MECHANIC REPAIR & MAINTENANCE OF LIGHT VEHICLES

COMPETENCY BASED CURRICULUM

(Duration: 2 Yrs.)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 5

SECTOR – AUTOMOBILE

सत्यमेव जयते

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

Directorate General of Training

Skill India
कौशल भारत-कुशल भारत

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(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 5

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
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1. BACKGROUND

1.1 Apprenticeship Training Scheme under Apprentice Act 1961

The Apprentices Act, 1961 was enacted with the objective of regulating the programme of training of apprentices in the industry by utilizing the facilities available therein for imparting on-the-job training. The Act makes it obligatory for employers in specified industries to engage apprentices in designated trades to impart Apprenticeship Training on the job in industry to school leavers and person having National Trade Certificate (ITI pass-outs) issued by National Council for Vocational Training (NCVT) to develop skilled manpower for the industry**.** There are four categories of apprentices namely**; trade apprentice, graduate, technician and technician (vocational) apprentices.**

Qualifications and period of apprenticeship training of **trade apprentices** vary from trade to trade. The apprenticeship training for trade apprentices consists of basic training followed by practical training. At the end of the training, the apprentices are required to appear in a trade test conducted by NCVT and those successful in the trade tests are awarded the National Apprenticeship Certificate.

The period of apprenticeship training for graduate (engineers), technician (diploma holders and technician (vocational) apprentices is one year. Certificates are awarded on completion of training by the Department of Education, Ministry of Human Resource Development.

1.2 Changes in Industrial Scenario

Recently we have seen huge changes in the Indian industry. The Indian Industry registered an impressive growth during the last decade and half. The number of industries in India have increased manifold in the last fifteen years especially in services and manufacturing sectors. It has been realized that India would become a prosperous and a modern state by raising skill levels, including by engaging a larger proportion of apprentices, will be critical to success; as will stronger collaboration between industry and the trainees to ensure the supply of skilled workforce and drive development through employment. Various initiatives to build up an adequate infrastructure for rapid industrialization and improve the industrial scenario in India have been taken.

1.3 Reformation

The Apprentices Act, 1961 has been amended and brought into effect from 22nd December, 2014 to make it more responsive to industry and youth. Key amendments are as given below:

- Prescription of number of apprentices to be engaged at establishment level instead of trade-wise.
- Establishment can also engage apprentices in optional trades which are not designated, with the discretion of entry level qualification and syllabus.
- Scope has been extended also to non-engineering occupations.
- Establishments have been permitted to outsource basic training in an institute of their choice.
- The burden of compliance on industry has been reduced significantly.

2. TRAINING SYSTEM

2.1 GENERAL

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

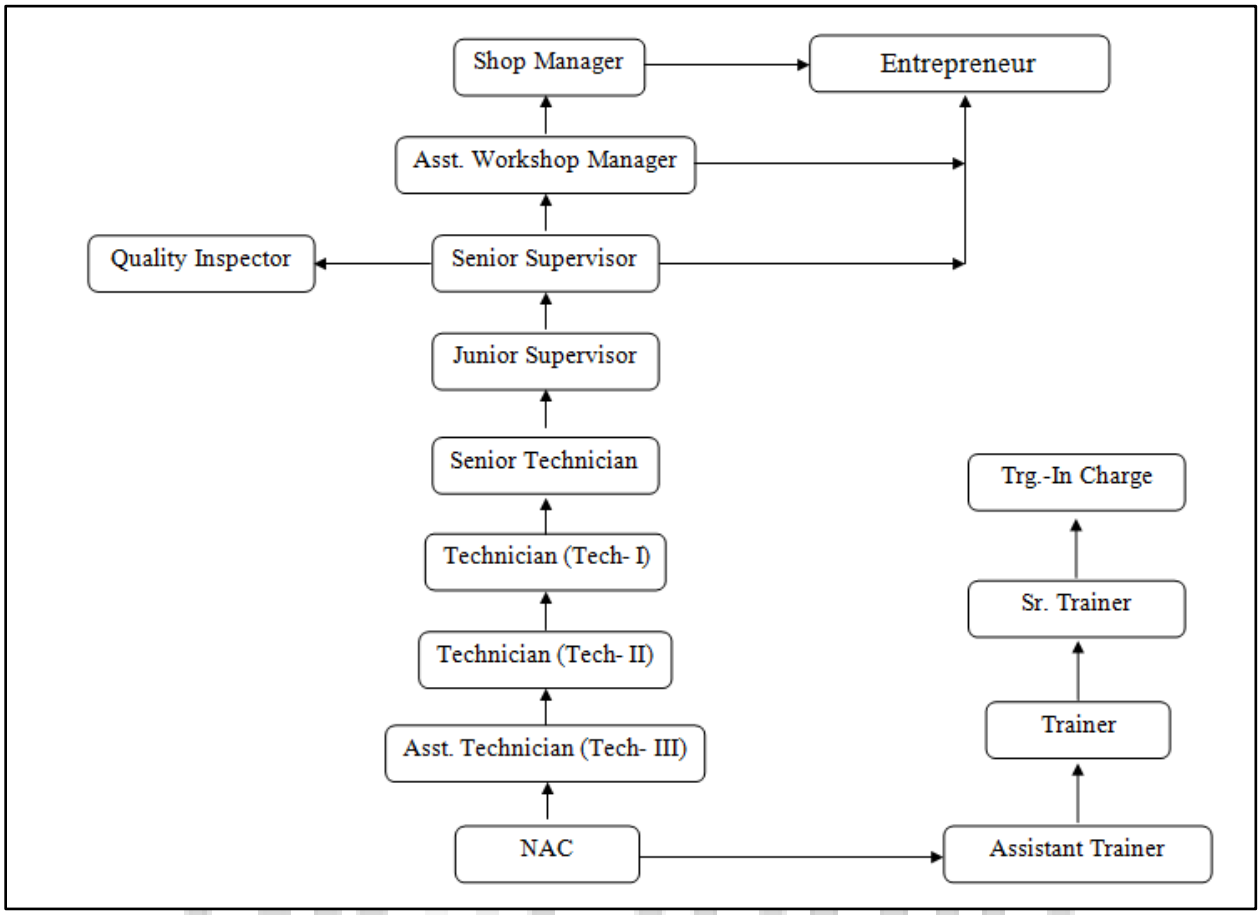
Mechanic Repair & Maintenance of Light Vehicles trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of two years (02 Blocks) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional - skills and knowledge, while Core area - Workshop Calculation and science, Engineering Drawing and Employability Skills imparts requisite core skills & knowledge and life skills. After passing out the training programme, the trainee is being awarded National Apprenticeship Certificate (NAC) by NCVT having worldwide recognition.

