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

COMPETENCY BASED CURRICULUM

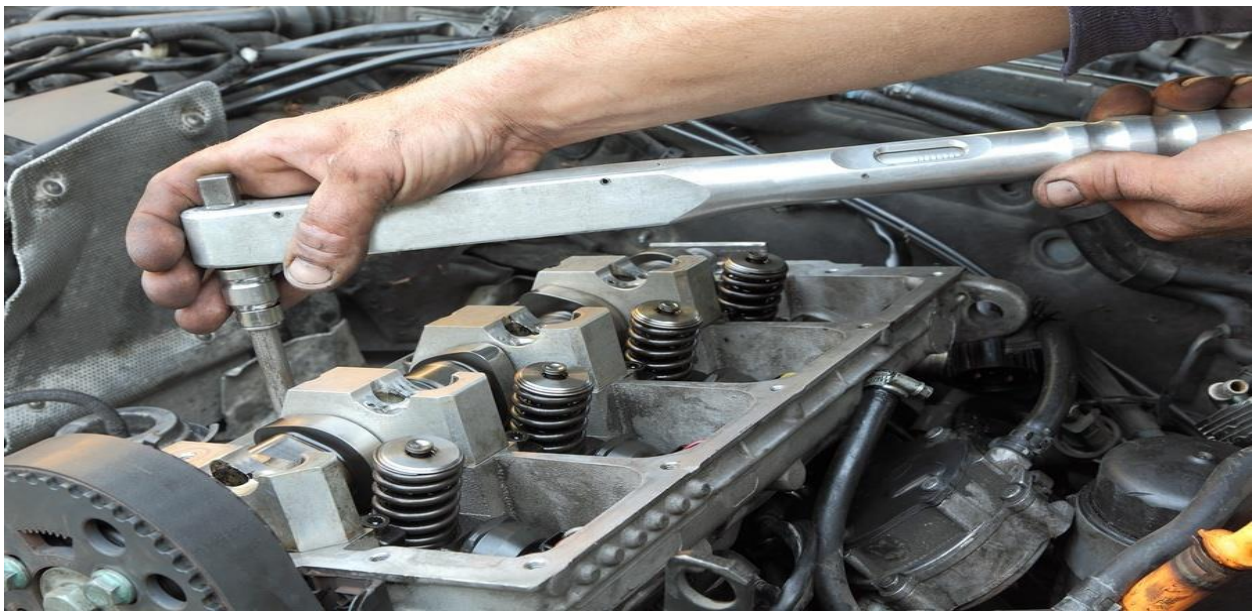
MECHANIC DIESEL

(Duration: One Year)

Revised in July 2022

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 3



SECTOR –AUTOMOTIVE

Directorate General of Training

MECHANIC DIESEL

(Engineering Trade)

(Revised in July 2022)

Version: 2.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL - 3

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE

EN-81, Sector-V, Salt Lake City,

Kolkata – 700 091

www.cstaricalcutta.gov.in

CONTENTS

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. Practice making various welding joints by using Arc and gas welding. 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

Trainees of one-year or two-year trade can also opt for optional courses ofup 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 DGTfrom 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 NTCwill 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/reductionofscrap/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	• Demonstration of good skill in the use of hand tools, machine tools and

attainment of an acceptable standard of craftsmanship with occasional guidance, and due regard for safety procedures and practices	workshop equipment. • 60-70% accuracyachieved 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% accuracyachieved 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% accuracyachieved 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: --

