सत्यमेव जयते

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

COMPETENCY BASED CURRICULUM

MECHANIC MOTOR VEHICLE

(Duration: Two Years)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 5

SECTOR – AUTOMOBILE

MECHANICAL MOTOR VEHICLE

(Engineering Trade)

(Revised in 2018)

Version: 1.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL - 5

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

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING OUTCOME	
Learning Outcome	**Assessment Criteria**
1. Recognize & comply with safe working practices, environment regulation and housekeeping.	1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements.
	1.2 Recognize and report all unsafe situations according to site policy.
	1.3 Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
	1.4 Identify, handle and store/ dispose of dangerous/unsalvageable goods and substances according to site policy and procedures following safety regulations and requirements.
	1.5 Identify and observe site policies and procedures in regard to illness or accident.
	1.6 Identify safety alarms accurately.
	1.7 Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.
	1.8 Identify and observe site evacuation procedures according to site policy.
	1.9 Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
	1.10 Identify basic first aid and use them under different circumstances.
	1.11 Identify different fire extinguisher and use the same as per requirement.
	1.12 Identify environmental pollution & contribute to avoidance of same.
	1.13 Take opportunities to use energy and materials in an environmentally friendly manner.
	1.14 Avoid waste and dispose waste as per procedure.
	1.15 Recognize different components of 5S and apply the same in the working environment.

2. Understand, explain different mathematical calculation & science in the field of study including basic electrical and apply in day-to-day work.*[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]*	2.1 Explain concept of basic science related to the field such as Material science, Mass, weight, density, speed, velocity, heat & temperature, force, motion, pressure, heat treatment, centre of gravity, friction.
	2.2 Measure dimensions as per drawing.
	2.3 Use scale/ tapes to measure for fitting to specification.
	2.4 Comply given tolerance.
	2.5 Prepare list of appropriate materials by interpreting detail drawings and determine quantities of such materials.
	2.6 Ensure dimensional accuracy of assembly by using different instruments/gauges.
	2.7 Explain basic electricity, insulation & earthing.
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Sectional views, Estimation of material, Electrical & electronic symbol]*	3.1 Read & interpret the information on drawings and apply in executing practical work.
	3.2 Read & analyse the specification to ascertain the material requirement, tools, and machining/ assembly/maintenance parameters.
	3.3 Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
4. Select and ascertain measuring instrument and measure dimension of components and record data.	4.1 Select appropriate measuring instruments such as micrometers, Vernier callipers, dial gauge, bevel protector and height gauge (as per tool list).
	4.2 Ascertain the functionality & correctness of the instrument.
	4.3 Measure dimension of the components & record data to analyse with the given drawing/measurement.

5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day-to-day work to improve productivity & quality.	5.1 Explain the concept of productivity and quality tools and apply during execution of job.
	5.2 Understand the basic concept of labour welfare legislation and adhere to responsibilities and remain sensitive towards such laws.
	5.3 Knows benefits guaranteed under various acts.
6. Explain energy conservation, global warming, pollution and contribute in day-to-day work by optimally using available resources.	6.1 Explain the concept of energy conservation, global warming, pollution and utilize the available resources optimally & remain sensitive to avoid environment pollution.
	6.2 Dispose waste following standard procedure.
7. Explain personnel finance, entrepreneurship and manage/ organize related task in day-to-day work for personal & societal growth.	7.1 Explain personnel finance and entrepreneurship.
	7.2 Explain role of various schemes and institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non-financing support agencies to familiarize with the policies/ programmes, procedure & the available scheme.
	7.3 Prepare Project report to become an entrepreneur for submission to financial institutions.
8. Plan and organize the work related to the occupation.	8.1 Use documents, drawings and recognize hazards in the work site.
	8.2 Plan workplace/ assembly location with due consideration to operational stipulation.
	8.3 Communicate effectively with others and plan project tasks.
	8.4 Assign roles and responsibilities of the co-trainees for execution of the task effectively and monitor the same.