Broadly candidates need to demonstrate that they are able to:

- Read & interpret technical parameters/document, plan and organize work processes, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional skill, knowledge, core skills & employability skills while performing jobs and solve problem during execution.
- Check the job/assembly as per drawing for functioning, identify and rectify errors in job/assembly.
- Document the technical parameters related to the task undertaken.

2.2 CAREER PROGRESSION PATHWAYS:

- Indicative pathways for vertical mobility.



2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two years (*Basic Training and On-Job Training*) : -

Total training duration details: -

Time (in months)	1-3	4-12	13-15	16-24
Basic Training	**Block– I**	**-----**	**Block – II**	**------**
Practical Training (On - job training)	**----**	**Block – I**	**------**	**Block – II**

A. Basic Training

For 02 yrs. Course (Engg) :-(**Total 06 months:** 03 months in 1st yr. + 03 months in 2nd yr.)

For 01 yr. course (Engg) :-(**Total 03 months:** 03 months in 1st yr.)

S No.	Course Element	Total Notional Training Hours	
		For 02 Yrs. course	**For 01 Yr. course**
1.	Professional Skill (Trade Practical)	550	275
2.	Professional Knowledge (Trade Theory)	240	120
3.	Workshop Calculation & Science	40	20
4.	Engineering Drawing	60	30
5.	Employability Skills	110	55
	Total (Including internal assessment)	**1000**	**500**

B. On-Job Training:-

For 02 yrs. Course (Engg) :-(**Total 18 months:** 09 months in 1st yr. + 09 months in 2nd yr.)

Notional Training Hours for On-Job Training: 3120 Hrs.

For 01 yr. course (Engg) :-(**Total 12 months**)

Notional Training Hours for On-Job Training: 2080 Hrs.

C. Total training hours:-

Duration	Basic Training	On-Job Training	Total
For 02 yrs. course (Engg)	1000 hrs.	3120 hrs.	4120 hrs.
For 01 yr. course (Engg)	500 hrs.	2080 hrs.	2580 hrs.

2.4 ASSESSMENT & CERTIFICATION:

The trainee will be tested for his skill, knowledge and attitude during the period of course and at the end of the training programme as notified by Govt of India from time to time. The Employability skills will be tested in first two semesters only.

a) The **Internal assessment** during the period of training will be done by **Formative assessment method** by testing for assessment criteria listed against learning outcomes. The training institute have to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the template (Annexure – II).

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

2.4.1 PASS REGULATION

The minimum pass percent for Practical is 60% & minimum pass percent for Theory subjects 40%. The candidate pass in each subject conducted under all India trade test.

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 assessment. Due consideration should be given while assessing for team work, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitivity to 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 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

Evidences of internal assessments are to be preserved until forthcoming semester examination for audit and verification by examination 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 with occasional guidance and showing due regard for safety procedures and practices,	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment

has produced work which demonstrates attainment of an acceptable standard of craftsmanship.	• Below 70% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A fairly good level of neatness and consistency in the finish • Occasional support in completing the project/job.
(b) Weightage in the range of above75% - 90% to be allotted during assessment	
For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.	• Good skill levels in the use of hand tools, machine tools and workshop equipment • 70-80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A good level of neatness and consistency in the finish • Little support in completing the project/job
(c) Weightage in the range of above 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% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Brief description of Job roles:

Mechanic, Automobile repairs overhauls and services motor vehicles to keep them in good running condition. Examines vehicle to ascertain nature and location of defects either by running engine or driving vehicle on road. Dismantles partially or completely defective unit or parts of vehicle such as engine, gear box, rear axle, front axle, steering assembly, radiator, etc. according to nature of repairs to be done, using hoist, jack, pullers, hand tools and other devices. Measures essential parts like cylinder, bores piston, sizes crank pins etc. using gauges, micrometer and other precision tools and gets cylinders re-bored, liners filled, valve seats refaced, bearings re-metalled etc. as necessary. Repairs or overhauls and assembles engine by performing tasks similar to those of Mechanic Petrol or Diesel Engine such as replacing defective parts, scrapping bearings, grinding valves, setting timing, cleaning injectors, tuning carburetor etc. according to maker's specification. Replaces or repairs defective parts of gear box, rear axle, steering mechanism etc. and sets them right ensuring correct alignment, clearance, meshing of gears, specified movements and operations. Relines and builds brakes, sets wheel alignment, adjust, steering, clutch, hand brakes etc. fits new or repaired accessories and body parts, makes electrical connection and performs other tasks to effect repairs. Lubricates joints, tightens loose parts, tests performance of vehicle by driving on road and makes necessary adjustments to attain desired standard. May assemble complete vehicle from finished components.

Reference NCO Code 2015: 7231.0100 - Mechanic, Automobile

4. NSQF LEVEL COMPLIANCE

NSQF level for Mechanic Repair & Maintenance of Light Vehicles trade under ATS: **Level 5**

As per notification issued by Govt. of India dated- 27.12.2013 on National Skill Qualification Framework total 10 (Ten) Levels are defined.

Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are:

a. Process
b. professional knowledge,
c. professional skill,
d. core skill and
e. Responsibility.

The Broad Learning outcome of Mechanic Repair & Maintenance of Light Vehicles trade under ATS mostly matches with the Level descriptor at Level- 5.

The NSQF level-5 descriptor is given below:

Level	Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility
Level 5	Job that requires well developed skill, with clear choice of procedures in familiar context.	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problem by selecting and applying basic methods, tools, materials and information.	Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication.	Responsibility for own work and Learning and some responsibility for other's works and learning.