ASC/N9401
CSC/N0304
ELE/N9412
CSC/N0304
CSC/N9404
ASC/N9402
ASC/N9403
ASC/N9404
ASC/N9405
ASC/N9406
ASC/N9404

ASC/N9404
ASC/N9407
ASC/N9408
ASC/N9409
CSC/N9401
CSC/N9402

4. GENERAL INFORMATION

Name of the Trade	**MECHANIC DIESEL**
Trade Code	DGT/1006
NCO - 2015	7233.0400
NOS Covered	ASC/N9401, CSC/N0304, ELE/N9412, CSC/N0304, CSC/N9404, ASC/N9402, ASC/N9403, ASC/N9404, ASC/N9405, ASC/N9406, ASC/N9404, ASC/N9404, ASC/N9407, ASC/N9408, ASC/N9409, CSC/N9401, CSC/N9402
NSQF Level	Level-3
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 inAutomobile) 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 or relevantAdvanced Diploma (Vocational) from DGT 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 Mechanical group (Gr-I) trades categorized under Engg. Drawing'/ D'man Mechanical / D'man Civil' with three years' experience. **Essential Qualification:** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade **OR** Regular / RPL variants of NCIC in RoDA / D'man (Mech /civil) 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 withshort 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. ASC/N9401
2. Plan & perform basic fastening & fitting operation by using correct hand tools, Machine tools & equipment. CSC/N0304
3. Trace and Test all Electrical & Electronic components & circuits and assemble circuit to ensure functionality of system. ELE/N9412
4. Join components by using Arc & Gas welding. CSC/N0304
5. Trace & Test Hydraulic and Pneumatic components. CSC/N9404
6. Check & Interpret Vehicle Specification data and VIN. Select & operate various Service Station equipment. ASC/N9402
7. Dismantle & assemble of Diesel Engine from vehicle (LMV/HMV) along with other accessories (torqueing methods, handling parts). ASC/N9403
8. Overhaul, service and testing Diesel Engine, its parts and check functionality. ASC/N9404
9. Trace, Test & Repair Cooling and Lubrication System of engine (types of coolants and oils relevant to the engines). ASC/N9405
10. Trace & Test Intake and Exhaust system of engine.(cleaning egr valves, exhaust inlet valves, ports and manifolds) ASC/N9406
11. Service Diesel Fuel System and check proper functionality (calibration of mechanical and electronic pumps, checking injectors, filters) ASC/N9404
12. Plan &overhaul the stationary engine and Governor and check functionality. ASC/N9404
13. Monitor emission of vehicle and execute different operation to obtain optimum pollution as per emission norms. ASC/N9407
14. Carryout overhauling of Alternator and Starter Motor. ASC/N9408
15. Diagnose & rectify the defects in LMV/HMV to ensure functionality of vehicle. ASC/N9409
16. Read and apply engineering drawing for different application in the field of work. CSC/N9401
17. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. 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. ASC/N9401	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. CSC/N0304	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. ELE/N9412	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. Join components by using Arc & Gas welding. CSC/N0304	Determine the principles, process of different welding process applicable in automobile industry.
	Demonstrate the edge preparation for butt and fillets welds.
	Select the type and size of filler rod and flux/electrode, size of nozzle and gas pressure/welding current, preheating method and temperature as per requirement.
	Set and tack metals as per drawing.
	Deposit the weld maintaining appropriate technique and safety aspects.
	Cool the welded joint by observing appropriate cooling method. Use post heating, peening etc. as per requirement.
	Clean the joint and inspect the weld for its uniformity and different types of surface defects.
5. Trace & Test Hydraulic and Pneumatic components. CSC/N9404	Demonstrate Brake System (Hydraulic& Air).
	Demonstrate Hydraulic Power Steering.
6. Check & Interpret Vehicle Specification data and VIN. Select & operate various Service Station Equipments. ASC/N9402	Identify of different type of vehicle.
	Identify the different vehicle specification data and information
	Demonstrate the garage, service station different equipment
7. Dismantle & assemble of Diesel Engine from vehicle (LMV/HMV) along with other accessories.Vehicle performance Test 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. Overhaul & service Diesel Engine, its parts and check functionality.(Judge weather this Engine needs overhaul or not) 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. Trace, Test & Repair Cooling and Lubrication System of engine ASC/N9405	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. Trace & Test Intake and Exhaust system of engine 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. Service Diesel Fuel System and check proper functionality. ASC/N9404	Overhauling fuel feed pump, fuel injector pump.
	Test injectors, check the injection timing by the spill cut off method
12. Plan & overhaul the stationary engine and Governor and check functionality. ASC/N9404	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 and execute different operation to obtain optimum pollution as per emission norms. 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. Carryout overhauling of Alternator and Starter Motor. ASC/N9408	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. ASC/N9409	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. CSC/N9401	Solve different mathematical problems
	Explain concept of basic science related to the field of study
17. Read and apply engineering	Read & interpret the information on drawings and apply in

drawing for different application in the field of work. CSC/N9402	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) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
ProfessionalSkill142 Hrs; ProfessionalKnowledge34 Hrs	Check&performMeasuring & marking byusing various Measuring& Marking tools (VernierCalipers,Micrometer,Telescopegauges,Dialboregauges,Dialindicators, straightedge,feelergauge,threadpitchgauge,vacuumgauge, tirepressuregauge.) Following safety precautions. (Mapped NOS: ASC/N9401)	1. Demonstration ofMachinery used in thetrade.(05hrs) 2. IdentifysafetyGear/PPE(Personal ProtectiveEquipments) and their uses(10 hrs) 3. Importance of maintenanceof safety equipment used inWorkshop.(05hrs) 4. Demonstrationonsafehandlingand Periodictesting of lifting equipment,and Safety disposal of used engine oil. (10 hrs.) 5. Demonstrationonhealthhazards, occupational safety &first Aid. (05 hrs) 6. Demonstrationfireservicestation to provide demo onFiresafety.(05hrs) 7. Perform use of fire extinguishers. (05 hrs) 8. Perform marking using all marking aids, like steel rule with spring callipers, dividers,	- Importance&scopeofMechanicDieselTradeTraining. - General discipline in theInstitute - ElementaryFirstAid,OccupationalSafety&Health - KnowledgeofPersonalSafety&Safetyprecautionsinhandling Dieselmachine - ConceptaboutHouseKeeping&5Smethod. - SafetydisposalofUsedengineoil, - Electricalsafetytips. - SafehandlingofFuelSpillage, - Safedisposalof toxic dust, safehandlingandPeriodictestingofliftingequipment. (10 hrs) **Hand&Power Tools: -** - Marking scheme, marking**material** chalk,Prussianblue. - Cleaningtools-Scraper,wirebrush,Emery paper**,** - Description, care and use ofSurfaceplates,steelrule, measuring tape, try square.Callipers-inside

