TECHNICIAN AUTOMOTIVE MANUFACTURING

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

TECHNICIAN AUTOMOTIVE MANUFACTURING

(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 5

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
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Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

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CONTENTS

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.

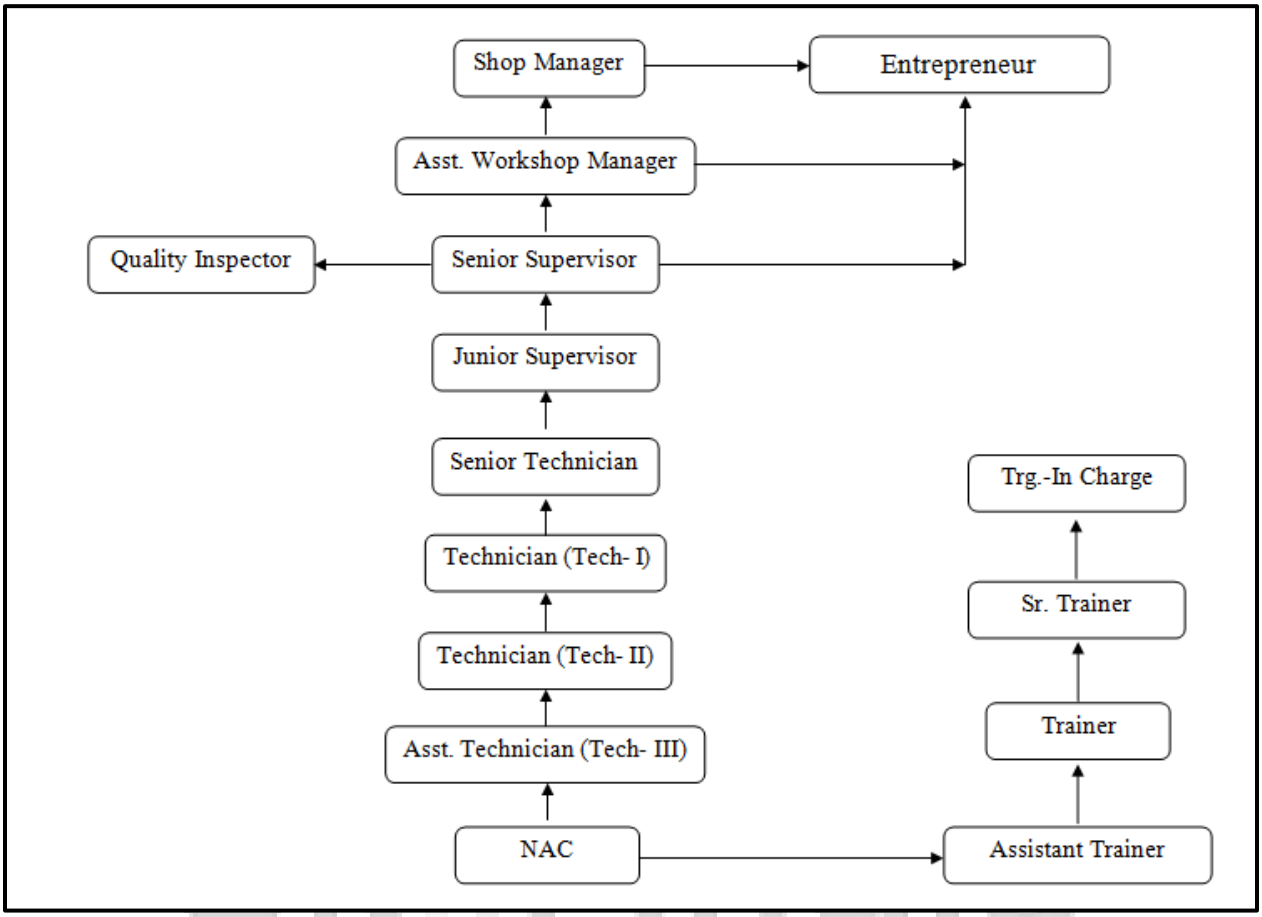
Technician Automotive Manufacturing trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of two years (02 Blocks) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional - 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, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. • 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:

On successful completion of the course the candidates shall be able to work in team of technicians in vehicle assembly & manufacturing with exposure to following skills.

- Works in an automotive manufacturing facility using the required personal protection equipment (PPE) with proper knowledge on first-aid, fire extinguishers and occupational health & safety practices.
- Operate different Types of Basic and Advanced Standard tools used in Automobile Manufacturing Process and performs various assembly processes using pneumatic tools, electrical tools, torque wrenches etc.
- Performs spot welding / robotic spot welding,CO2, Tig and Mig Welding of various structural components of vehicle body and other components during assembly
- Perform painting operations like surface cleaning, sealant application and spray painting with suitable guns.
- Perform all the installation/Fitment of the entire component on Trim Chassis Final Line of Vehicle Manufacturing.
- Perform Inspection and tests on various stages of Manufacturing and final product as per set standards.