SPECIFIC LEARNING OUTCOMES	
LEARNING OUTCOME	**ASSESSMENT CRITERIA**
FIRST YEAR	
9. Check & perform Measuring & marking by using various Measuring & Marking tools (Vernier Caliper, Micrometer, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.)	9. 1 Plan the working principles of measuring instruments and special tools required for auto workshop.
	9. 2 Select, care and use of measuring instrument.
	9. 3 Set up the measured value with workshop manual and quality concepts and proper safety.
	9. 4 Carry out decision on whether to replace or not.
10. Plan & perform basic fastening & fitting operation by using correct hand tools, Machine tools & equipments.	10.1 Describe the purpose, use of auto hand tools.
	10.2 List the safety rules for hand tools.
	10.3 Select the correct tool for the job.
	10.4 Set up the tacked pieces in specific position.
	10.5 Joint components by Brazing, Soldering, Riveting as per given drawing.
	10.6 Produce components by different operation (Drilling, Reaming, Taping, Dieting)
11. Trace and Test all Electrical & Electronic components & circuits and assemble circuit to ensure functionality of system. Charge and test batteries used in vehicle.	11.1 Plan and prepare as per procedure and safety methods of soldering the cable ends using an electric soldering iron.
	11.2 Use crimping tool to make a circuit joint.
	11.3 Explain the connection of an ammeter, voltmeter, and ohmmeter in a circuit trouble shooting.
	11.4 State open & short circuit, series and parallel circuits.
	11.5 Verify DC series & parallel circuits and its characteristics.
	11.6 Check out the open and short circuits in the lighting circuits.
	11.7 Verify ohm's law and measure resistance using rheostat.
	11.8 Check the voltage drop in the auto electrical system by using multimeter.
	11.9 Trace the auto electrical components by using vehicle wiring circuits.

	11.10 Check the condition of the solenoid switch in the starting system.
	11.11 Determine the forward to reverse resistance ratio of diodes and identify good / bad diodes.
	11.12 Perform battery charging
12. Join components by using Arc & Gas welding.	12.1. Determine the principles, process of different welding process applicable in automobile industry.
	12.2. Demonstrate the edge preparation for butt and fillets welds.
	12.3. 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.
	12.4. Set and tack metals as per drawing.
	12.5. Deposit the weld maintaining appropriate technique and safety aspects.
	12.6. Cool the welded joint by observing appropriate cooling method. Use post heating, peening etc. as per requirement.
	12.7. Clean the joint and inspect the weld for its uniformity and different types of surface defects.
13. Check & Interpret Vehicle Specification data and VIN. Select & operate various Service Station Equipments	13. 1 Identify of different type of vehicle.
	13. 2 Identify the different vehicle specification data and information
	13. 3 Demonstrate the garage, service station different equipment
14. Dismantle & assemble of Engine from vehicle (LMV/HMV) along with other accessories	14.1 Demonstrate safe handling of lifting equipments.
	14.2 Identify the problems in the vehicle
	14.3 Perform the periodic testing of lifting equipments.
	14.4 Judge whether this Engine needs overhaul or not
	14.5 Perform dispose the used engine oil and safety measures in disposal.
	14.6 Perform on vehicle Engine Tests to analyze need of Overall
	14.7 Perform sequencing and identifying parts at the time of dismantle and assemble.
	14.8 Then Dismantle of Engine & Overhaul is ok, refer below attached screen shot for your reference

15. Overhaul Engine and check functionality	15. 1 Remove accessories fitted to the engine prior to engine removal.
	15. 2 Align the left hook of the crane with engine lifting bracket.
	15. 3 Remove the engine mountings
	15. 4 Remove the engine from vehicle.
	15. 5 Mount the engine on the vehicle.
	15. 6 Align and fit the gear box to the engine.
	15. 7 Refit the accessories to the engine.
	15. 8 Set the Timing of the Engine
	15. 9 Overhaul Valve Actuating Mechanism (Hydraulic latch actuator).
16. Trace, Test & Repair Cooling and Lubrication System of engine	16.1 Overhauling of Radiator/ Recovery tank water pump, oil pump, air cleaner
	16.2 Check the engine oil pressure at different r.p.ms.
	16.3 Overhaul the Oil Pump.
	16.4 Set Checking &Top up coolant, Draining & refilling coolant.
	16.5 Testing cooling system pressure & Thermostat
	16.6 Cleaning & reverse flushing. Overhauling water pump and refitting and repairs to oil flow pipe lines and unions if necessary.
	16.7 Check proper functioning of radiator fan (Mechanical/ Electrical / viscous / belt drive).
17. Trace & Test Intake and Exhaust system of engine	17.1 Overhauling of manifolds, silencer and tail pipe, air compressor, air exhauster and inspect parts of air exhauster, turbo charger from vehicle.
	17.2 Overhauling of air filter, clean & refit air cooler, fuel filter assembly and replace filter elements
	17.3 Remove and replace EGR valve, Use Smoke meter to test emission from engine.
18. Service Fuel System and check proper functionality	18.1 Overhauling fuel feed pump, fuel injector pump.
	18.2 Test injectors, check the injection timing by the spill cut off method
19. Test Engine Performance	19.1 Start engine, adjust idling speed.