		scriber, punches, chisel etc. on MS Flat/Sheet Metal. (17 hrs) Measure a wheel base of a vehicle with measuring tape. (08 hrs) 9. Perform to remove wheel lug nuts with use of an air impact wrench (08 hrs) 10. Operate General workshop tools & power tools. (15 hrs)	and outside.Dividers,surfacegauges,scriber, - Punches-prick punch,centrepunch,pinpunch,hollow punch, number andletterpunch.Chisel-flat,cross-cut.Hammer-ballpein,lump,mallet.Screwdrivers-blade - Screwdriver,Phillipsscrew driver, Ratchet screwdriver.Allenkey, bench vice & C-clamps, - Spanners-ringspanner,openendspanner&thecombination spanner,universaladjustableopenendspanner.Sockets&accessories, - Pliers - Combination pliers,multi grip, long nose, flat-nose,Nippersorpincerpliers,Sidecutters,Tinsnips,Circlippliers,externalcirclipspliers. - Air impactwrench, air ratchet,wrenches-Torquewrenches,pipewrenches, Pipe flaring & cutting tool,pullers-Gearandbearing.(15 hrs)
		11. Perform measuring practice on Cam height, Camshaft Journal dia, crankshaft	**Systemsofmeasurement**, - Description,LeastCountcalculation, care & use of - Micrometers-

		journal dia, Valve stem dia, piston diameter, and piston pin dia with outside Micrometres. (05 hrs) 12. Perform measuring practice on cylinder bore for taper and out-of-round with Dial bore gauges. (10 hrs) 13. Perform measuring practice to measure wear on crankshaft end play, crankshaft run out, and valve guide with dial indicator and magnetic stand (05 hrs) 14. Perform measuring practice to check the flatness of the cylinder head is warped or twisted with straightedge is used with a feeler gauge. (10 hrs) 15. Perform measuring practice to check the end gap of a piston ring, piston-to-cylinder wall clearance with feeler gauge. (09 hrs) 16. Perform practice to check engine manifold vacuum with vacuum gauge. (05hrs) 17. Perform practice to	Outside,anddepthmicro meter, - Micrometeradjustments, - Description,LeastCountca lculation,care&useofVern ier Calliper. - Telescope gauges, Dial boregauges,Dialindicator s,straightedge,feelergaug e,thread pitch gauge, vacuumgauge, tire pressure gauge.(09 hrs)

		check the air pressure inside the vehicle tyre is maintained at the recommended setting. (05hrs)	
ProfessionalSkill90 Hrs; ProfessionalKnowledge; 17 Hrs	Plan&performbasicfastening&fittingoperationbyusingcorrecthandtools, Machine tools & equipments. (Mapped NOS: CSC/N0304)	18. Perform removal of stud/bolt using stud extractor (05hrs) 19. Perform practice on cutting tools like Hacksaw, file, chisel, Sharpening of Chisels, center punch, safety precautions while grinding. (10hrs) 20. Perform practice on Hacksawing and filing to given dimensions. (25 hrs)	- Differenttypesofmetaljoint (Permanent,Temporary), methodsof, Soldering,etc. **Fasteners** - Study of different types ofscrews, nuts, studs & bolts,locking devices, Such as locknuts, cotter, split pins, keys,circlips,lockrings,lockwashers and locating wheretheyareused.Washers&chemical compounds can beusedtohelpsecurethesefasteners.Functionof**Gaskets,**Selectionofmaterialsforgasketsandpacking,**oilseals.Typesof Gaskets** – paper, multilayered metallic,liquid,rubber,copperandprinted. - ThreadSealants-Varioustypeslike,locking, sealing,temperatureresistance,antilocking,lubricatingetc. **Cuttingtools** - StudyofdifferenttypeofcuttingtoolslikeHacksaw,Fil

			e-Definition,partsofafile,specification,Grade,shape, different type of cutanduses.,OFF-handgrinding with sander, benchandpedestalgrinders,safetyprecautionswhilegrinding. (7 Hrs)
		21. Perform practice on Marking and Drilling clear and Blind Holes, Sharpening of Twist Drills Safety precautions to be observed while using a drilling machine. (10hrs) 22. Perform practice on Tapping a Clear and Blind Hole, Selection of tape drill Size, use of Lubrication, Use of stud extractor. (15 hrs) 23. 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. (25hrs)	**Drillingmachine** - DescriptionandstudyofBenchtypeDrillingmachine, Portable electricalDrillingmachine, drillholdingdevices,Work Holdingdevices,Drillbits. **TapsandDies** - HandTapsandwrenches,Calculation of Tap drill sizesformetricandinchtaps.DifferenttypeofDieand Diestock.Screwextractors. - **HandReamers** DifferentTypeofhandreamers,Drillsizeforreaming, Lapping,Lappingabrasives,typeofLaps.(10 hrs)
ProfessionalSkill92Hrs; ProfessionalKnowledge;	TraceandTestallElectrical&Electroniccomponents&circuits and assemble	24. Perform practice in joining wires using soldering Iron. (20 hrs) 25. Prepare simple	**Basicelectricity** - Electricity principles, - Ground connections, - Ohm's law,

