MECHANIC (DIESEL)

NSQF LEVEL- 6

SECTOR- AUTOMOTIVE

COMPETENCY BASED CURRICULUM

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

GOVERNMENT OF INDIA
Ministry of Skill Development & Entrepreneurship
Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
EN-81, Sector-V, Salt Lake City, Kolkata – 700091

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(Engineering Trade)

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(Revised in 2019)

Version 1.1

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1. COURSEOVERVIEW

The Craft Instructor Training Scheme is operational since inception of the Craftsmen Training Scheme. The first Craft Instructor Training Institute was established in 1948. Subsequently, 6 more institutes namely, Central Training Institute for Instructors (now called as National Skill Training Institute (NSTI)), NSTI at Ludhiana, Kanpur, Howrah, Mumbai, Chennai and Hyderabad were established in 1960's by DGT. Since then the CITS course is successfully running in all the NSTIs across India as well as in DGT affiliated institutes viz. Institutes for Training of Trainers (IToT). This is a competency based course for instructors of one year duration. "Mechanic (Diesel)" CITS trade is applicable for Instructors of "Mechanic (Diesel)" CTS Trade.

The main objective of Craft Instructor training programme is to enable Instructors explore different aspects of the techniques in pedagogy and transferring of hands-on skills so as to develop a pool of skilled manpower for industries, also leading to their career growth & benefiting society at large. Thus promoting a holistic learning experience where trainee acquires specialized knowledge, skills & develops attitude towards learning & contributing in vocational training ecosystem.

This course also enables the instructors to develop instructional skills for mentoring the trainees, engaging all trainees in learning process and managing effective utilization of resources. It emphasizes on the importance of collaborative learning & innovative ways of doing things. All trainees will be able to understand and interpret the course content in right perspective, so that they are engaged in & empowered by their learning experiences and above all, ensure quality delivery.

2. TRAINING SYSTEM

2.1 GENERAL

CITS courses are delivered in National Skill Training Institutes (NSTIs) & DGT affiliated institutes viz., Institutes for Training of Trainers (IToT). For detailed guidelines regarding admission on CITS, instructions issued by DGT from time to time are to be observed. Further complete admission details are made available on NIMI web portal http://www.nimionlineadmission.in. The course is of one-year duration. It consists of Trade Technology (Professional skills and Professional knowledge), Training Methodology and Engineering Technology/ Soft skills. After successful completion of the training programme, the trainees appear in All India Trade Test for Craft Instructor. The successful trainee is awarded NCIC certificate by DGT.

2.2 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.	**Trade Technology**	
	Professional Skill (Trade Practical)	640
	Professional Knowledge (Trade Theory)	240
2.	**Engineering Technology**	
	Workshop Calculation & Science	80
	Engineering Drawing	120
3.	**Training Methodology**	
	TM Practical	320
	TM Theory	200
	Total	**1600**

2.3 PROGRESSION PATHWAYS

- Can join as Instructor in Vocation Training Institute/ Technical Institute.
- Can join as a supervisor in Industries.

2.4 ASSESSMENT & CERTIFICATION

The CITS trainee will be assessed for his/her Instructional skills, knowledge and attitude towards learning throughout the course span and also at the end of the training program.

a) The Continuous Assessment (Internal) during the period of training will be done by **Formative Assessment Method** to test competency of instructor with respect to assessment

criteria set against each learning outcomes. The training institute has to maintain an individual trainee portfolio in line with assessment guidelines. 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 Method**. The All India Trade Test for awarding National Craft Instructor Certificate will be conducted by DGT at the end of the year as per the guidelines of DGT. The learning outcome and assessment criteria will be the basis for setting question papers for final assessment**.** The external 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 CRITERIA

Sl. No.	Subject		Marks	Internal Assessment	Full Marks	Pass Marks	
						Exam	Internal Assessment
1	Trade Technology	Trade Theory	100	40	140	40	24
		Trade Practical	200	60	260	120	36
2	Engineering Technology	Workshop Cal. & Sc.	50	25	75	20	15
		Engineering Drawing	50	25	75	20	15
3	Training Methodology	TM Practical	200	30	230	120	18
		TM Theory	100	20	120	40	12
Total Marks			**700**	**200**	**900**	**360**	**120**

The minimum pass percent for Trade Practical, TM practical Examinations and Formative assessment is 60% & for all other subjects is 40%.There will be no Grace marks.

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. While assessing, the major factors to be considered are approaches to generate solutions to specific problems by involving standard/non-standard practices.

Due consideration should also be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure,

behavioral attitude, sensitivity to the environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising of the following:

- Demonstration of Instructional Skills (Lesson Plan, Demonstration Plan)
- Record book/daily diary
- Assessment Sheet
- Progress chart
- Video Recording
- Attendance and punctuality
- Viva-voce
- Practical work done/Models
- Assignments
- Project work

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

Performance Level	Evidence
(a) Weightage in the range of 60%-75% to be allotted during assessment	
For performance in this grade, the candidate should be well versed with instructional design, implement learning programme and assess learners which demonstrates attainment of an ***acceptable standard*** of crafts instructorship with ***occasional*** **guidance** and engage students by demonstrating good attributes of a trainer.	• Demonstration of ***fairly good*** skill to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Average engagement of students for learning and achievement of goals while undertaking the training on specific topic. • A fairly good level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the entire lesson. • Occasional support in imparting effective training.
(b) Weightage in the range of 75%-90% to be allotted during assessment	
For performance in this grade, the candidate should be well versed with instructional design, implement learning programme and assess learners which demonstrates	• Demonstration of ***good*** skill to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Above average engagement of students

attainment of a ***reasonable standard*** of crafts instructorship with ***little*** **guidance** and engage students by demonstrating good attributes of a trainer.	for learning and achievement of goals while undertaking the training on specific topic. • A ***good*** level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the entire lesson. • Little support in imparting effective training.
(c) Weightage in the range of more than 90% to be allotted during assessment	
For performance in this grade, the candidate should be well versed with instructional design, implement learning programme and assess learners which demonstrates attainment of a ***high standard*** of crafts instructorship with ***minimal or no support*** and engage students by demonstrating good attributes of a trainer.	• Demonstration of ***high*** skill level to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Good engagement of students for learning and achievement of goals while undertaking the training on specific topic. • A ***high*** level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the entire lesson. • Minimal or no support in imparting effective training.