5. GENERAL INFORMATION

Name of the Trade	MECHANIC REPAIR & MAINTENANCE OF LIGHT VEHICLES
NCO - 2015	7231.0100
NSQF Level	Level – 5
Duration of Apprenticeship Training (Basic Training + On-Job Training)	Two years (02 Blocks each of one year duration).
Duration of Basic Training	a) Block –I : 3 months b) Block – II : 3 months **Total duration of Basic Training: 6 months**
Duration of On-Job Training	a) Block– I: 9 months b) Block–II : 9 months **Total duration of Practical Training: 18 months**
Entry Qualification	Passed 10thclass examination under 10+2 system of education or its equivalent.
Selection of Apprenticeship	The apprentices will be selected as per Apprenticeship Act amended time to time.
Instructors Qualification for Basic Training	As per ITI instructors qualifications as amended time to time for the specific trade.
Infrastructure for Basic Training	As per related Trade of ITI
Examination	The internal examination/ assessment will be held on completion of each block. Final examination for all subjects will be held at the end of course and same will be conducted by NCVT.
Rebate to Ex-ITI Trainees	1year
CTS trades eligible for Mechanic Repair & Maintenance of Light Vehicles Apprenticeship	Mechanic Repair & Maintenance of Light Vehicles.

Note:

- *Industry may impart training as per above time schedule for different block, however this is not fixed. The industry may adjust the duration of training considering the fact that all the components under the syllabus must be covered. However the flexibility should be given keeping in view that no safety aspects is compromised.*
- *For imparting Basic Training the industry to tie-up with ITIs having such specific trade and affiliated to NCVT.*

6. LEARNING OUTCOME

6.1 GENERIC LEARNING OUTCOME

The following are minimum broad Common Occupational Skills/Generic Learning Outcome after completion of the Mechanic Repair & Maintenance of Light Vehicles course of 02 years duration under ATS.

Block I & II

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Understand and explain different mathematical calculation & science in the field of study. *[Different mathematical calculation & science – Conversion of Units, Percentage, & Mensuration-Area & Volume of different surfaces and solids, and Properties of materials, Ferrous & non-ferrous metals, Mass, weight, Density, Specific Gravity etc.]*
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical figures like Triangles, Square, Rectangle, Rhombus, Parallelogram, Circle etc., Lettering & Numbering, Freehand sketching of Hand tools used for Mechanic Repair & Maintenance of Light Vehicles / Wireman / Electrician/ trade & wire joints, Signs & symbols for Electrical components used in electrical circuits and AC/DC systems, Electrical wiring diagram of different lamps, Schematic diagram of plate and pipe earthing, insulators used in over head line, Layout diagram of a substation, Single line Diagram of Electrical substation feeders.]*
4. Select and ascertain measuring instrument and measure dimension of components and record data.
5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
8. Plan and organize the work related to the occupation.

6.2 SPECIFIC LEARNING OUTCOME

Block – I

1. Checks main bearing and crank shaft.
2. Checks connecting rod bearings.
3. Checks and cleans oil passages in the crank shaft and engine block.
4. Overhauls oil pump.
5. Checks timing chain tension, replacing worn chain and warping in the cylinder head.

6. Fits new bearing shells and adjusting main bearings.
7. Overhauls petrol pump and testing, Replace hose pipes and checking leaks.
8. Start engine and adjust slow speed of engine.
9. Trouble shooting in cooling system, lubrication system and fuel feed system.
10. Practice starting and stopping a diesel engine.
11. Overhauls Transfer Pumps (feed pumps).
12. Removes fuel injection pump from running engine, cleaning changing Lubrication oil, refitting and setting injection timing.

Block – II

13. Checks exhaust gases and rectifying defects for improper exhaust gas.
14. Repair components in lighting circuit.
15. Overhauls a dynamo in the vehicle.
16. Study wiring circuit of traffic signal flasher circuit and rectifying defects in the circuit.
17. Checks electronic control unit and its circuit in a vehicle and replace.
18. Identify noise and rectifying in transmission system.
19. Overhauls rear axle assembly, adjusting tooth contract in final drive Assembly.
20. Overhauls front wheel drive front axle.
21. Care and maintenance of Air compressor and Hydraulic hoist.
22. Care and maintenance of valve refacer, injector, tester, spark plug, taster and car washer.
23. Diagnosis of faults in engine, steering, brakes and transmission system and rectifying them.
24. Use, care and maintenance of vacuum/pressure gauges in diagnosis engine troubles.

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

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING OUTCOME	
LEARNING OUTCOMES	**ASSESSMENT CRITERIA**
1. Recognize & comply 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 off 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	2.1 Explain concept of basic science related to the field

mathematical calculation & science in the field of study. apply in day to day work.*[Different mathematical calculation & science - Conversion of Units, Percentage, & Mensuration-Area & Volume of different surfaces and solids, and Properties of materials, Ferrous & non-ferrous metals, Mass, weight, Density, Specific Gravity etc.]*	such as Material science - Properties of materials, Ferrous & non-ferrous metals, etc.
	2.2 Mass, weight, Density, Specific Gravity etc.
	2.3 Use scale/ tapes to measure as per specification.
	2.4 Calculate area / volume of the materials.
	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.
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-. Geometrical figures like Triangles, Square, Rectangle, Rhombus, Parallelogram, Circle etc., Lettering & Numbering, Freehand sketching of Hand tools used for Mechanic Repair & Maintenance of Light Vehicles / Wireman / Electrician/ trade & wire joints, Signs & symbols for Electrical components used in electrical circuits and AC/DC systems, Electrical wiring diagram of different lamps, Schematic diagram of plate and pipe earthing, insulators used in over head line, Layout diagram of a substation, Single line Diagram of Electrical substation feeders.]*	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.
	3. 4. Read & interpret the signs and symbols for electrical components and AC/DC systems.
	3. 5. Encounter drawings with electrical circuit diagrams and layout diagrams.
4. Select and ascertain measuring instrument and measure dimension of components and record data.	4.1 Select appropriate measuring instruments such as Ammeter, voltmeter, meggar, earth tester etc. (as per tool list).
	4.2 Ascertain the functionality & correctness of the instrument.
	4.3 Measure dimension of the components & record data to analyse the with given drawing/measurement.
5. Explain the concept in	5.1 Explain the concept of productivity and quality

productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & 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 and 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 recourses 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 familiarizes 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 OUTCOME	
Block-I & II (Section:10 in the competency based curriculum)	
*Assessment Criteria i.e. the standard of performance, for each specific learning outcome mentioned under **block – I & block – II** (section: 10) must ensure that the trainee achieves well developed skill with clear choice of procedure in familiar context. Assessment criteria should broadly cover the aspect of **Planning** (Identify, ascertain, estimate etc.); **Execution** (perform, illustration, demonstration etc. by applying 1) a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information 2) Knowledge of facts, principles, processes, and general concepts, in a field of work or study 3)Desired Mathematical Skills and some skill of collecting and organizing information, communication) and **Checking / Testing** to ensure*	

functionality during the assessment of each outcome. The assessments parameters must also ascertain that the candidate is responsible for own work and learning and some responsibility for other's work and learning.