Reference NCO 2015:

i. 8211.1200- Assembler, Automobile,

ii. 8211.1300- Assembler, Motor Cycle

4. NSQF LEVEL COMPLIANCE

NSQF level for Technician Automotive Manufacturing 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 Technician Automotive Manufacturing 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	Technician Automotive Manufacturing
NCO - 2015	8211.1200,.8211.1300
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 10th class examination with Science and Mathematics under10+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	01 year
CTS trades eligible for Technician Automotive Manufacturing Apprenticeship	1. Fitter 2. Automotive Manufacturing

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 Technician Automotive Manufacturing 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 including basic electrical. *[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]*
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]*
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. MEASURING PRACTICE – taper measurement of the given job and flatness of the given job
2. Practice on Hacksawing and filing to given dimensions.
3. Construction of simple electrical circuits
4. Diagnose series, parallel, series parallel circuits using Ohm's law,
5. Check electrical circuit with a test lamp.
6. Practical with wrench, screwdriver and pliers.

7. Use of Allen key
8. Understanding types and sizes of fasteners and picking of defined number of fasteners
9. Carryout the Filing operation on Mild steel piece
10. Fitment of vehicle identification number plate
11. Installation of electrical components in vehicle assembly line
12. Installation of wiring harness in vehicle
13. Installation of battery on Vehicle
14. Fitment of Fuel tanks and fuel lines
15. Fitment of Accelerator, brake and parking Brake, Clutch cables and pedals.
16. Practice drop of sub-assemblies like gear box, axles, cabin, car frame, etc. at the respective stations without damaging the components.
17. Fitment of Driving Shaft, Rear axle, shock Absorber,
18. Wheels and their alignments, steering wheel, Fitment of Muffler, and Exhaust pipe,
19. Battery and testing of battery with Hydrometer, doors on the vehicle and front and Rear seats.
20. Fitment of Electronic Controlled Module (ECM)/wiring harness and related components
21. Dismantle and assemble of Engine block Assembly (Crank shaft, connecting rod, piston fitment, oil pump, oil seal housing, fly wheel fitment, intake and Exhaust manifold etc.)
22. Fitment of engine Head Assembly (Intake and exhaust valve fitting, cam cap cover, rocker arm shaft, gallery blocking etc.)
23. Fitment of Radiator and cooling system, Bumpers,
24. Fitment of HVAC (Heater ventilation and air condition) system component in Vehicle.

Block – II

25. On the job training in various production shops to get acquainted to the vehicle manufacturing process
26. Practical with drill reamer and tap.
27. Produce the pressed components and inspect them for the surface defects.
28. Hands on training in Blanking and stamping shops
29. Practical on Riveting in frame
30. Carry out welding training and understanding of different types of welding
31. Fit and weld panel parts into place, using fixtures and Spot welding equipment, and grind down welds to smooth them, using power grinders and other tools.
32. Produce the structural members and reinforce them with the necessary reinforces using the CO2 welding process.
33. Set the welding parameters in CO2 and defect free panel bodies.
34. Practice working on spot welding
35. Detect the defect occurs during spot welding and its remedies.
36. Practice working on co2 welding
37. Practice working on Tig and Mig welding
38. Practice working on Brazing and soldering
39. Prepare the welded cabin and panels for the painting process through PTED processes.
40. Produce the painted cabins, doors as per the colour shade.
41. Finish the body using appropriate waxing and buffing processes.

42. Carryout painting operations in automotive paint shop and identify the various defects and their causes occurred during paint process of vehicle body
43. Pick the right fastening part and right tightening tool from the right tray/ kit
44. Trolley as identified in the Drawing/ Standard Operating Procedure/ Work
45. Instruction and is correctly placed in the designated slot/ space as indicated inthe Work Instructions/ SOP
46. Assembly of bearings, seals and gears and Splined shafts
47. Shim selection
48. Correctly Position or align components for assembly, manually or using hoists
49. Practice the use hoists are used to lift the right material from the conveyors, bins,part trolleys etc.
50. Ensure part clearances as specified in the Work Instructions/ Standard Operating Processes.
51. Assemble the required parts using pneumatic, hydraulic/ PLC controlled assembly tools
52. Practice the assembly of trim fitments seats, windshield, dashboard components, door assembly and interiors.
53. Hands on training on conveyor line and sub assembly
54. Assembly of Automobile Components using pneumatic tools/electrical screw driver/torque wrenches.
55. Fitment of roof head lining and Rail component of Roof fitment.
56. Abnormality detection and correction at various stages of automotive manufacturing.
57. Final Vehicle inspection and identification of Abnormality in Finished product. And Visual inspection of interior, exterior and functional components as per inspection standards.
58. On the Job Training at Vehicle Assembly Shop and Quality Assurance department
59. Practice of pre-delivery inspections as per the specifications.