3. GENERAL INFORMATION

Name of the Trade	**Mechanic (Diesel)-CITS**
Trade Code	DGT/ 4007
NCO – 2015	2356.0100,7233.0400
NSQF Level	Level-6
Duration of Craft Instructor Training	One Year
Unit Strength (No. Of Student)	25
Entry Qualification	Degree in appropriate branches of Mechanical/ Automobile Engineering from AICTE/ UGC recognized Engineering College / University. OR Diploma in appropriate branches of Mechanical / Automobile Engineering from AICTE/ recognized board / Institution. OR National Trade Certificate in **Mechanic (Diesel) or** related trades. OR National Apprenticeship Certificate in **Mechanic (Diesel)** or related trades. AND **Essential:** Valid MCWG & LMV driving License Mandatory for all.
Minimum Age	18 years as on first day of academic session.
Space Norms	120 sq. m + 80 Sq. m (Parking area)
Power Norms	5.5 KW
Instructors Qualification for	
1. Mechanic (Diesel) - CITS Trade	B.Voc/Degree in Automobile or Mechanical Engineering from recognized University with two years experience in relevant field. OR 03 years Diploma in Automobile or Mechanical from AICTE/recognized Board/ Institution or relevant Advanced Diploma (Vocational) from DGT with five years experience in relevant field. OR NTC/ NAC in Mechanic (Diesel) with seven years of experience in relevant field. AND **Essential**: Valid MCWG & LMV driving License Mandatory for all. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in **Mechanic (Diesel)** trade, in any of the variants under DGT.
2. Workshop Calculation & Science	B.Voc/Degree in any Engineering from AICTE/ UGC recognized Engineering College/ university with two years experience in relevant field. OR 03 years Diploma in Engineering from AICTE /recognized board of

	technical education or relevant Advanced Diploma (Vocational) from DGT with five years' experience in the relevant field. OR NTC/ NAC in any Engineering trade with seven years experience in relevant field. **Essential:** National Craft Instructor Certificate (NCIC) in relevant trade OR 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 two years experience in relevant field. OR 03 years Diploma in Engineering from AICTE /recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with five 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 seven years experience. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in relevant trade OR NCIC in RoDA / D'man (Mech /civil) or any of its variants under DGT
4. Training Methodology	B.Voc/Degree in any discipline from AICTE/ UGC recognized College/ university with two years experience in training/ teaching field. OR Diploma in any discipline from recognized board / University with five years experience in training/teaching field. OR NTC/ NAC passed in any trade with seven years experience in training/ teaching field. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in any of the variants under DGT / B.Ed /ToT from NITTTR or equivalent.
5. Minimum Age for Instructor	21 Years

Distribution of training on Hourly basis: (Indicative only)

Total Hrs /week	Trade Practical	Trade Theory	Workshop Cal. & Sc.	Engg. Drawing	TM Practical	TM Theory
40 Hours	16 Hours	6Hours	2 Hours	3 Hours	8 Hours	5 Hours

4. JOB ROLE

Brief description of job roles:

Mechanic Diesel; can learn about diesel engine fundamentals and power generation. The trainees have to participate in hands-on work and begin repairing diesel engine vehicles.

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.

Manual Training Teacher/Craft Instructor; instructs students in ITIs/Vocational Training Institutes in respective trades as per defined job role. Imparts theoretical instructions for the use of tools & equipment of related trades and related subjects. Demonstrate process and operations related to the trade in the workshop; supervises, assesses and evaluates students in their practical work. Ensures availability & proper functioning of equipment and tools in stores.

Reference NCO 2015:

a) 7233.0400 – Mechanic, Diesel Engine
b) 2356.0100 – Manual Training Teacher/ Craft Instructor.

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 TRADE TECHNOLOGY

1. Explain Quality Management tools- 5S, 7QC etc. & ensure compliance of safety practice and handling of hand tools, special tools and maintenance of them.
2. Analyse diagnosis of problems in various Engine system (viz. Lubrication system, emission control system and control system) and troubleshoot engine.
3. Evaluate maintenance, diagnosis and servicing of fuel supply system in Petrol/diesel engines.
4. Evaluate maintenance, diagnosis and troubleshooting of Electrical and Electronics systems.
5. Monitor emission of vehicle and execute different operation to obtain optimum pollution as per emission norms.
6. Plan, Diagnose & rectify the defects in HMV to ensure functionality of vehicle.
7. Evaluate diagnosis and troubleshooting of CNG, LPG & hybrid system.
8. Assess Service of Diesel Fuel System and check proper functionality (calibration of mechanical and electronic pumps, checking injectors, filters).
9. Analyse diagnosis and troubleshooting of Electric and Electronic related to CRDI.
10. Analyse diagnosis Repair and Overhauling of CRDI Engine.
11. Plan & overhaul the stationary engine check functionality of various sub-systems attached.