8. SYLLABUS

BASIC TRAINING (Block – I)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1.	Description of safety equipment their use safety rules to be observed in an Automobiles repair shop. Accident & their causes-up keep of fire extinguishers. Familiarization of the tools and machinery available in the shop. Their use and upkeep, importance of cleanness of workshop, tools, jacks, trays and horses.	Importance of safety & general precautions to be observed in the shop, fire extinguishers used for different types of fire storing & handling of inflammable materials elementary first aid. Different types of Fire Extinguishers used for different types of fires.
2.	General servicing of vehicles washing, cleaning, oiling, greasing and lubrication of vehicle. Inspection of under carriage of vehicle. Tightening all loose bolts & nuts-use of hydraulic jacks hoist and horses used in the shop selecting materials for packing cutting packing's and gaskets practice in use of locking devices such as lock nuts, cotter and split pins keys, Circlip, lock rings, lock washers-wire, locking location where they are used.	General description of motor vehicles major assemblies description location and function of each locking methods and devices used in vehicles hydraulic and screw jacks hydraulic hoist & air compressor their description & uses.
3.	Remove wheels from vehicle, dismantling tyres and tubes checking puncture assembling inflating to correct pressure. Rotating the wheels in vehicle minor repairs to wheels and tyres.	Description of wheels and tyres types selection of tyres, ply rating, inflation pressure and carrying capacity, storage of tyres.
4.	Inspect frame checking alignment of frame servicing of spring replacing new bushes in shackle pins changing hushes in shock absorbers-cleaning & lubrication of wheel bearings, adjusting wheel bearings. Remove king pins and bushes replacing new bushes & plus after removing bushes & lubrication of king pin bushes in the front, independent suspension system.	Frames-description and function common troubles conventional suspension system. Types of leaf springs used different types of shock absorbers. Their description operation & maintenance. Description of different types of independent suspension system, special features in each system maintenance and lubrication of front suspension system.
5.	Inspect and overhaul front & rear	The front axle description & functions

	suspension rear springs, coil spring torsion bars, check up main axle for alignment. Inspect and adjust steering linkages, after replacement of worn parts alignment of steering wheels with respect to front wheel, check and correct toe-in.	types of steering knuckles arrangement of steering knuckle joint general layout of steering linkages. Description of different types of steering boxes (latest type of steering boxes), special features of each adjustments repair and maintenance of steering and boxes power steering description and its advantages.
6.	Inspect and overhaul steering boxes adjusting steering gear backlash, and end play check and adjust toe-in, camber angles checking king-pin angle & caster angle with special gauges. Inspect and overhauling of different types of power steering (Egg. Hydraulic and Electronic Power Steering). Adjust brake pedal play dismantling wheel break assembly cleaning and inspecting adjusting brake shoes for proper clearances, bleeding hydraulic brakes & Disk brakes.	Description of Ackerman's angle, caster, camber toe in and toe-out on turns, purpose and effects of these angles. Arrangement of brakes in cars and trucks-description of hand brakes, its purposes layout of mechanical and hydraulic breaking system in cars.
7.	Perform removing of master cylinder, dismantling cleaning and inspection of parts assembling and testing bleeding the braking system after cleaning the pipelines. Dismantling and Assembling of Vacuum Servo brakes.	Master cylinders common troubles & remedy. Engine Exhaust brakes. T.B. Valves used in light vehicles.
8.	Dismantle wheel brake assembly removing old lining & fitting new lining on the brake shoe removing, cleaning of brake drums inspecting wheel cylinders & brake drums-fitting new cups and brake hosepipes, reassembling adjusting wheel bearing ad testing adjusting all 4 wheel brakes.	Brake lining types of uses relining the brake shoes precautions to be observed wheel cylinders description function and types brake fluids. Description and use types of fluids used.
9.	Adjust clutch pedal play removing gear box and clutch assembly from vehicle. Dismantling clutch assembly, cleaning inspecting parts.	Layout of transmission system description of single plate clutch different types of clutches used in vehicle. Study of Hydraulic clutches.
10.	Perform assembling of pressure plate adjusting the fingers checking run out of fly wheel and aligning clutch assembly with flywheel.	Fluid coupling description operation & advantage of using fluid coupling common troubles and remedy.
11.	Dismantle a synchromesh gear box,	Synchromesh gear box advantages

	cleaning, inspecting parts replacing worn out defective parts assembling & testing for correct performance identifying noises from gear boxes and rectifying.	description, operation in different gear positions common trouble and remedy types of synchromesh gearboxes their special features. Study about overdrives. Transfer cause used in 4 wheel drive vehicles.
12.	Remove open type propeller shaft from vehicle, removing universal joints cleaning replacing worn out parts, re-assembling & refitting to vehicle-special precautions while removing torque tube drive shaft.	Universal joints and propeller shaft-open and closed type propellers shaft types of universal joints, care and maintenance constant velocity joints special and advantages.
13	**Assessment/Examination 03days**	

Note: - *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

BASIC TRAINING (Block – II)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	Remove rear axle assembly from vehicle, dismantling, cleaning, inspecting parts for wear and damage, cutting packing's/gaskets- removing tail pinion and bearings cleaning and inspection of oil-seals and bearings.	Description & functions of final drive assembly crown wheel and tail pinion hypoid gear and its lubrication descriptions of differential and its principle of operation.
2	Trouble shooting in the transmission system of vehicle detecting noises from clutch, gear box, universal joints and rear axle assembly dismantling transfer case from vehicle, cleaning, inspecting replacing worn parts, reassembling & fitting to vehicle.	Description & purpose of optional fittings such as transfer case free wheel power take off common troubles in these unit and their remedy care and maintenance.
3	Dismantle unserviceable engine cleaning studying the parts in the engine and reassembling the engine practice in the use of correct tools and right procedure.	Description of internal and external combustion engineers, different types of I.C. engines. Important working parts in the engine, the 4-stroke cycle of operation.
4	Dismantle an unserviceable engine, cleaning of parts in the engine, measuring of cylinder bore crank pins main journals pistons studying valve operating mechanism	Two-stroke cycle operation difference between 4 stroke & 2 stroke cycle engines. Description of valve operating mechanism & valve timing description and function of valve spring guide tappets, valve seals and locks.
5	Check compression pressure in a running engine dismantling the cylinder head from the engine, decarbonising the cylinder head, removing the valves cleaning re assembling and adjusting tappets.	Description & function of cylinder block cylinder head cylinder liners reconditioning of cylinder heads.
6	Remove connecting rod assembly, cleaning & checking bearing clearances, replacing bearing shells, setting correct clearances. Measuring wear in crank pins and main journals in crank shaft.	Description & functions of connecting rod. Materials used for connecting rods-big end and main bearings shells piston pins and locking methods of piston-pins crank shaft description function & types common trouble & remedy.
7	Assemble crankshaft, main bearings, connecting rods and piston assembly in the engine, fitting cylinder head and starting the engine and tuning up engine for	Firing order of the different types engine and crank shaft balancing description of the fly wheel and its function crank case and oil sump.