and set idling speed	19.2 Overhaul the Governor (Mechanical & Pneumatic)
	19.3 Set the Engine Timing.
	19.4 Check performance of engine off load.
	19.5 Servicing of the cylinder and replace the defective parts.
20. Monitor emission of vehicle and execute different operation to obtain optimum pollution as per emission norms.	20.1 Check vacuum pump for its functioning.
	20.2 Perform troubleshooting of EVAP Canister.
	20.3 Inspect PCV hose, inspect PCV Valve and check for vacuum.
	20.4 Clean the PCV valve and replace if required.
	20.5 Inspect & clean EGR.
21. Carryout overhauling of Alternator and Starter Motor.	21.1 Trace the circuit from the alternator to the battery.
	21.2 Perform servicing of starter motor.
	21.3 Perform servicing of alternator and test its performance.
	21.4 Check belt condition and replace as per requirement.
22. Diagnose & rectify the defects in LMV/HMV to ensure functionality of vehicle.	22.1 Plan and diagnose the problem if engine not starting.
	22.2 Diagnose high fuel consumption and engine overheating.
	22.3 Diagnose for excessive oil consumption and low/high engine oil pressure.
	22.4 Diagnose for abnormal engine noise.
	22.5 Diagnose for engine's poor performance.
SECOND YEAR	
23. Plan & perform maintenance, diagnosis and servicing of transmission system	23.1 Select and wear suitable personal protective equipment and use vehicle coverings throughout all removal and replacement activities.
	23.2 Work in compliance with standard safety norms
	23.3 Carry out their removal and replacement activities by reviewing: • Vehicle technical data • Removal and replacement procedure • Legal requirements
	23.4 Use technical information to support the overhauling

		of light vehicle/Heavy Vehicle transmission units.
	23.5	Select tools and materials for the job and make this available for use in a timely manner.
	23.6	Use the tools and equipment in the way specified by manufacturers to overhaul light vehicle/Heavy vehicle transmission unit.
	23.7	Ascertain the assessment of the dismantled unit identifies accurately its condition and suitability for overhaul
	23.8	Conduct appropriate and target oriented discussions with higher authority and within the team, where an overhaul is uneconomic or unsatisfactory to perform
	23.9	Perform all overhauling of light vehicle transmission units, adhering to the specifications and tolerances for the vehicle and following: a. Manufacturer's approved overhauling methods b. Standard repair methods c. health and safety requirements. d. workplace procedures Range: a. Gear box b. Single plate clutch assembly c. Diaphragm clutch assembly d. Constant mesh Gear box e. synchromesh gear box f. Gear linkages g. Propeller shaft h. Universal Slip Joint i. Rear axle assembly j. Differential assembly
	23.10	Use testing methods that comply with the manufacturer's requirements.
	23.11	Adjust the unit's components correctly where necessary to ensure that they operate to meet the vehicle operating requirements.
24. Plan & perform maintenance, diagnosis	24.1	Select and wear suitable personal protective equipment and use vehicle coverings throughout all

and servicing of Vehicle Control System	removal and replacement activities. Work in compliance with standard safety norms.
	24.2 Work in compliance with standard safety norms.
	24.3 Use technical information to support the overhauling of light vehicle/Heavy Vehicle steering and suspension system
	24.4 Carryout their removal and replacement activities by reviewing: • Vehicle technical data • Removal and replacement procedures • Legal requirements
	24.5 Use the tools and equipment in the way specified by manufacturers to overhaul steering, suspension and braking system
	24.6 Ascertain the assessment of the dismantled unit identifies accurately its condition and suitability for overhaul
	24.7 Perform all overhauling of light vehicle Chassis units, adhering to the specifications and tolerances for the vehicle and following: a. The manufacturer's approved overhauling methods b. Standard repair methods c. health and safety requirements. d. workplace procedures Range: a) Shackle b) Leaf spring c) Front axle d) Front and rear suspension e) Steering Gearbox- worm and roller type f) Steering Gearbox- Reticulating ball type g) Master cylinder h) Tandem Master cylinder i) Front and rear brake j) Wheel cylinder k) Vacuum booster l) Air servo unit m) Air tank (reservoir)