6. COURSE CONTENT

SYLLABUS FOR MECHANIC (DIESEL) –CITS TRADE			
TRADE TECHNOLOGY			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Practical 32Hrs Theory 12Hrs	Explain Quality Management tools-5S, 7QC etc. & ensure compliance of safety practice and handling of hand tools, special tools and maintenance of them.	1. Practice 5s techniques in the automobile work shop. 2. Practice 7QC techniques in the automobile work shop. 3. Precautions to be observed while working in the automobile work shop and garage equipments. 4. Familiarization with computer.	• Admission, introduction, facility available in the institute. • Importance of safety, safety precautions& first aid. • Concept of 5S & 7QC tools, time management as employed for quality circle. Importance of healthy environment. • Application of computers & its Features.
		5. Handling & maintenance of hand tools, special tools, equipment & machineries. 6. Maintenance of garage equipment in the workshop. 7. Preventive maintenance of vehicle/engines.	• Application and safety to be observed while handling hand tools, special tools, equipment & machineries Importance and types of maintenance of vehicles/engines.
Practical 96Hrs Theory 36Hrs	Analyse diagnosis of problems in various Engine system (viz. Lubrication system, emission control system and control system) and troubleshoot engine.	8. Checking engine vacuum & compression pressure. 9. Taking Cylinder leakage test with compressed air. 10. Measure the cubic capacity of a given engine.	• Explanation of Principle of All types of SI and CI Engines with respect to pressure, volume and temperature. • Thermodynamic cycles with respect to pv&ts diagrams. • Valve timing diagram of all types of Engine.
		11. Servicing cylinder head assembly.	• Importance of servicing cylinder head-Precautions

		12. Remove all accessories attached with the engine dismantling the head components and its visual inspection. 13. Measuring components for wear with precision measuring instruments-suggestions for remedy and taking remedial measures. 14. Reassembling cylinder head components.	to be observed while servicing cylinder head. • Reasons for frequently occurring abnormal wear in cylinder head components and its Effects on engine performance. • Constructional details, Advantages and disadvantages of variable valve timing
		15. Servicing cylinder block assembly. 16. Removing and dismantling piston and connecting rod assembly, crank shaft and flywheel, vibration damper from the engine. 17. Visual inspection of cylinder block for various parameters such as bore, main journal etc. for wear and suggest remedial measures. 18. Visual inspection of the cylinder blocks components (piston and connecting rod assembly, crank shaft, flywheel etc.)	• Importance of servicing cylinder block-Precautions to be observed while servicing cylinder block. • Reason for measuring cylinder block for various parameters to find out its serviceability and suggestions for remedial measures. Reasons for frequently occurring abnormal wear in cylinder block components and its Effects on engine performance.
		19. Measuring cylinder block & components for wear with precision measuring instruments-suggestions for remedy and taking remedial measures. 20. Reassembling the engine block and its components. 21. Refit cylinder head assembly. 22. Setting valve timing. 23. Checking and setting valve clearance. 24. Practice on checking and	• Importance of measuring cylinder block components for actual wear to decide serviceability. • Engine assembly procedure as recommended by manufacturers. • Importance and correct procedure of setting valve timing. • Importance of correct valve clearance Precautions to be observed while assembling

		setting variable valve timing.	engine components.
		25. Maintenance, diagnosis and Servicing intake systems. 26. Servicing of different types of air cleaner, turbocharger, intercooler, throttle body, intake manifold. 27. Maintenance, diagnosis and Servicing exhaust systems. 28. Servicing of exhaust manifold, catalytic converter, resonator, muffler.	• Study about intake system components such as air cleaner, different types of turbo charger, super charger, throttle body, intake manifold etc. • Importance of maintenance, diagnosis and Servicing intake systems. • Causes of failure of the components of intake system. • Trouble shooting in an intake system. Study about exhaust system components such as exhaust manifold, muffler, types of catalytic converter etc. • Importance of maintenance, diagnosis and Servicing exhaust systems. • Causes of failure of the components of exhaust system. • Trouble shooting in an intake system.
Practical 96Hrs Theory 36 Hrs	Evaluate maintenance, diagnosis and servicing of fuel supply system in Petrol/diesel engines.	29. Maintenance, diagnosis and servicing of basic petrol fuel system components. 30. Overhauling of fuel tank, mechanical fuel Pump, electrical pump, fuel filters, carburetors Testing of fuel pumps for proper functioning.	• FUEL SUPPLY SYSTEM IN PETROL ENGINE Gasoline Fuel: properties of Gasoline fuel -combustion processes. • Study about carburetor fuel system and its components such as fuel tank, mechanical fuel Pump, electrical pump, fuel filters, carburetors and its circuits etc.

			• Importance of maintenance, diagnosis and Servicing carburetor fuel system and its components. • Causes of failure of the carburetor fuel system and its components. • Trouble shooting in carburetor fuel system and its components. • Importance of testing of fuel pumps.
		31. Maintenance, diagnosis and servicing of conventional diesel fuel system and its components. 32. Overhauling of fuel tank, fuel feed Pump, electrical pump, fuel filters, types of fuel injection pumps, governors, injector. 33. Testing of fuel feed pumps for proper functioning. 34. Servicing of fuel tanks, Checking leaks in the fuel lines, draining of water separators. 35. Replacing of primary& secondary filters. 36. Phasing and calibration of fuel injection pump. 37. Testing of injectors for its proper functioning. 38. Setting fuel injection timing Bleeding diesel fuel system.	• Fuel supply system in diesel engines. • Diesel fuel& its properties - combustion processes. • Study about conventional diesel fuel system and its components such as fuel tank, fuel feed Pump, electrical pump, fuel filters, water separators, fuel injection pumps, governors, injectors etc. Importance of maintenance, diagnosis and Servicing diesel fuel system and its components. Causes of failure of the diesel fuel system and its components. • Importance of testing of fuel feed pumps, FIP and injectors. • Importance of setting correct FIP timing. Importance of bleeding the fuel system. Trouble shooting in diesel fuel system and its components.
		39. Maintenance, diagnosis and servicing of lubrication	**Engine lubrication system** • Lubricant, types, application