14 Hrs	circuit toensurefunctionalityofsystem. (Mapped NOS: ELE/N9412)	electrical circuits, measuring of current, voltage and resistance using digital multimeter. (20 hrs) 26. Perform practice continuity test for fuses, relay and diodes (09hrs)	- Voltage, Current, Resistance, Power, Energy. - Voltmeter, ammeter, Ohmmeter, Multimeter, - Conductors & insulators, Wires, Shielding, Length vs. resistance,Resistorratings (04Hrs)
		27. Check circuit using of service manual wiring diagram fortroubleshooting (08 hrs)	- Fuses& circuit breakers, - Ballast resistor, - Stripping wire insulation, - Cable colour codesand sizes, Resistors in Series circuits, - Parallel circuits and Series- parallel circuits (04Hrs)
		28. Execute cleaning and topping up of a lead acid battery. (10 hrs) 29. Perform testing battery with hydrometer. (12 hrs) 30. Perform connecting battery to a charger for battery charging and checking & testing a battery after charging. (08 hrs) 31. Perform test of relay and solenoids and its circuit. (05 Hrs)	- Description of Chemical effects, Batteries & cells, Lead acid batteries & Stay Maintenance Free (SMF) batteries, - Magnetic effects, Heating effects, Thermo-electric energy, Thermistors, Thermo couples, - Electrochemical energy, Photo-voltaic energy, Piezo- electric energy, Electromagnetic induction, - Relays, Solenoids, Primary & Secondary windings, Transformers, stator and rotor coils. (6

			Hrs)
ProfessionalSkill35 Hrs; ProfessionalKnowledge;9 Hrs	Trace&TestHydraulicand Pneumaticcomponents. (Mapped NOS: CSC/N0304)	32. Identify of Hydraulic and pneumatic components used in vehicle. (10 hrs) 33. Tracing of hydraulic circuit on hydraulic jack, hydraulic, and Brake circuit. (15hrs) 34. Identify components in Air brake systems (10hrs)	**Introduction to Hydraulics &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 controlvalveused inautomobile. (9 hrs)
ProfessionalSkill25Hrs; ProfessionalKnowledge; 5 Hrs	Check&InterpretVehicleSpecificationdataandVIN.Select&operatevariousServiceStationEquipments. (Mapped NOS: CSC/N9404)	35. IdentifyofdifferenttypesofVehicle.(05 hrs) 36. Demonstrateofvehicle specificationdata. (05hrs) 37. Identifyofvehicleinformation Number (VIN).(05 hrs). 38. DemonstrateofGarage, Service stationequipments.-Vehiclehoists-Twopostandfourposthoist,Enginehoists,Jacks,Stands.(10hrs)	- Classification of vehicles onthebasisofloadasperce ntralmotorvehiclerule,wheels, final drive, and fuelused,axles,positionof engineandsteeringtransmission,bodyandload.Brief description - UsesofVehiclehoists–Twopostandfourposthoist,Engine hoists, Jacks, Stands. (05 Hrs)
ProfessionalSkill50Hrs; ProfessionalKnowledge; 8 Hrs	Dismantle&assembleofDieselEnginefromvehicle(LMV/HMV)alongwithotheraccessories. (Mapped NOS: ASC/N9402)	39. IdentifythedifferentpartsofICEngine(10hrs) 40. Identifythedifferentparts in a diesel engine ofLMV/ HMV (10 hrs) 41. Performpracticeonstartingandstoppingofdieselengines.Observeand	**IntroductiontoEngine**: - Description of internal & external combustion engines, Classification of IC engines, Principle &working of 2 & 4-stroke diesel engine (Compression ignition

		report the reading ofTachometer,Odometer,tempandFuelgauge underidealandonloadcondition.(10hrs) 42. Practiceondismantling DieselengineofLMV/HMVasperprocedure.(20hrs)	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. (8 hrs)
ProfessionalSkill;160Hrs; Professional Knowledge; 25Hrs	Overhaul&serviceDieselEngine,itspartsandcheckfunctionality. (Mapped NOS: ASC/N9403)	43. PerformOverhaulingof cylinderheadassembly, Useofservicemanualfor 44. clearance and other parameters.	**DieselEngineComponents:** - Description and Constructional feature of Cylinder head, Importance of Cylinder head design,

		(10hrs) 45. Performpracticeonremovingrockerarmassemblymanifolds.(05hrs) 46. Performpracticeonremovingthevalvesandits parts from the cylinderhead,cleaning. (05hrs) 47. Inspectionofcylinderheadandmanifoldsurfacesforwarping,cracksandflatness.Checkingvalve seats&valveguide–Replacingthe valve if necessary. (05hrs) 48. Check leaks of valve seatsforleakage–Dismantlerockershaftassembly-clean&checkrockershaft-and levers, for wearandcracksandreassemble.(05hrs) 49. Checkvalvesprings,tappets,pushrods,tappets crewsandvalvestemcap.Reassemblingvalvepartsinsequence,refitcylinderheadandmanifold &rockerarmassembly, adjustablevalveclearances,startingengineafter adjustments. (10 hrs)	- Type of Diesel combustion chambers, - Effect on size of Intake & exhaust passages, Head gaskets. - Importance of Turbulence. Valves & Valve Actuating Mechanism - - Description and Function of Engine Valves, different types, materials, - Type of valve operating mechanism, Importance of Valve seats, Valve seats inserts in cylinder heads, - importance of Valve rotation, Valve stem oil seals, size of Intake valves, Valve trains, Valve- timing diagram, concept of Variable valve timing. - Description of Camshafts &drives , - Description of Overhead camshaft (SOHC and DOHC), importance of Cam lobes, Timing belts & chains, Timing belts &tensioners.(07hrs)
		50. Perform Overhauling piston and connecting rod assembly. Use of service manual for	- Description&functionsof different types of pistons, piston rings and piston pins and