		n) Brake valve o) Hand/parking brake p) Single brake chamber q) Slack adjuster r) Disc brake
	24.8	Carry out wheel balancing to within acceptable limits
	24.9	Carryout the recommended trouble shooting procedure as per Workshop manual for a) Abnormal wear b) Wheel wobbling c) Poor self centering d) Hard steering
	24.10	Rectify the defects following the vehicle manufacture standard procedure
	24.11	Use testing methods that comply with the manufacturer's requirements
	24.12	Adjust the unit's components correctly where necessary to ensure that they operate to meet the vehicle operating requirements.
	24.13	Ensure replaced driveline units and assemblies conform to the vehicle operating specification and any legal requirements
25. Troubleshoot vehicle Engine components and ascertain repair	31.25	Carryout the recommended trouble shooting procedure as per Workshop manual for a) Engine Not starting – Mechanical & Electrical causes, b) Engine Noise. c) High fuel consumption, d) Engine overheating, e) Low Power Generation, f) Excessive oil consumption, g) Low/High Engine Oil Pressure,
	31.26	Rectify the defects following the vehicle manufacture standard procedure.
26. Plan & service Electronic Control System and check functionality.	26.1	Identify the MPFI components by its name and Locate the MPFI Components in the given engine
	26.2	Ascertain and select tools and materials for the job and make this available for use in a timely manner.
	26.3	Plan work in compliance with standard safety norms.

		26.4	Connect the scan tool to the Data link connector of given engine
		26.5	Read the Error code
		26.6	Test the reference voltage and continuity of the circuit as per vehicle wiring circuit
		26.7	Repair/Replace the defective part or wiring
		26.8	Erase the error memory
		26.9	Start and check the engine
27.	Diagnose & rectify the defects in vehicle to ensure functionality of vehicle	27.1	Ascertain and select tools and materials for the job and make this available for use in a timely manner.
		27.2	Plan work in compliance with standard safety norms.
		27.3	Troubleshoot the Engine for Engine Crank but will not start
		27.4	Check Ignition Timing of Engine.
		27.5	Check the function of Mal Indication Lamp (MIL) ,Oil pressure warning light, charge indication light, Temperature warning light/gauge, Seat belt warning light, ABS warning light, Parking light, fuel level gauge
		27.6	Test the various sensors fitted on the given engine using multi meter/scan tool
28.	Carryout overhauling of charging system	28.1	Check Charging system for proper functioning as per manufacturer guidelines.
		28.2	Check alternator for proper functioning
		28.3	Remove alternator from the vehicle
		28.4	Overhaul and check alternator for proper function
		28.5	Refit Alternator to the vehicle and check for functioning
29.	Carryout overhauling of starting system	29.1	Check starting system for proper functioning as per manufacturer guidelines.
		29.2	Check starter for proper functioning
		29.3	Remove starter from the vehicle.
		29.4	Overhaul and check starter for proper function
		29.5	Refit starter to the vehicle and check for functioning
30.	Troubleshoot electrical components of vehicle and ascertain repair	30.1	Ascertain and select tools and materials for the job and make this available for use in a timely manner.
		30.2	Plan work in compliance with standard safety norms
		30.3	Carryout the diagnostic procedure for the following troubles in the electrical accessories a) No horn, poor horn, continuous horn b) Wiper and washer no operation, continuous operation,

		Intermittent operation c) Power window no operation d) Power Door lock no operation e) Immobilizer system and keyless entry no operation f) Trouble(Error indication) in Automatic seat belt system g) g) Trouble(Error indication) in Air bag system
31.	Overhaul, service and testing Vehicle Air Conditioning system, its parts and check functionality	31.1 Ascertain and select tools and materials for the job and make this available for use in a timely manner.
		31.2 Plan work in compliance with standard safety norms.
		31.3 Carryout the diagnostic procedure for the following troubles a) No cooling b) Intermittent cooling c) Insufficient cooling d) Abnormal noise from compressor, magnetic clutch, condenser, evaporator and blower motor e) High pressure gauge-pressure High and low f) f) Low pressure gauge-pressure High and low
32.	Drive vehicle following Traffic Regulations and maintenance of good road conduct.	32.1 Follow the Road safety measures, Traffic rules and statutory regulations.
		32.2 Practice straight Driving
		32.3 Practice Driving through lanes and curves
		32.4 Practice Reverse Driving
		32.5 Practice Overtaking of another vehicle
		32.6 Practice Driving through sand and wet surface
		32.7 Practice Parking and Diagonal parking