		system. 40. Changing engine oil and filter. 41. Tracing oil leak from the engine. 42. Overhauling of oil pump, checking oil pressure relief valves for proper functioning. 43. Servicing oil coolers. 44. Checking oil galleries. 45. Oil pressure testing. 46. Removing of sludge by using flushing oil.	and its properties. Study about lubrication systems and its components such as oil sump, oil strainer, oil pump, relief valve, filter, bypass valve, oil cooler etc. • Study about oil filtering systems. • Importance of maintenance, diagnosis and Servicing lubricating system and its components. • Causes of failure of the lubricating system and its components. • Importance of testing of oil pumps. • Importance of servicing oil filter. • Importance of checking and setting correct oil pressure. • Reasons for sludge formation and its prevention Trouble shooting in lubricating system and its components.
		47. Maintenance, diagnosis and servicing of cooling system. 48. Flushing cooling system replacing coolant. 49. Tracing coolant leakage from the engine. 50. Checking cooling system for proper functioning. 51. Replacing/overhauling of water pump. 52. Checking thermostat valve. 53. Adjusting fan belt tension. 54. Checking radiator pressure cap for proper functioning. 55. Replacing/Servicing radiator. 56. Diagnosis of improper	**Engine cooling system** • Coolant, types, and its properties. • Importance of maintaining correct coolant-water ratio. • Study about cooling systems and its components such as radiator, pressure cap, types of hoses, types of water pump, electric fan, thermostat, fan belts, temperature gauge, temperature sensor etc. • Study about oil filtering systems. • Importance of

		operating temperature.	maintenance, diagnosis and Servicing cooling system and its components. • Causes of failure of the cooling system and its components. • Importance of testing of pressure cap. • Importance of servicing radiator. • Trouble shooting in cooling system and its components.
Practical 96Hrs Theory 36 Hrs	Evaluate maintenance, diagnosis and troubleshooting of Electrical and Electronics systems.	57. Maintenance, diagnosis and servicing battery Checking of battery condition using hydrometer and battery tester. 58. Charging batteries in series and parallel. 59. Maintenance of battery. 60. Jump starting a battery. 61. Preparation of electrolyte. Reconditioning of terminal post.	• **Battery/accumulator:** - types, construction, working. Battery capacity &rating, Booster starting. IBS, Disposal of waste battery. • Advantages of slow charging. Advantages of solidification of electrolyte by adding salicylic acid or introducing absorbed glass mat (AGM) - VRLA batteries Electrolyte-definition, percentage of sulphuric acid and water effects of improper ratio of acid and water on battery life. • Specific gravity of water, acid and electrolyte. Temperature effect on specific gravity. Battery troubles and their remedies
		62. Maintenance, diagnosis and servicing of starting system. 63. Checking starter circuit for proper functioning. 64. Checking solenoid switches for proper functioning. 65. Overhauling all types of	• Study about starting system and its components. Importance of checking starter circuit for proper functioning. • Role of solenoid switch and relay, importance of its checking.

		starter. 66. Checking of starter for proper functioning.	• Importance of testing starter components. Troubles and remedies in starting system.
		67. Maintenance, diagnosis and servicing of charging system. 68. Checking charging circuit voltage drop test for proper functioning. 69. On vehicle inspection of alternator for proper functioning. 70. Overhauling of alternator Testing voltage regulator.	• Study about Charging system and its components. • Importance of checking charging circuit for proper functioning. • Importance of voltage regulation • Importance of testing charging system components. • Troubles and remedies in charging system.
		71. Maintenance, diagnosis and servicing of conventional ignition system. 72. Checking ignition circuit for proper functioning. 73. Checking magneto coil for proper functioning. 74. Checking magneto for proper strength. 75. Checking and Setting of magneto ignition timing using Ignition Timing light.	• Study about types of conventional Ignition system and its components. • Importance of checking ignition circuit. • Importance of checking and setting correct ignition timing.
		76. Overhauling distributor. 77. Checking vacuum & centrifugal advance mechanism for proper functioning. 78. Testing ignition coil, spark plug, condenser for proper functioning using testing equipment. 79. Setting ignition timing. Checking of Ignition timing using Ignition Timing light	• Study about distributor and its components. • Importance of checking distributor for proper functioning. • Importance of testing ignition coil, spark plug, condenser for proper functioning. Common troubles in Ignition system.
Practical	Monitor emission	80. Checking of exhaust gas in	**Emission control system**

16 Hrs Theory 06 Hrs	of vehicle and execute different operation to obtain optimum pollution as per emission norms.	petrol engine using exhaust gas analyser. 81. Checking of exhaust gas in diesel engine using Smoke meter. 82. Maintenance of crank case ventilation system. 83. Maintenance of EGR system.	• Definition, Sources of emission (such as Exhaust system, crank case, fuel tank and carburetor). Methods to control emission, (1. exhaust system with EGR OR Air injection system in to exhaust manifold with catalytic converter 2. Positive crank case ventilation. 3. Evaporative control system i.e. charcoal canister.). Vehicle emission standards- Euro and Bharat standards. Emission control
Practical 64Hrs Theory 24Hrs	Plan, Diagnose & rectify the defects in HMV to ensure functionality of vehicle.	84. Trouble tracing in engines through dashboard gauges such as Mal function Indicator Lamp , cooling system indicator, oil level indicator, battery charging indicator, glow plug indicator etc.	• Digital panel board gauges and their circuit. details about MIL indicator, cooling system indicator, oil level indicator, battery charging indicator, glow plug indicator etc.
		85. Engine tune up procedure, diagnosing abnormal noises coming from engine and its causes. 86. Troubleshooting of engine-mechanical and electrical problems.	• Tune up the engine with the help of multi scan tool, adjusting of valve tappet clearance checking and setting at injection timing & valve timing.
		87. Determining the mechanical efficiency of the engine by Morse test using dynamometer and tachometer.	**Engine performance tests** • Purpose of testing an I.C engine. Classification of test, fault finding tests, routine tests. Measurement of IHP, indicative mean effective pressure, BHP, Mechanical efficiency, fuel consumption, thermal efficiency, volumetric efficiency, relative