		clearance and other parameters. (05 hrs) 51. Perform Practice on removing oil sump and oil pump – clean the sump. (04 hrs) 52. Perform removing the big end bearing, connecting rod with the piston. (04 hrs) 53. Perform removing the piston rings; Dismantle the piston and connecting rod. Check the side clearance of piston rings in the piston groove & lands for wear. Check piston skirt and crown for damage and scuffing, clean oil holes. (05 hrs) 54. Measure -the piston ring close gap in the cylinder, clearance between the piston and the liner, clearance between crank pin and the connecting rod big end bearing. (03 hrs) 55. Check connecting rod for bend and twist. Assemble the piston and connecting rod assembly. (04 hrs)	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. (05 Hrs)
		56. PerformOverhaulingof crankshaft, Use of servicemanual for	- Description and function of Crank shaft, camshaft, - Engine bearings-

		clearance andotherparameters(05hrs) 57. Perform removing damperpulley,timinggear/timing chain,flywheel,mainbearingcaps,bearingshellsandcrankshaftfromengine(05hrs) 58. Inspectoilretainerandthrustsurfacesforwear.(05 hrs) 59. Measurecrankshaftjournalforwear,taperandovality.(05hrs) 60. Demonstratecrankshafttforfilletradii,bend&twist.(05hrs)	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. (04Hrs)
		61. Inspectflywheelandmountingflanges,spigotandbearing.(05hrs) 62. Checkvibrationdamperfordefect.(02hrs) 63. Performremovingcamshaftfromengineblock,Check for bend & twist ofcamshaft.Inspection ofcamlobe,camshaftjournals and bearings andmeasure cam lobe lift. (05 hrs) 64. Fixingbearinginsertsincylinderblock&capchecknipandspreadclearance&oilholes&locatinglugsfixcrankshaftonblock-torquebolts-	- 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. (04 Hrs)

		checkendplayremoves haft-checkseating, repeat similarly for connecting rod and Checkseatingandrefit.(08hrs)	
		65. Performcleaningandcheckingofcylinderblocks .(10 hrs) 66. Surfaceforanycrack,flatness measure cylinderborefortaper& ovality,cleanoilgalleryp assageandoilpipeline. (15hrs) 67. Performreassemblingallparts of engine in correctsequenceandtorqueallboltsandnutsas perworkshopmanualof theengine.(12hrs) 68. Performtestingcylinder compression,Checkidle speed. (08hrs) 69. Performremoving&replacing a cam belt, andadjusting an engine drivebelt,replacingangine drivebelt.(05hrs)	- Description of Cylinder block, - Cylinder block construction, - Different type of Cylinder sleeves (liner). (05 Hrs)
Professional Skill50Hrs; ProfessionalKnowledge; 10 Hrs	Trace, Test &Repair CoolingandLubrication Systemof engine. (Mapped NOS: ASC/N9404)	70. Perform practice on checking & top up coolant, draining & refilling coolant, checking / replacing a coolant hose. (05 hrs) 71. Perform test cooling system pressure. (04	**NeedforCoolingsystems** - -Heat transfer method, - Boiling point & pressure, - Centrifugal force, - Vehicle coolant properties and recommended change of

		hrs) 72. Execute on removing & replacing radiator/ thermostat check the radiator pressure cap. (06 hrs) 73. Test of thermostat. (03 hrs) 74. Perform cleaning &reverse flushing. (08hrs) 75. Perform overhauling water pump and refitting. (07 hrs) 76. Perform checking engine oil, draining engine oil, replacing oil filter, & refilling engine oil (07 hrs) 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. (10 hrs)	interval, - Different type of cooling systems, **Basic cooling systemcomponents** - Radiator, Coolant hoses, - - Water pump, - Cooling system thermostat, Cooling fans, - Temperature indicators, - Radiator pressure cap, Recovery system, Thermo- switch. **Needforlubricationsystem**, - Functions of oil, Viscosity and its grade as per SAE , - Oil additives, Synthetic oils, The lubrication system**,** **Splashsystem,** - 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. (10 hrs)
Professional Skill26Hrs;	Trace & TestIntakeand	78. Execute dismantling air	**Intake&exhaustsystems**– - Description of Diesel

ProfessionalKnowledge 06 Hrs	Exhaust system of engine. (Mapped NOS: ASC/N9405)	compressorandexhauster and cleaning allparts - measuring wear inthe cylinder, reassemblingall parts and fitting themintheengine.(7hrs) 79. Executedismantling&assemblingofturbocharger,checkforaxialclearanceasperservicemanual.(05hrs) 80. Examineexhaustsystemforrubbermountingfordamage,deterioratio nandoutofposition;forleakage,looseconnection,dentanddamage;(08 hrs) 81. Performpracticeonexhaust manifold removalandinstallation,practiceonCatalyticconverterremovalandinstallation.(06 hrs)	induction & Exhaust systems. Description & function of air compressor, exhauster, Super charger, Intercoolers, turbo charger, variable turbo charger mechanism. **Intakesystemcomponents-** - Description and function of Air cleaners,Differenttypeaircleaner,DescriptionofIntakemanifoldsandmaterial**,** **Exhaustsystemcomponents -** - Description and function of Exhaust manifold, Exhaust pipe, Extractors, Mufflers-Reactive, absorptive, Combination of Catalytic converters, Flexible connections, Ceramic coatings, Back-pressure, - Electronic mufflers. (06Hrs)
ProfessionalSkill70Hrs; ProfessionalKnowledge 12Hrs	ServiceDieselFuelSystemandcheckproperfunctionality. (Mapped NOS: ASC/N9406)	82. Performworkonremoving&cleaningfueltanks, checkingleaksinthefuel lines. (10hrs) 83. ExecuteoverhaulingofFeedPumps(Mechanical &Electrical).(10hrs) 84. Performbleedingofairfromthefuellines,servicingprimary&secondaryf	**FuelFeedSysteminICEngine (Petrol&Diesel)** - Gravity feed system, Forced feed system, main parts, Fuel Pumps-Mechanical & Electrical - Feed Pumps. - Knowledge about function, working &types of Carburetor.