	smooth slow speed running with the help of using torque wrench, at proper torque & sequence.	
8	Check cooling system for overheating cleaning radiators, dismantling, cleaning, assembling and testing water pump, reverse flushing the system and adjusting the fan belt tension.	Engine cooling methods air & water-cooling radiators, pump, thermostats and fan, their description, function care and maintenance reasons for engine overheating.
9	Identify lubrication oil flow system in engine, overhauling oil filters, oil pump and setting the pressure release valve for correct oil pressure maintenance and repairs in the lubrication system in engine.	Need for lubrication of engine parts-friction lubrication oil and its properties, lubrication system types full flow and by pass flow system, components in lubrication system oil filters and pumps, types their special features and uses.
10	Simple repairs in fuel feed system overhauling of petrol pump, carburetors, fuel filters & air cleaners. Cleaning and servicing of primary fuel filters and pressure stage filters, removing feed pump dismantling cleaning, reassembling, re-fitting and testing the feed pump.	Fuel feed system in motor vehicles description and layout of the system description, operation, maintenance of fuel pump & fuel injector's filters and carburetors. Study of Diesel fuel supply systems, FIP timing setting, Injector testing, Diesel fitter changing Air bleeding from Diesel supply system, Engine Idling speed adjusting. Study bout CRDI (Common Rail Diesel Injector System) Study about LPG and CNG driving vehicles. Study about vehicle Air conditioning.
11	Repairs to solex and S.U. carburetors adjusting float level and slow speed adjustments studying the flow circuit in carburetors. Function of E.C.M. system & sensors	Types of carburettors, special features, advantages, different adjustments & their purposes. Types of sensors.
12	Identify electrical circuit in the engine assembly checking loose open and short circuits cleaning and testing spark plugs overhauling of distributor assembly checking and setting ignition timing.	Description of electrical circuits-ignition system and the components purpose of induction coil, condenser, spark plugs common troubles in ignition circuit & remedy.
13	**Assessment/Examination 03 days**	

Note: - *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

9. SYLLABUS - CORE SKILLS

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

Block – I		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration: - 30 hrs.)**
1.	Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	**Engineering Drawing: Introduction and its importance** - Viewing of engineering drawing sheets. Method of Folding of printed Drawing Sheet as per BIS SP:46-2003 **Drawing Instruments** : their Standard and uses - Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.
2.	Fractions, Decimal fraction, L.C.M., H.C.F., Multiplication and Division of Fractions and Decimals	**Lines :** - Definition, types and applications in Drawing as per BIS SP:46-2003 - Classification of lines (Hidden, centre, construction, Extension, Dimension, Section) - Drawing lines of given length (Straight, curved) - Drawing of parallel lines, perpendicular line - Methods of Division of line segment
3.	**Percentage** : Introduction, Simple calculation.	**Drawing of Geometrical Figures**: Definition, nomenclature and practice of - - Angle: Measurement and its types, method of bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements
4.	**Material Science** : properties -Physical & Mechanical, Types –Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals.	**Lettering and Numbering** as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case.

5.	Introduction of Iron, Cast Iron, Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous metals, Non-Ferrous Alloys.	Free Hand sketch of hand tools, measuring tools used in Electrician /wireman/ Lineman trade. Free hand sketch of wire joints. Free hand sketching of nuts bolts studs with dimensions from samples. Free hand sketching of solids and hollow bodies such as square rectangular, cylinder, rings and cones.
6.	Metric system, met weight & measurement units used conversion from FPS to Metric system & vice versa. Exercise involving metric and FPS. Shop problems in metric system.	Explanation of simple orthographic projection 1st angle. Free hand sketching of types and wheels. Exercise in simple orthographic projection. Explanation of 3rd angle projection. Free hand sketching of front axle assembly.
7.	Meaning of tenacity, elasticity brittleness, hardness, compressibility and ductility examples of each. Effect of alloying elements and properties of cast iron and steel alloys.	Views of simple hallow and solids bodies with dimensions sketching of steering linkages. Free hand sketching of different types of steering boxes
8.	Explanation of horse power and indicated horse power electrical equivalent of H.P. Applied problems on work, energy & power.	Free hand sketching of brake wheel cylinders cam adjuster, brake shoe assembly and anchor pins. Free hand sketching of the arrangement of gears inside the sliding mesh gear box in different gear position.

Block – II		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration: - 30 hrs.)**
1.	**Mass ,Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals	**Signs & Symbols of AC/DC System** Symbols used in electrical circuits. Electrical components.
2.	Square Root: Square and square root, method of finding out square roots. Simple problem using calculation.	Electrical wiring diagram of different lamps, room (3/4 point), stair case. Schematic diagram of plate and pipe earthing,
3.	**Mensuration :** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Surface area of solids – cube, cuboid, cylinder and Sphere.	Types of insulator used in over head line. (Half sectional views)
4.	Volume of solids – cube, cuboid, cylinder and Sphere. Measurement of angles.	Layout diagram of a substation. Single line Diagram of Electrical substation feeders.
5.	Calculation of volume of square, rectangular and conical blocks volume of cylinders solid and hollow. Calculation of volumes and weight of cubes, hexagonal prisms shop problems.	Free hand sketching of different types of rear axles. Free hand sketching of universal joints, silencer brackets and spring shackles. Free hand sketching of 4 stroke cycles and 2 stroke cycles.
6.	Geometry properties of angles, triangles and circles.	Drawing of 3 views of stepped & taper blocks in 3 rd angle projection.
7.	Magnets natural and artificial types poles of Magnets Magnetic fields. Heat and temperature Thermometers centigrade & Fahrenheit scales their conversion. Use of temperature measuring instruments their description & uses.	Drawing of plan, elevation and side views of tapered hollow objects. Free hand sketching of oil filters oil flow circuits oil pumps. Free hand sketching of ignition circuit of a vehicle sketching the circuit line diagram of magneto ignition.
8.	Electricity and its effects static & dynamic electricity – AC & DC differences. Lubricants types special purpose viscosity effects of temperature on viscosity high detergent oil and its applications. Lubricants types, viscosity and effects of temperature on viscosity high	Free hand sketching of electrical symbols and drawing of simple electrical circuits. Free hand sketching of charging system. Sketching starter motor circuit and solenoid switch circuit.