			efficiency, air consumption, lubricating oil consumption. • Dynamometers and its types. • Preparation of heat balance sheet.
Practical 16 Hrs Theory 06 Hrs	Evaluate diagnosis and troubleshooting of CNG, LPG & hybrid system.	88. Find out the location of CNG kit components in vehicle. 89. Overhauling of CNG kit components.(conventional type). 90. Overhauling of CNG kit components.(Gas injection type) 91. Find out the location of L P G kit components in vehicle. 92. Overhauling of L P G kit components. 93. Maintenance, diagnosis and servicing of electric and hybrid car.	• Alternative fuels, types, PROPERTIES, Advantages & disadvantages of each type of fuel. CNG engine and its advantages. CNG conversion kit, function, constructional details. (conventional type) CNG conversion kit, function, constructional details. (Gas injection type) L P G engine and its advantages. LPG Conversion kit, function, constructional details. Comparison between petrol, diesel, LPG and CNG. • Electric car and Hybrid car.
Practical 32Hrs Theory 12Hrs	Asses Service of Diesel Fuel System and check proper functionality (calibration of mechanical and electronic pumps, checking injectors, filters)	94. Maintaining fuel injection test bench further practice on overhauling. 95. Testing of different types inline fuel injection pump	• Importance of testing the pumps. • Procedure for testing before dismantling. • Procedure as per the manufacturer for dismantling, inspecting and assembling inline pump.
		96. Further practice on servicing and testing different types of inline FIP, governors and injectors. 97. Servicing and testing different types of distributor type fuel injection pumps.	• Detailed description of procedure of servicing mechanically controlled distributor type, electronically controlled distributor type and solenoid valve controlled distributor type pumps-details of start assist systems. • Procedure as per the manufacturer for dismantling, inspecting and

			assembling distributor pumps.
Practical 80 Hrs Theory 30Hrs	Analyse diagnosis and troubleshooting of Electric and Electronic related to CRDI.	98. Trouble tracing in engine using multi scan tool such as Engine management system, electronic fuel injection, Air flow measurement, Variable intake manifold system, types of EFI wiring system, Electronic control unit, malfunction indicating lamp, Data link connector, Onboard diagnostic system Checking of sensors. 99. Checking of actuators. Checking of pumps.	**Engine management system** • Definition, Function, Types of system available, • Parts of Engine Management System. (All sensors, actuators, pumps.) & their function. • Closed and open loop system, cold start system, Air flow measurement, Variable intake manifold system, EFI wiring system, Electronic control unit, pre heaters for inlet manifold, Data link connector, Onboard diagnostic system.
		100. Diesel Engine diagnostic information and procedures. 101. Engine and emission control system-analyzing the complaint. 102. Handling of scan tool-checking freeze frame data-recording freeze frame data and clearance. 103. Visual inspection-confirmation of trouble system- rechecking freeze frame data.	• Precautions to be observed while working with engine emission control systems-details of OBD-description of data link connector-study about schematic and routing diagram of emission control system-flow diagram of control systems-terminal arrangement of ECM.
		104. Trouble shooting for DTC-checking DTC circuits. 105. Identifying the trouble by scan tool. 106. Tracing the faults by trouble code. 107. Checking intermittent problems-final confirmation test.	• Details of trouble codes-functions of sensors and actuators-details of scan tool-precautions while working with sensors and actuators.
Practical 48Hrs	Analyse diagnosis Repair and	Servicing CRDI fuel system: 108. Checking low pressure fuel	• Description of CRDI systems and its components.

Theory 18 Hrs	Overhauling of CRDI Engine.	supply circuit-preliminary check. 109. Checking fuel pump operation. 110. Checking fuel pressure. 111. Checking high pressure fuel supply circuit. 112. Checking fuel injector leak. 113. Checking fuel regulator.	Precautions to be observed before removing the CRDI fuel system-study about the low and high pressure fuel supply circuits.
		114. Removing a high pressure CRDI pump from an engine. 115. Refit the pump to the engine, start and adjusting for proper functioning. 116. Servicing and testing of various types of electronic injectors. 117. Checking and replacing the components of CRDI system.	**Electronic Diesel control-** • Electronic Diesel control systems, Common Rail Diesel Injection (CRDI) system, Hydraulically actuated electronically controlled unit injector (HEUI) diesel injection system. • Sensors, actuators and ECU (Electronic Control Unit) used in Diesel Engines.
		118. Servicing CRDI diesel engines Dismantling, inspecting, measuring the engine components for wear, suggestions for remedy. 119. Replacement of worn out/unserviceable parts and reassembling. 120. Starting engine and tune up for better performance.	• Importance of measuring/ inspecting the engine components for wear to decide serviceability.
Practical 64Hrs Theory 24 Hrs	Plan & overhaul the stationary engine check functionality of various sub-systems attached.	121. Servicing stationary diesel engine-PT injection system. 122. Dismantling, inspecting, measuring the engine components for wear, suggestions for remedy. 123. Replacement of worn out/unserviceable parts and reassembling. 124. Starting and adjusting for better performance	• Study about PT fuel system. definition, function, components, function and working of each component and advantages and disadvantages of PT system. • Importance of measuring/ inspecting the engine components for wear to decide serviceability.