		ilters.(10hrs) 85. Execute removing a fuelinjectionpumpfromanengine-refit the pump tothe engine re-set timing - filllubricating-oilstartand adjust slow speed oftheengine. (15hrs) 86. Executeoverhaulingofinjectorsandtestingofinjector.(15hrs) 87. GeneralmaintenanceofFuelInjectionPumps(FIP).(10hrs)	**DieselFuelSystems** - Description and function of Diesel fuel injection, fuel characteristics, concept of Quiet diesel technology &Clean dieseltechnology. **Diesel fuel systemcomponents** - Description and function of Diesel tanks & lines, Diesel fuel filters, water separator, Lift pump, Plunger pump, Priming pump, - Inline injection pump, Distributor-type injection pump, Diesel injectors, Glow plugs, Cummins & Detroit Diesel injection. **ElectronicDieselcontrol-** - 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. (12hrs)
ProfessionalSkill25 Hrs; ProfessionalKnowledge	Plan & overhaul the stationary engine and Governor and	88. Execute Start engine adjustidlingspeedanddamping device	**Marine&StationaryEngine:-Types,** - -double acting engines,

05Hrs	check functionality. (Mapped NOS: ASC/N9404)	inpneumaticgovernorandventurecontrolunitchecking.(06hrs) 89. Verifyperformanceofenginewithoffloadadjustingtimings.Startengine-adjustingidlespeed of the engine fittedwith mechanical governorchecking-highspeedoperationoftheengine.(07 hrs) 90. Checkperformanceformissingcylinderbyisolatingdefectiveinjectorsandtest-dismantleandreplacedefectivepartsandreassembleandrefitback totheengine.(12 hrs)	- opposed piston engines, starting systems, cooling systems, lubricating systems, supplying fuel oil, hydraulic coupling, - Reduction gear drive, electromagnetic coupling, - Electrical drive, generators and motors, supercharging. (05 Hrs)
ProfessionalSkill25 Hrs; ProfessionalKnowledge 05Hrs	Monitoremissionofvehicleandexecutedifferentoperationtoobtainoptimumpollutionasperemissionnorms. (Mapped NOS: ASC/N9404)	91. Monitor emissionsproceduresbyuseofEnginegasanalyserorDieselsmokemeter.(10hrs) 92. Checking&cleaningaPositivecrankcaseventilation(PCV)valve.Obtaining&interpretingscan tool data. InspectionofEVAPcanisterpurgessystembyuseofscanTool.(10hrs) 93. EGR/SCRValveRemoveandinstallationforinspection.(05hrs)	**EmissionControl:-** **Vehicleemissions** - Standards- Euro and Bharat II, III, IV, V Sources of emission, Combustion, Combustion chamberdesign. **Typesofemissions**: - CharacteristicsandEffectofHydrocarbons,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 (05Hrs)
Professional Skill 25 Hrs; Professional Knowledge 05 Hrs	Carryout overhauling of Alternator and Starter Motor. (Mapped NOS: ASC/N9407)	94. Perform removing alternator from vehicle dismantling, cleaning checking for defects, assembling and testing for motoring action of alternator & fitting to vehicles. (15 hrs) 95. Practice on removing starter motor Vehicle and overhauling the starter motor, testing of starter motor (10 hrs)	- Basic Knowledge about DC Generator & AC Generator. - Constructional details of Alternator - Description of charging circuit operation of alternators, regulator unit, ignition warning lamp- troubles and remedy in charging system. - Description of starter motor circuit, - Constructional details of starter motor solenoid switches, common troubles and remedy in starter circuit. (05 Hrs)
Professional Skill 25 Hrs; Professional Knowledge 05 Hrs	Diagnose & rectify the defects in LMV/HMV to ensure functionality of vehicle. (Mapped NOS: ASC/N9408)	96. Execute troubleshooting in LMV/HMV for Engine Not starting – Mechanical & Electrical causes, High	- Troubleshooting : - Causes and remedy for - Engine Not starting Mechanical & Electrical causes, - High fuel consumption,

		fuel consumption, Engine overheating, Low Power Generation, Excessive oil consumption, Low/High Engine Oil Pressure, Engine Noise. (25 hrs)	Engine overheating, - Low Power Generation, - Excessive oil consumption, - Low/High Engine Oil Pressure, Engine Noise. (05 hrs)
ENGINEERING DRAWING:(40 Hrs.)			
Professional Knowledge ED- 40 Hrs.	Read and apply engineering drawing for different application in the field of work. (Mapped NOS: CSC/N9401)	**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.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (Mapped NOS: CSC/N9402)	**WORKSHOP CALCULATION & SCIENCE** **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) OverhaulingofPressureLubricationsystem
b) Maintenanceofcoolingsystem.
c) OverhaulingofFIP.
d) Cleaning&TestingofInjectors.
e) OverhaulingofAlternator
f) OverhaulingofStarterMotor
g) StudyonDiagnosisTool/ScannerToolforECUofCRDIengine

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 edge file (20 Nos)		2Each
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.	Gloves for Welding	Leather and Asbestos	5 Sets
75.	Glow plug tester		2 Nos.
76.	Granite surface plate with stand and cover	1600 x 1000mm	1 No.
77.	Grease Gun		2 Nos.
78.	Grease Gun heavy duty trolley type	10 kg capacity	1 No.
79.	Growler		2 Nos.
80.	Hacksaw frame	Adjustable 20-30 cm	12 Nos.