	detergent oils and their application	
9.	Gears and belt drives, problems on gear and belt torque definition its relation to forces on engine mounting, steering gear box and torque wrench. Inclined plane its uses examples and applied problems. Screws and screw jacks problems on screw jacks.	Free hand sketching of combustion chambers of different types. Free hand sketching of four stroke cycles and two stroke cycle engines. Free hand sketching of diesel fuel feed system and fuel filters.

9.2 EMPLOYABILITY SKILLS

(DURATION: - 110 HRS.)

Block – I (Duration – 55 hrs.)	
1. English Literacy Duration : 20 Hrs.	Marks : 09
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
Speaking / Spoken English	Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.
2. I.T. Literacy Duration : 20 Hrs.	Marks : 09
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
Computer Operating System	Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.
Word processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets.
Computer Networking and Internet	Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks),

	Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.
3. Communication Skills Duration : 15 Hrs.	Marks : 07
Introduction to Communication Skills	Communication and its importance Principles of Effective communication Types of communication - verbal, non verbal, written, email, talking on phone. Non verbal communication -characteristics, components-Para-language Body language Barriers to communication and dealing with barriers. Handling nervousness/ discomfort.
Listening Skills	Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening. Triple- A Listening - Attitude, Attention & Adjustment. Active Listening Skills.
Motivational Training	Characteristics Essential to Achieving Success. The Power of Positive Attitude. Self awareness Importance of Commitment Ethics and Values Ways to Motivate Oneself Personal Goal setting and Employability Planning.
Facing Interviews	Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview.
Behavioral Skills	Problem Solving Confidence Building Attitude
Block – II **Duration – 55 hrs.**	
4. Entrepreneurship Skills Duration : 15 Hrs.	Marks : 06
Concept of Entrepreneurship	Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. management, Entrepreneurial motivation.

	Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.
Project Preparation & Marketing analysis	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
Institutions Support	Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.
5. Productivity Duration : 10 Hrs. Marks : 05	
Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation - How improves or slows down.
Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
6. Occupational Safety, Health and Environment Education Duration : 15 Hrs. Marks : 06	
Safety & Health	Introduction to Occupational Safety and Health importance of safety and health at workplace.
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.
Accident & safety	Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety

	measures.
First Aid	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person.
Basic Provisions	Idea of basic provision legislation of India. safety, health, welfare under legislative of India.
Ecosystem	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
Energy Conservation	Conservation of Energy, re-use and recycle.
Global warming	Global warming, climate change and Ozone layer depletion.
Ground Water	Hydrological cycle, ground and surface water, Conservation and Harvesting of water.
Environment	Right attitude towards environment, Maintenance of in -house environment.
7. Labour Welfare Legislation Duration : 05 Hrs.	Marks : 03
Welfare Acts	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act.
8. Quality Tools Duration : 10 Hrs.	Marks : 05
Quality Consciousness	Meaning of quality, Quality characteristic.
Quality Circles	Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles.
Quality Management System	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
House Keeping	Purpose of House-keeping, Practice of good Housekeeping.
Quality Tools	Basic quality tools with a few examples.

10. DETAILS OF COMPETENCIES (ON-JOB TRAINING)

The **competencies/ specific outcomes** on completion of On-Job Training are detailed below: -

Block – I

1. Checks main bearing and crank shaft.
2. Checks connecting rod bearings.
3. Checks and cleans oil passages in the crank shaft and engine block.
4. Overhauls oil pump.
5. Checks timing chain tension, replacing worn chain and warping in the cylinder head.
6. Fits new bearing shells and adjusting main bearings.
7. Overhauls petrol pump and testing, Replace hose pipes and checking leaks.
8. Start engine and adjust slow speed of engine.
9. Trouble shooting in cooling system, lubrication system and fuel feed system.
10. Practice starting and stopping a diesel engine.
11. Overhauls Transfer Pumps (feed pumps).
12. Removes fuel injection pump from running engine, cleaning changing Lubrication oil, refitting and setting injection timing.

Block – II

13. Checks exhaust gases and rectifying defects for improper exhaust gas.
14. Repair components in lighting circuit
15. Overhauls a dynamo in the vehicle
16. Study wiring circuit of traffic signal flasher circuit and rectifying defects in the circuit
17. Checks electronic control unit and its circuit in a vehicle and replace
18. Identify noise and rectifying in transmission system
19. Overhauls rear axle assembly, adjusting tooth contract in final drive Assembly
20. Overhauls front wheel drive front axle
21. Care and maintenance of Air compressor and Hydraulic hoist
22. Care and maintenance of valve refacer, injector, tester, spark plug, taster and car washer.
23. Diagnosis of faults in engine, steering, brakes and transmission system and rectifying them.
24. Use, care and maintenance of vacuum/pressure gauges in diagnosis engine troubles.

Note:

1. Industry must ensure that above mentioned competencies are achieved by the trainees during their on job training.
2. In addition to above competencies/ outcomes industry may impart additional training relevant to the specific industry.