		125. Servicing PT fuel system. overhauling components of PT fuel system	
		126. Identify terminals of 3 phase generator set-determine dc excitation/field winding terminals. 127. Testing gen set for continuity-connect start, run the gen set & measure build up voltage. 128. Determine the load performance.	• Read and interpret the name plate details-selecting ohmmeter for proper range-advantages of using megger-residual magnetism-residual voltage and current
		129. Dismantling of reciprocating pumps-valves, pistons, cranks, seals etc. for inspection, repair & replacement. 130. Cleaning of parts & assembling. 131. Installing of reciprocating pumps.	• Importance of pumps in agricultural & industrial applications. Classification of pumps, parts, constructional details and its working. • Classification of reciprocating pump, construction and operation. Installation technique of reciprocating pump. Tools and equipment required & procedure.
		132. Dismantling of rotary pumps-impeller, shaft, bearing etc, for inspection, Repair & replacement. 133. Cleaning of parts and assembling. 134. Checking for alignment, clearance, etc., Priming technique and its application. 135. Installing, operating & testing of rotary pumps.	• Classification of rotary pumps-Construction and operation- repairing procedure. Brief description of turbine & stage pumps, positive displacements and their advantages. • Meaning of priming and its effect. Installation techniques of rotary pump-procedure, tools and equipments required.

SYLLABUS FORCORE SKILLS
1. Workshop Calculation & Science(Common for all Engineering CITS trades) (80 Hrs)
2. Engineering Drawing (Group I) (120Hrs)
3. Training Methodology (Common for all trades) (320Hrs + 200Hrs)

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

7. ASSESSMENT CRITERIA

LEARNING OUTCOME	ASSESSMENT CRITERIA
TRADE TECHNOLOGY	
1. Explain Quality Management tools- 5S, 7QC etc. & ensure compliance of safety practice and handling of hand tools, special tools and maintenance of them.	Explain 5s & 7QC techniques in the automobile work shop.
	Ensure precautions to be observed while working in the automobile work shop and garage equipments.
	Evaluate handling & maintenance of hand tools, special tools, equipment & machineries.
	Ensure compliance of safety precautions while handling hand tools, special tools, equipment & machineries.
	Evaluate Preventive maintenance of garage equipment in the workshop.
2. Analyse diagnosis of problems in various Engine system (viz. Lubrication system, emission control system and control system) and troubleshoot engine.	Assess planning and executing of dismantling & assembling of Engine from vehicle (LMV/HMV) along with other accessories.
	Evaluate Overhauling of Engine and check functionality.
	Evaluate Tracing, Testing& Repairing of Cooling and Lubrication System of engine, Intake and Exhaust system of engine.
	Assess servicing of different types of air cleaner, turbocharger, intercooler, throttle body and intake manifold.
	Assess servicing of exhaust manifold, catalytic converter, resonator and muffler.
	Check and propose possible optimization and compare their cost effectiveness.
	Contribute to continuous improvement of work process in the related area.
	Evaluate Engine Performance and set idling speed.
	Analyse emission of vehicle and execution of different operation to obtain optimum pollution as per emission norms.
	Monitor, evaluate and document work result.
3. Evaluate maintenance, diagnosis and servicing of fuel supply system in Petrol/diesel engines.	Evaluate dismantling & assembling of fuel feed system along with other accessories.
	Evaluate Servicing of Fuel System and check proper functionality.
	Check and propose possible optimization and compare their cost effectiveness.
	Contribute to continuous improvement of work process in the related area.
	Evaluate Engine Performance and set idling speed.
4. Evaluate maintenance, diagnosis and troubleshooting of Electrical	Evaluate diagnosis of problems and maintenance of batteries.
	Evaluate Service & repair of charging and starting System components.

and Electronics systems.	Assess overhauling and assembling of distributor.
	Evaluate Servicing of ignition system, vacuum & centrifugal advance mechanism and check proper functionality.
	Check and propose possible optimization and compare their cost effectiveness.
	Contribute to continuous improvement of work process in the related area.
	Evaluate Performance of serviced units for functionality.
5. Monitor emission of vehicle and execute different operation to obtain optimum pollution as per emission norms.	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.
6. Plan, Diagnose & rectify the defects in HMV to ensure functionality of vehicle.	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.
7. Evaluate diagnosis and troubleshooting of CNG, LPG & hybrid system.	Evaluate dismantling & assembling of CNG, LPG& hybrid system components.
	Analyse rectification of the defects following the vehicle manufacture`s standard procedure.
	Select and use of testing methods that comply with the manufacturer's requirements.
	Check and propose possible optimization and compare their cost effectiveness.
	Evaluate Performance of serviced units for functionality.
8. Assess Service of Diesel Fuel System and check proper functionality (calibration of mechanical and electronic pumps, checking injectors, filters).	Overhauling fuel feed pump, fuel injector pump.
	Test injectors, check the injection timing by the spill cut off method.
9. Analyse diagnosis and troubleshooting of Electric and Electronic related to CRDI.	Evaluate dismantling and assembling of CRDI pump for servicing.
	Plan and execute dismantling & assembling and evaluate servicing of CRDI system components.
	Analyse Rectify rectification of the defects following the vehicle manufacture`s standard procedure.
	Select and use testing methods that comply with the manufacturer's requirements.
	Check and propose possible optimization and compare their cost effectiveness.

	Evaluate Performance of serviced units for functionality.
	Assess trouble shooting for Diagnostic Trouble Code (DTC) and check DTC circuits.
	Monitor, evaluate and document work result.
10. Analyse diagnosis Repair and Overhauling of CRDI Engine.	Illustrate Dismantling, inspecting, measuring the engine components for wear.
	Align the left hook of the crane with engine lifting bracket.
	Remove the engine mountings.
	Remove the engine from vehicle
	Analyse Engine Overhauling procedure.
	Mount the engine on the vehicle.
	Align and fit the gear box to the engine.
	Refit the accessories to the engine.
	Overhaul Valve Actuating Mechanism (Hydraulic latch actuator).
11. Plan & overhaul the stationary engine check functionality of various sub-systems attached.	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.