81.	Hammer Ball Peen	0.75 Kg	4 Nos.
82.	Hammer Chipping	0.25 Kg	5 Nos.
83.	Hammer copper with handle	1 Kg	4 Nos.
84.	Hammer Mallet		4 Nos.
85.	Hammer Plastic		4 Nos.
86.	Hand operated crimping tool	(i) up to 4mm (ii) up to 10mm	2 Each
87.	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
88.	Hand Shear Universal	250mm	2 Nos.
89.	Hand vice	Up to 37 mm	2 Nos.
90.	Hollow Punch set of seven pieces	6mm to 15mm	2Set
91.	Injector – Multi hole type, Pintle type		4 each
92.	Injector cleaning unit		1 No.
93.	Injector testing set (Hand tester)		1 No.
94.	Insulated Screw driver	20 cm x 9mm blade	4 Nos.
95.	Insulated Screw driver	30 cm x 9mm blade	4 Nos.
96.	Left cut snips	250mm	4 Nos.
97.	Lifting jack screw	3 Ton, 5Ton & 20 Ton	1 Each
98.	Magneto spanner set with 8 spanners		1Set
99.	Magnifying glass	75mm	2 Nos.
100.	Marking out table	90 x 60 x 90 cm.	1 No.
101.	Multimeter digital	DC 200mv - 500 V,0 – 10A & AC 200mv- 500V , 0-10A, resistance 0-20 MΩ and 3 1/2 digit	5 Nos.
102.	Oil can	0.5/0.25 liter capacity	4 Nos.
103.	Oil pump for dismantling and assembling.		2 Nos.
104.	Oil Stone	15 cm x 5 cm x 2.5 cm	1 No.
105.	Oscilloscope	20MHz	2 Nos.
106.	Outside micrometer	0 to 25 mm	2 Nos.
107.	Outside micrometer	25 to 50 mm	2 Nos.

108.	Outside micrometer	50 to 75 mm	1 No.
109.	Outside micrometer	75 to 100 mm	1 No.
110.	Philips Screw Driver set of 5 pieces	100 mm to 300 mm	2 Nos.
111.	Pipe cutting tool		2 Nos.
112.	Pipe flaring tool		2 Nos.
113.	Piston ring compressor		2 Nos.
114.	Piston Ring expander and remover.		2 Nos.
115.	Piston Ring groove cleaner.		1 No.
116.	Pliers combination	20 cm.	2 Nos.
117.	Pliers flat nose	15 cm	2 Nos.
118.	Pliers round nose	15 cm	2 Nos.
119.	Pliers side cutting	15 cm	2 Nos.
120.	Portable electric drill Machine	15 mm drill bit capacity	1 No.
121.	Prick Punch	15 cm	4 Nos.
122.	Punch Letter 4mm (Number)		2 Sets
123.	Radiator cut section-cross flow		1 No.
124.	Radiator cut section-down flow		1 No.
125.	Radiator pressure cap		2 Nos.
126.	Right cut snips	250mm	2 Nos.
127.	Rivet sets snap and Dolly combined	3mm, 4mm, 6mm	2 Nos.
128.	Scraper flat	25 cm	2 Nos.
129.	Scraper half round	25 cm	2 Nos.
130.	Scraper Triangular	25 cm	2 Nos.
131.	Scriber	15 cm	2 Nos.
132.	Scriber with scribing black universal		2 Nos.
133.	Set of stock and dies -Metric		2Sets
134.	Tinnman’s Shear	450 mm x 600mm	2 Nos.
135.	Sheet Metal Gauge		2 Nos.
136.	Tinnman’sShear	300mm	4 Nos.
137.	Soldering Copper	Hatchet type 500gms	2 Nos.
138.	Solid Parallels in pairs (Different size) in Metric		2 Nos.