ANNEXURE – I

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

MECHANIC REPAIR & MAINTENANCE OF LIGHT VEHICLES			
LIST OF TOOLS AND EQUIPMENT for Basic Training (for 20 apprentices)			
A. TRAINEES TOOL KIT			
Sl. no.	**Name of the Tool &Equipments**	**Specification**	**Quantity**
1.	Hammer ball Peen	0.75 Kg.	21Nos.
2.	Chisel Cold Flat	19 mm.	21Nos.
3.	Centre Punch	10 mm. Dia x 100 mm.	21Nos.
4.	Steel Rule	15 cm English and Metric	21Nos.
5.	Screw Driver	30 cm x 9 mm. Blade	21Nos.
6.	Screw Driver	20 cm x 9 mm. Blade	21Nos.
7.	Spanner DE Set of 12 pieces	6 mm. - 32 mm.	21Nos.
8.	Plier Combination	15 cm	21Nos.
9.	Hand File	20 cm second cut	21Nos.
10.	Feeler gauge	20 blades (Metric)	21Nos.
11.	Ring spanner set of 12 pieces	6 mm. - 32 mm.	21Nos.
12.	Steel tool box with Lock and Key	folding type) size 400 x 200 x 150 mm.	21Nos.
13.	Allen Key set of 12 pieces	(2 mm.-14 mm.)	5 sets
14.	Circlip Plier (Ext. and Int.)	150 mm. And 200 (two each)	9 sets
15.	Philips screw driver type set of 5 pieces	100 mm. - 300 mm.	5 sets
B. GENERAL SHOP OUTFIT			
16.	Rule Steel	300 mm	2 nos.
17.	Divider Spring Joint	150 mm	2 nos.
18.	Prick Punch	15 cm	2 nos.
19.	Chisel cross cut	200 mm X 6 mm	1 no.
20.	Hammer Ball Peen	0.5 kg	2 nos.
21.	Hammer copper	1 kg with handle	1 no.
22.	Engineering square	15 cm blade	2 nos.
23.	Scriber	15 cm	2 nos.
24.	Scriber block Universal		1 no.
25.	Marking out tables	90 x 60 x 90 CM (high)	1 no.
26.	Surface Plate	60 X 60 cm	1 no.
27.	Hacksaw frame	30 cm blade	4 nos.
28.	'V Block	75 X 38 mm pair with clamps	2 nos.

29.	Punch Hollow	6, 7, 8, 9, 10.5 and 12 mm set	1 set
30.	Punch figure set	3 mm	1 set
31.	Punch letters set	3 mm	1 set
32.	Hand vice	37 mm	2 nos.
33.	Screw Driver Electrician type	15 cm size	2 nos.
34.	File, flat	35 cm bastard	2 nos.
35.	File, flat	25 cm second cut	2 nos.
36.	File, flat	20 cm smooth	2 nos.
37.	File, flat safe edge	25 cm smooth	2 nos.
38.	File, triangular	15 cm second cut	2 nos.
39.	File, half round	20 cm second cut	2 nos.
40.	File, square	30 cm rough	2 nos.
41.	File, square	20 cm second cut	2 nos.
42.	Twist Drill, metric	3 mm to 12 mm (1 mm step)	1 set
43.	Tape and dies complete set in box B.A., B.S.W., B.S.F., American and metric with handle		2 set
44.	Hand reamer, adjustable	10.5 mm to 11.25 mm, 11.25 to 12.75 mm, 12.75 mm to 14.25 mm, and 14.25 mm to 15.75 mm	1 set
45.	Scraper flat	25 cm	1 no.
46.	Scraper triangular	25 cm	1 no.
47.	Scraper half round	25 cm	1 no.
48.	Sets of Morse socket MT	0-1, 1-2, and 2-3	1 no.
49.	Micrometer outside	25 - 50 mm	1 no.
50.	Micrometer outside	0-25 mm	1 no.
51.	Micrometer outside	50-57 mm	1 no.
52.	Micrometer outside	75 -100 mm	1 no.
53.	Micrometer inside	50 to 75 mm and 150 mm and 25 mm to 50 mm	1 each
54.	Vernier Caliper set	250 or 200 mm inside, outside and depth	1 no.
55.	Safety goggles		2 pairs
56.	Hammer, planishing		1 no.
57.	Setting hammer		1 no.
58.	Mallet (Wooden)		1 no.
59.	Trammel	30 cm	1 no.
60.	Blow Lamp	0.5 litre	1 no.
61.	Soldering iron	120 watts	2 nos.
62.	Soldering iron Copper	225 gms (fire heated) 150	2 nos.

		mm and 200 mm	
63.	Pliers nose (round and straight)	150 mm and 200 mm	2 each
64.	Pliers nose (round and straight)	150 mm and 200 mm	1 no.
65.	Spanners double ended set of	12 metric sizes 6 to 32 mm	1 set
66.	Spanner off-set double ended	set of 7 Pds. (6 mm to 17 mm)	1 set
67.	Double open ended ignition spanner	set of 5 (0 to 9 mm)	4 set
68.	Spanners adjustable	20 cm	1 set
69.	Spanner Ring off	set of 6 (SAE)	1 set
70.	Spanner for sparking plug	14 mm	1 set
71.	Magneto spanner	set of 8 spanners	1 set
72.	Spanner socket	set 6-32 mm sockets (complete set)	2 nos.
73.	Spanner T. Flex for screwing up and unscrewing in inaccessible position		1 no.
74.	Double open ended Tappet spanner		1 set
75.	Drift copper	10 mm dia X 150 mm	2 nos.
76.	Spray Gun – Kerosene		1 no.
77.	Pressure Grease Gun		1 no.
78.	Chain Pulley Block	3 ton capacity	1 no.
79.	Tray cleaning	45 X 30 cm	20 nos.
80.	Drilling machine (bench)	12 mm dia.	1 no.
81.	Oil can	0.5 litre	1 no.
82.	Lifter, Valve spring		1 no.
83.	Tool, Valve grinding, suction type (consumable tool)		6 nos.
84.	Valve seat cutting tools complete with Guides and Pilot bar (all angles) in Box		1 set
85.	Extractor, Stud Ezy out type		1 no.
86.	Compression gauge to read	17.6 kg/Sq cm	1 no.
87.	Vacuum gauge	0 to 75 cm	1 no.
88.	Stone, Carborandum	15 X 5 X 3.75 cm rough and smooth	2 nos.
89.	Cylinder Dial Gauge		1 set
90.	Torque wrench	(0 to 67.5 Kg. Meter) set of 3	1 no.
91.	Work bench	240 X 120 X75 cm with 4 vices 12.5	4 nos.
92.	Lockers	8 drawers (standard size)	2 nos.
93.	Metal rack	180 X 150 X 45 cm	1 no.
94.	Fuel pump (old for practice)		2 nos.
95.	Distributor (old for practice)		2 nos.