8. INFRASTRUCTURE

LIST OF TOOLS AND EQUIPMENT FOR MECHANIC (DIESEL) - CITS			
For batch of 25 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.	Calliper inside with spring	15 cm	6 +1 Nos.
3.	Callipers 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.	Philips 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.	Air blow gun with standard accessories		1 No.
22.	Allen Key set of 12 pieces	2mm to 14mm	4 Nos.
23.	Ammeter DC with external shunt	300A/ 60A	4 Nos.
24.	Air ratchet with standard accessories		4 Nos.
25.	Air impact wrench with standard accessories		4 Nos.

26.	Angle plate adjustable	250x150x175mm	1 No.
27.	Angle plate size	200x100x200mm	2 Nos.
28.	Anvil with Stand	50 Kgs	1 No.
29.	Auto Electrical test bench		1 No.
30.	Battery –charger	5 meters flexible in case	2 Nos.
31.	Blow Lamp	1 litre	2 Nos.
32.	Belt Tensioner gauge		1 No.
33.	Caliper inside with Spring	15 cm	4 Nos.
34.	Caliper outside with spring	15 cm	4 Nos.
35.	Car Jet washer with standard accessories		1 No.
36.	Chain Pulley Block capacity with tripod stand	3 ton	1 No .
37.	Chisel flat	10 cm	4 Nos.
38.	Chisels cross cut	200 mm x 6mm	4 Nos.
39.	Circlip pliers Expanding and contracting	15cm and 20cm	4 each
40.	Clamps C	100mm	2 Nos.
41.	Clamps C	150mm	2 Nos.
42.	Clamps C	200mm	2 Nos.
43.	Cleaning tray	45x30 cm.	4 Nos.
44.	Compression testing gauge suitable for diesel Engine with standard accessories		2 Nos.
45.	Connecting rod alignment fixture		1 No.
46.	Copper bit soldering iron	0.25 Kg	4 Nos.
47.	Cylinder bore gauge capacity	20 to 160 mm	4 Nos.
48.	Cylinder liner- Dry & wet liner, press fit & slidefit liner		1 Each
49.	DC Ohmmeter	0 to 300 Ohms	2 Nos.
50.	Depth micrometer	0-25mm	4 Nos.
51.	Dial gauge type 1 Gr. A (complete with clamping devices and with magnetic stand)		4 Nos.
52.	Different type of Engine Bearing model		1 set
53.	Different type of piston model		1 set
54.	Dividers with Spring	15 cm	4 Nos.
55.	Drift Punch Copper	15 Cm	4 Nos.
56.	Drill point angle gauge		1 No.
57.	Drill twist (various sizes)	1.5 mm to 15 mm by 0.5mm	4 Nos.
58.	Electric Soldering Iron	230 V, 60 watts 230 V, 25 watts	2 Each

59.	Electric testing screw driver		4 Nos.
60.	Engineer's square	Blade size 15 cm	4 Nos.
61.	Engineers stethoscope		1 No.
62.	Feeler gauge 20 blades (metric)		4 Nos.
63.	File flat , bastard	20 cm	4 Nos.
64.	File, half round ,second cut	20 cm	4 Nos.
65.	File, Square second cut	20 cm	4 Nos.
66.	File, Square round	30 cm	4 Nos.
67.	File, triangular , second cut	15 cm	4 Nos.
68.	Files assorted sizes and types including safe edge file (20 No's)		2Each
69.	Flat File , second cut	25 cm	4 Nos.
70.	Flat File , bastard	35 cm	4 Nos.
71.	Fuel feed pump for Diesel		1 No.
72.	Fuel injection pump (Diesel) inline		1 No.
73.	Fuel injection pump dismantling tool kit /Universal Vice		1 No.
74.	Fuel injection pump VE pump / Distributor fuel rotary pump (DPC) pumps / along with special tools and accessories		1 Each
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	10 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		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		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		2 Sets
134.	Tinnman's Shear	450 mm x 600mm	2 Nos.
135.	Sheet Metal Gauge		2 Nos.
136.	Tinnman's Shear	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)		1 Set
159.	Taps and wrenches - Metric		2 Sets

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.	Bench lever shears	250mm Blade x 3mm	1 No.
182.	Diesel Engine – CRDI - 4 stroke	Dismantling and assembling with Swivelling stand	1No .
183.	Diesel engine (Running condition) Stationary type		1 No.
184.	Discrete Component Trainer / Basic Electronics Trainer		1 No.
185.	Drilling machine bench to drill up to 12mm dia along with accessories		1 No.
186.	Dual Magnetization Yoke	AC / HWDC, 230 VAC, 50Hz	01 Set
187.	Grinding machine (general purpose) D.E. pedestal with 300 mm dia. wheels rough and		1 No.

	smooth		
188.	Heavy Commercial vehicle type (without body on frame)		1 No.
189.	Hydraulic jack HI-LIFT type -3 ton capacity, and 5 Ton capacity		1 Each
190.	Liquid penetrate Inspection kit		1 Set
191.	Multi Scan Tool		1 No.
192.	Pipe Bending Machine (Hydraulic type)	12mm to 30mm	1 No.
193.	Pneumatic rivet gun with standard accessories		2 Nos.
194.	Spring tension tester		1 No.
195.	Tin smiths bench folder	600 x 1.6mm	1 No.
196.	Trolley type portable air	compressor single cylinder with 45 litres capacity Air tank, along with accessories & with working pressure 6.5 kg/sq. cm	1 No.
197.	Working Condition of Diesel Engine – CRDI - 4 stroke Engine, Assembly with fault simulation board		1 No.
198.	Cut section of 4/6 cylinder diesel engine with moving condition to show momentum of internal parts		1 No.
199.	Fuel injection test bench for calibration of fuel pump		1 No.
200.	Electrical test bench		1 No.
201.	Diesel Engine six Cylinder in running condition		1 No.
CONSUMABLE			
202.	Battery- SMF		As required
203.	Brake fluids		As required
204.	Chalk, Prussian blue		As required
205.	Chemical compound for fasteners		As required
206.	Diesel		As required
207.	Different type gasket material		As required
208.	Different type of oil seal		As required
209.	Drill Twist (assorted)		As required
210.	Emery paper - 36–60 grit , 80–120		As required
211.	Engine oil & Engine coolant		As required
212.	Gear oils		As required
213.	Hacksaw blade (consumable)		As required