139.	Spanner Clyburn	15 cm	1 No.
140.	Spanner D.E. set of 12 pieces	6mm to 32mm	4 Nos.
141.	Spanner T. flocks for screwing up and up-screwing inaccessible		2 Nos.
142.	Spanner, adjustable	15cm	2 Nos.
143.	Spanner, ring set of 12 metric sizes	6 to 32 mm.	4 Nos.
144.	Spanners socket with speed handle, T-bar, ratchet and universal		2 Nos.
145.	Spark lighter		2 Nos.
146.	Spark plug spanner 14mm x 18mm x Size		2 Nos.
147.	Starter motor axial type, pre-engagement type & Co-axial type		1Each
148.	Steel measuring tape in a case	10 meter	4 Nos.
149.	Steel rule 15 cm inch and metric		4 Nos.
150.	Steel rule 30 cm inch and metric		4 Nos.
151.	Straight edge gauge 2 ft.		2 Nos.
152.	Straight edge gauge 4 ft.		2 Nos.
153.	Stud extractor set of 3		2Sets
154.	Stud remover with socket handle		1 No.
155.	Surface gauge with dial test indicator plunger type	0.01 mm	4 Nos.
156.	Tachometer (Counting type)		1 No.
157.	Tandem master cylinder with booster		4 Nos.
158.	Taps and Dies complete sets (5 types)		1Set
159.	Taps and wrenches - Metric		2Sets
160.	Telescope gauge		4 Nos.
161.	Temperature gauge with sensor	0-100 ^{0}C	2 Nos.
162.	Thermostat		2 Nos.
163.	Thread pitch gauge Metric		2 Nos.
164.	Timing lighter		2 Nos.
165.	Torque wrenches	5-35 Nm, 12-68 Nm & 50-225 Nm	1Each
166.	Trammel	30 cm	2 Nos.
167.	Turbocharger cut sectional view		1 No.

168.	Tyre pressure gauge with holding nipple		2 Nos.
169.	Universal puller for removing pulleys, bearings		1 No.
170.	V' Block 75 x 38 mm pair with Clamps		2 Nos.
171.	Vacuum gauge	0 to 760 mm of Hg.	2 Nos.
172.	Valve Lifter		1 No.
173.	Valve spring compressor universal		1 No.
174.	Vernier calliper	0-300 mm with least count 0.02mm	4 Nos.
175.	Vice grip pliers		2 Nos.
176.	Water pump for dismantling and assembling		4 Nos.
177.	Wire Gauge (metric)		2 Nos.
178.	Work bench	250 x 120 x 60 cm with 4 vices 12cm Jaw	4 Nos.
GENERAL SHOP OUTFIT			
179.	Air conditioned CRDI Vehicle in running condition -LMV		1 No.
180.	Arbor press hand operated 2 ton capacity		1 No.
181.	Automotive Diesel Smokemeter (for Diesel engine)		1 No.
182.	Bench lever shears	250mm Blade x 3mm	1 No.
183.	Diesel Engine – CRDI - 4 stroke	Dismantling and assembling with Swivelling stand	1No.
184.	Diesel engine (Running condition) Stationary type		1 No.
185.	Discrete Component Trainer / Basic Electronics Trainer		1 No.
186.	Drilling machine bench to drill up to 12mm dia along with accessories		1 No.
187.	Dual Magnetization Yoke	AC / HWDC, 230 VAC, 50Hz	01 Set
188.	Gas Welding Table	1220mm x760mm	2 Nos.
189.	Grinding machine (general purpose) D.E. pedestal with 300 mm dia. wheels rough and smooth		1 No.
190.	Heavy Commercial vehicle type (without body on frame)		1 No.

191.	Hydraulic jack HI-LIFT type -3 ton capacity, and 5 Ton capacity		1Each
192.	Liquid penetrate Inspection kit		1Set
193.	Multi Scan Tool with oscilloscope		1 No.
194.	Pipe Bending Machine (Hydraulic type)	12mm to 30mm	1 No.
195.	Pneumatic rivet gun with standard accessories		2 Nos.
196.	Spring tension tester		1 No.
197.	Tin smiths bench folder	600 x 1.6mm	1 No.
198.	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.
199.	Welding plant Oxy-Acetylene complete (high pressure)		1 No.
200.	Welding Transformer with all accessories including consumables	150-300 Amps	1 No.
201.	Working Condition of Diesel Engine – CRDI - 4 stroke Engine, Assembly with fault simulation board		1 No.
202.	Cut section of 4/6 cylinder diesel engine with moving condition to show momentum of internal parts		1 No.
203.	Fuel injection test bench for calibration of fuel pump		1 No.
204.	Electrical test bench		1 No.
205.	Diesel Engine six Cylinder in running condition		1 No.
CONSUMABLE			
206.	Battery- SMF		As required
207.	Brake fluids		As required
208.	Chalk, Prussian blue		As required
209.	Chemical compound for fasteners		As required
210.	Diesel		As required
211.	Different type gasket material		As required
212.	Different type of oil seal		As required
213.	Drill Twist (assorted)		As required

214.	Emery paper - 36–60 grit , 80–120		As required
215.	Engine oil & Engine coolant		As required
216.	Gear oils		As required
217.	Gloves for Welding (Leather and Asbestos)		As required
218.	Hacksaw blade (consumable)		As required
219.	Hand rubber gloves tested for 5000 V		5 Pairs
220.	Holders, lamp teakwood boards, plug sockets,		As required
221.	Hydrometer		8 Nos.
222.	Lapping abrasives		As required
223.	Leather apron		5 Nos.
224.	Petrol		As required
225.	Power steering oil		As required
226.	Radiator Coolants		As required
227.	Safety glasses		As required
228.	Steel wire Brush 50mmx150mm		5 Nos.
CLASS ROOM FURNITURE FOR TRADE THEORY			
229.	Instructor's table and Chair (Steel)		1 Set
230.	Students chairs with writing pads		24 Nos.
231.	White board size 1200mm X 900 mm		1 No.
232.	Instructors lap top with latest(vista & above) configuration pre-loaded with operating system. and MS Office package.		1 No.
233.	LCD projector with screen		1 No.
234.	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.

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