.	Torque wrenches	5-35 Nm, 12-68 Nm & 50-225 Nm	1 Each
150.	Turbocharger cut sectional view		1 No.
151.	Tyre pressure gauge with holding nipple		2 Nos.
152.	Universal puller for removing pulleys, bearings		1 No.
153.	V' Block 75 x 38 mm pair with Clamps		2 Nos.
154.	Vacuum gauge	0 to 760 mm of Hg.	2 Nos.
155.	Valve Lifter		1 No.
156.	Valve spring compressor universal		1 No.
157.	Vernier calliper	0-300 mm with least count 0.02mm	4 Nos.
158.	Vice grip pliers		2 Nos.
159.	Water pump for dismantling and assembling		4 Nos.
160.	Wire Gauge (metric)		2 Nos.
161.	Work bench	250 x 120 x 60 cm with 4 vices 12cm Jaw	4 Nos.
162.	Refractometer		1 Nos.
163.	Plastigauge (consumable)		As per requirement
GENERAL SHOP OUTFIT			
164.	Air conditioned CRDI Vehicle in running condition -LMV		1 No.
165.	Arbor press hand operated 2-ton capacity		1 No.
166.	Automotive Diesel Smoke meter (for Diesel engine) (optional)		1 No.
167.	Diesel Engine – CRDI - 4 stroke	Dismantling and assembling with Swivelling stand	1 No.
168.	Diesel engine (Running condition) Stationary type	Single Cylinder, OH valves, fuel tank with handle, fuel feed, water cooling. Capacity: 5 - 8 HP	1 No.

169.	Drilling machine bench to drill up to 12mm dia along with accessories		1 No.
170.	Grinding machine (general purpose) D.E. pedestal with 300 mm dia. wheels rough and smooth		1 No.
171.	Heavy Commercial vehicle (without body on frame)	Fitted with Latest Engine	1 No.
172.	Hydraulic jack HI-LIFT type -3-ton capacity, and 5 Ton capacity		1 Each
173.	Multi Scan Tool		1 No.
174.	Pneumatic rivet gun with standard accessories		2 Nos.
175.	Spring tension tester		1 No.
176.	Trolley type portable air compressor	compressor single cylinder with 45 litres capacity Air tank, along with accessories & with working pressure 6.5 kg/sq. cm	1 No.
177.	Working Condition of Diesel Engine – CRDI - 4 stroke Engine	Assembly with fault simulation board	1 No.
178.	Cut section of 4/6 cylinder diesel engine with moving condition to show momentum of internal parts		1 No.
179.	Diesel Engine six Cylinder in running condition		1 No.
CONSUMABLE			
180.	Battery- SMF		As required
181.	Brake fluids		As required
182.	Chalk, Prussian blue		As required
183.	Chemical compound for fasteners		As required
184.	Diesel		As required
185.	Different type gasket material		As required
186.	Different type of oil seal		As required
187.	Drill Twist (assorted)		As required
188.	Emery paper - 36–60 grit, 80–120		As required
189.	Engine oil & Engine coolant		As required
190.	Gear oils		As required
191.	Hacksaw blade (consumable)		As required
192.	Holders, lamp teakwood boards, plug sockets,		As required
193.	Hydrometer		8 Nos.
194.	Lapping abrasives		As required
195.	Leather apron		5 Nos.

196.	Petrol		As required
197.	Power steering oil		As required
198.	Radiator Coolants		As required
199.	Safety glasses		As required
200.	Steel wire Brush 50mmx150mm		5 Nos.
CLASS ROOM FURNITURE FOR TRADE THEORY			
201.	Instructor's table and Chair (Steel)		1 Set
202.	Students chairs with writing pads		24 Nos.
203.	White board size 1200mm X 900 mm		1 No.
204.	Instructors laptop with latest configuration pre-loaded with operating system and MS Office package.		1 No.
205.	LCD projector with screen		1 No.
206.	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.

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ANNEXURE – III

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