214.	Hand rubber gloves tested for 5000 V		5 Pairs
215.	Holders, lamp teakwood boards, plug sockets,		As required
216.	Hydrometer		8 Nos.
217.	Lapping abrasives		As required
218.	Leather apron		5 Nos.
219.	Petrol		As required
220.	Power steering oil		As required
221.	Radiator Coolants		As required
222.	Safety glasses		As required
223.	Steel wire Brush 50mmx150mm		5 Nos.
C. CLASS ROOM FURNITURE FOR TRADE THEORY			
224.	Instructor's table and Chair (Steel)		1 Set
225.	Students chairs with writing pads		25 Nos.
226.	White board size 1200mm X 900 mm		1 No.
227.	Instructors lap top with latest configuration pre-loaded with operating system and MS Office package.		1 No.
228.	LCD projector with screen.		1 No.
229.	Trainees locker	6½ ' x 3' x 1½'	1 Set each (optional)

ANNEXURE – I

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

List of Expert members participated for finalizing the course curriculum of Mechanic (Diesel) (CITS) trade.			
S No.	**Name & Designation Shri/Mr./Ms.**	**Organization**	**Remarks**
Industry Experts			
1.	Dr. K C Vora Sr. Dy. Director & Head Arai Academy	The Automotive Research Association Of India. S.No.102, Vetal Hill, Off Paud Road, Kothrud, Pune	Chairman
2.	Jayanta Patra Sr. Manager	Micromatic Machine Tools (P) Ltd. 240/241,11th Main , 3rd Phase, Peenya Industrial Area, Bangalore.	Member
3.	Kashinath M. Patnasetty Head - Application Support Group	Ace Designers Ltd. Plot No. 7&8, Ii Phase Peenya Industrial Area, Bangalore	Member
4.	SuyogFulbadave, Executive HR	Piaggio Vehicles Pvt. Ltd, Pune	Member
5.	Sunil Khodke Training Manager	Bobst India Pvt Ltd Pirangut, Mulashi, Pune	Member
6.	Lokesh Kumar Manger Training Academy	Volkswagen India Pvt Ltd Pune	Member
7.	Shriram TatyabaKhaire Executive Engineering.	Sulzer India Pvt Ltd. Kondhapuri, Shirur, Pune	Member
8.	Milind P Desai Sr. Shift Engineer	Atlas Copco (I) Ltd Dapodi, Pune	Member
9.	Shrikant Mujumdar DGM	John Deere India Pvt Ltd. Pune - Nagar Road, Sanaswadi, Pune	Member
10.	Milind Sanghai Team Manager	Alfa Laval India Ltd. Dapodi, Pune.	Member
11.	Rajesh Menon Unit Manager	Alfa Laval India Ltd. Dapodi, Pune.	Member
12.	N K A Madhuubalan DGM - QC, QA & SMPS	Sandvik Asia Pvt.Ltd. Dapodi, Pune.	Member
13.	Irkar Balaji, Sr. Engineer Mfg.	Premium Transmission Ltd. Chinchwad, Pune.	Member
14.	Rajendra Shelke Sr. Engineer Mfg.	Premium Transmission Ltd. Chinchwad, Pune - 19	Member
15.	Bhagirath Kulkarni Manager Maintenance	Tata Ficosa Auto Sys Ltd Hinjawadi, Pune	Member
16.	Rohan More Hr& Admin	Tata Ficosa Auto Sys Ltd Hinjawadi, Pune	Member
17.	G. Venkateshwaran	Cummins India Ltd	Member

18.	Mahesh Dhokale Engineer	Tata Toyo Radiator Ltd	Member
19.	Pankaj Gupta DGM- HR & IR	Tata Toyo Radiator Ltd	Member
20.	S K Joshi Head - Business Development.	Radheya Machining Ltd Pune- Nagar Road, Sanaswadi, Pune.	Member
21.	A L Kulkarni DGM Mfg.	Pmt Machines Ltd Pimpri, Pune	Member
22.	S V Karkhanis DGM Planning	Pmt Machines Ltd Pimpri, Pune	Member
23.	Kiran ShirsathAsso. Manager M.E.	Burckhardt Compressioni Pvt Ltd, Ranjangaon, Pune	Member
24.	Ajay Dhuri Manager	Tata Motors Ltd Pimpri, Pune	Member
25.	Arnold Martin	Godrej & Boyce Mfg Co Ltd, Mumbai	Member
26.	Ravindra L. More	Mahindra CIE Automotive Ind. Ltd. Ursc-Pune	Member
27.	Kushagra P. Patel	NRB Bearings Ltd., ChiklthanaAurongabad	Member
28.	M. M. Kulkarni	NRB Bearings Ltd., ChiklthanaAurongabad	Member
DGT & Training Institute			
29.	Nirmalya Nath Asst. Director of Trg.	CSTARI, Kolkata	Member cum Co-coordinator
30.	Akhilesh Pandey	ATI, Mumbai	Expert
31.	Amar Prabhu, Principal	Don Bosco, Mumbai	Expert
32.	Indranil Mukherjee, Instructor	ITI, Tollygaunj	Expert


कौशलं बलम्