96.	Carburetor (two different types)		2each
97.	Water Pump and Oil Pump		1 each
98.	Filing jig for adjusting the piston ring gap		1 no.
99.	Steel almirah	180 X 90 X 50 cm	1 no.
100.	Black Board	180X90	1 no.
101.	Desk or table	90 X 60 cm (for Instructor)	1 no.
102.	Fire Extinguisher		2 nos.
103.	Fire buckets with stand		4 nos.
104.	Tachometer		1 no.
105.	Lifting Jack Screw type		1 no.
106.	Tester sparking plug "NEON" Type		1 no.
107.	Compressor Air piston type (vehicular)		1 no.
108.	Wheel alignment gauge - magnetic type with turn tables		1 no.
109.	Sectionised engine gear box and differential mounted on chassis		1 no.
110.	Brake Assembly, master cylinder, wheel cylinder and servo		1 no.
111.	Vacuum assisted hydraulics brake assembly with vacuum booster		1 no.
112.	Air brake assembly		1 no.
113.	Brake lining riveting machine (foot operated)		1 no.
114.	Clutches, different types such as Cone type disc type diaphragm type etc		1 no.
115.	Axle, Gear Boxes, steering boxes fount axle assembly independent front wheel spring assembly		1 no.
116.	Full floating axle and semi - floating axle assembly		1 each
117.	Steering Assembly - Rack and Pinion type		1 no.
118.	Steering Assembly - Rack and Pinion type		1 no.
119.	Spring tension scale	0-4.5 Kg	1 no.
120.	Valve spring compressor		1 no.
121.	Carburetor repair tool Kit		1 no.
122.	Puller set steering wheel universal		1 no.
123.	Puller set universal bearing and bushes		1 no.
124.	Lifting jack, screw type		4 nos.
125.	Coil spring compressor for suspension spring		1 no.
126.	Hot patch clamp		2 nos.
127.	Piston ring compressor		2 nos.

128.	Valve key inserter		1 no.
129.	Wall charts (driving instructions)		1 no.
130.	Connecting rod alignment fixture		1 no.
131.	Valve refacer		1 no.
132.	Piston ring expander		1 no.
133.	High rate discharge tester		1 no.
134.	A.V.O.Meter /Digital Millimeter		1 no.
135.	Pneumatic tools		1 no.
136.	Impact Screw Driver		1 no.
137.	General purpose puller		1 no.
138.	Stud Extractor		1 no.
139.	Spring Pliers	150, 200 mm	1 no.
140.	Torque Wrench (set of three nos.)		1 no.
141.	Growler		1 no.
142.	Battery Charger		1 no.
143.	Timing light		1 no.
144.	Hydrometer		1 no.
145.	Continuity meter		1 no.
146.	Tyre Changer		1 no.
147.	Sound Meter		1 no.
148.	Gas Analyzer		1 no.
149.	Smoke Meter - with Engine r.p.m. & Temp. Sensor		1 no.
150.	4- - gas analysis with temp. & Engine r.p.m. Sensors.		1 no.
C. GENERAL MACHINERY			
151.	Grinder	with two 7 " wheel capacity	1 no.
152.	Arbor press & operated	1 ton capacity	1 no.
153.	Light Motor Vehicle in running condition (Diesel) (Indian make)		1 no.
154.	Motor Car (Petrol) in running condition (Indian make)		1 no.
155.	Petrol engine running condition (Car type) (Indian make)		2 nos.
156.	Diesel engine running condition (Vehicle type)		2 nos.
157.	Spark plug cleaning and tester equipment		1 set
158.	Air compressor	2 stage - 500 liter with 5 FTP motor and air recover	1 no.
159.	Car washer – Reciprocating type electrically operated with 5 HP motor	222 liter tank	1 no.
160.	Hydraulic Hoist		1 no.

161.	l.P.G. / C.M.G. Retro-fitting Kit (for Dens ant type)		1 no.
D. WORKSHOP FURNITURE			
162.	Discussion Table		1 no.
163.	Tool Cabinet		2 Nos.
164.	Trainees locker		Required to accommodate 20 lockers
165.	Book shelf (glass panel)		1 no.
166.	Storage Rack		2 Nos.
167.	Storage shelf		2 Nos.
168.	Computer table		1 no.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: MECHANIC REPAIR & MAINTENANCE OF LIGHT VEHICLES

LIST OF TOOLS& EQUIPMENTS FOR - 20 APPRENTICES

1) Space Norms : 45 Sq. m.(For Engineering Drawing)

2) Infrastructure:

A : TRAINEES TOOL KIT:-			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1.	Draughtsman drawing instrument box		21
2.	Set square celluloid 45^o	(250 X 1.5 mm)	21
3.	Set square celluloid 30^o-60^o	(250 X 1.5 mm)	21
4.	Mini drafter		21
5.	Drawing board IS: 1444	(700mm x500 mm)	21
B : Furniture Required			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1	Drawing Board		20
2	Models : Solid & cut section		as required
3	Drawing Table for trainees		as required
4	Stool for trainees		as required
5	Cupboard (big)		01
6	White Board	(size: 8ft. x 4ft.)	01
7	Trainer's Table		01
8	Trainer's Chair		01

TOOLS & EQUIPMENTS FOR EMPLOYABILITY SKILLS		
Sl. No.	**Name of the Equipment**	**Quantity**
1.	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 Nos.
2.	UPS - 500VA	10 Nos.
3.	Scanner cum Printer	1 No.
4.	Computer Tables	10 Nos.
5.	Computer Chairs	20 Nos.
6.	LCD Projector	1 No.
7.	White Board 1200mm x 900mm	1 No.
Note: - Above Tools & Equipments not required, if Computer LAB is available in the institute.		

ANNEXURE-II

FORMAT FOR INTERNAL ASSESSMENT

Name & Address of the Assessor :			**Year of Enrollment :**
Name & Address of ITI (Govt./Pvt.) :			**Date of Assessment :**
Name & Address of the Industry :			**Assessment location: Industry / ITI**
Trade Name :	**Semester:**		**Duration of the Trade/course:**
Learning Outcome:			

Sl. No	**Candidate Name**	**Father's/Mother's Name**	Safety consciousness	Workplace hygiene	Attendance/ Punctuality	Ability to follow Manuals/ Written instructions	Application of Knowledge	Skills to handle tools & equipment	Economical use of materials	Speed in doing work	Quality in workmanship	VIVA	**Total internal assessment Marks**	**Result (Y/N)**
Maximum Marks (Total 100 Marks)			**15**	**5**	**10**	**5**	**10**	**10**	**5**	**10**	**15**	**15**		
1														
2														