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 mathematical calculation & science in the field of study including basic	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.

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]*	2.2 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 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 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	6.1 Explain the concept of energy conservation, global warming, pollution and utilize the available recourses

and pollution and contribute in day to day work by optimally using 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 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.	**GENERAL SHOP SAFETY** First aid and Fire safety, Use of fire extinguishers. Identify fuels, oils and chemicals used in the engines and accessories-handling of shop safety equipment-handling of safety devices-first aid- practice on hazard waste disposal.	**Occupational Safety & Health** Importance of Safety and general Precautions to be observed in the shop. Basic first aid, safety signs - for Danger, Warning, caution & personal safety message. Use Personal Protective Equipment (PPE). Safe handling of Fuel Spillage, Fire extinguishers used for different types of fire. Safe disposal of toxic dust, safe handling and Electrical safety tips.
2.	**MEASURING SYSTEMS AND EASUREMENTS** Practice on measuring on the given jobs- measuring space with a feeler gauge- measuring the given jobs with precision measuring instruments- checking external and internal diameter and run outs-measure straightness on the given job.	Measuring systems and types- description of steel rule- description of feeler gauge- constructional details and working principle of precision measuring instruments like Vernier caliper, micrometer, bore gauge and dial gauge- description of surface plate and V blocks- importance of correct roundness-surface finish and its importance.
3.	**BASIC HAND TOOLS** Practice on marking and cutting of a given job- file the job to bring required size- repair damaged threads. Identify hand tools and Special purpose tools.	Details of various types of marking and cutting tools- punch, scriber, hammer and mallets, hack saw frame and blade, chisels etc. – marking media. Description of work holding devices like vices- details of screw extractors- details of bench grinders. Safety precautions to be observed while working with hand tools. Explain the functioning of the hand tools like Screw driver, spanners, wrenches (Torque wrenches, CLW, etc.)
4.	**FASTENERS AND BEARINGS** Identify the different types of fastener. Practice on general cleaning, checking and on loosening and tightening of various types of	Describe the function and construction of the fastener. Threads- thread categorization- types of threads- types of screwed joints- types of nuts- property classes of bolts- screw locking arrangements- types and description of screwing tools- description and types different types of

	screwing joints using screwing tools. Removal of broken stud /bolt from blind hole. Remove and replace bearings from the given jobs.	bearings.
5-6.	**BASIC HYDRAULICS AND PNEUMATICS** Construction of hydraulic circuits using all frequently used valves like check valves, flow control valve, pressure relief valve, actuators, directional control valves, hydraulic accumulator, etc. Exercise on using impact wrenches. **BASIC ELECTRICAL AND ELECTRONICS** Identify and interpret electrical/electronic system concern. Practice on measuring circuit voltage, ampere and resistance. Practice on measuring voltage drop. Practice on installing crimp connector and terminal end. Practice on soldering wires. Practice on testing fuses and relays- test diodes	Fundamentals of Hydraulics & Pneumatics. Symbols of various Hydraulics & Pneumatic elements. Application of different types of hydraulic components like actuators, directional control valves, flow control valves, hydraulic accumulator, etc. Description of air compressors, impact wrenches. Description of Power tools and equipment. Safety precautions to be observed while working with Hydraulic and pneumatics equipment. Define and Explain the construction and functioning of pneumatic and Special Purpose tools and lifting & carrying components and equipment. General principles of electrical engineering- structure of atoms- voltage- current- fuses- electrical conduction- current direction- types of current- voltage drop- resistance- PTC and NTC resistors- types of resistors- ohm's law- resistor circuits- electro magnetism- electromagnetic induction- description of multimeter- function and types of relays- semiconductors- N type and P type semiconductors- description of diodes and transistors. Safety precautions to be observed while working with electrical equipment.
7.	**KNOWLEDGE ABOUT AUTOMOBILE INDUSTRY.** Familiarization to various types of vehicles. Identification of vehicle information Number (VIN).	Describe & explain the various types of Automobile vehicle according to the shape, according to the Engine Series, according to the fuel- Petrol, Diesel, according to the Frame structure (Ladder frame, Unibody, Back bone, Tubular space etc.) Gasoline Commercial and Defence Vehicle, Earth Movers (Excavators, Back hole loaders, Bulldozers, Motor Graders etc.) Applications of vehicle (Passengers, Goods Carrier, Transportation, Agriculture etc.)
8.	**INTRODUCTION TO ENGINE**	Description of internal & external combustion

	Identification of major components of Engine and its accessories. Different types of Starting and Stopping Method of different Engine. Understanding Automotive technical terms by demonstration. Demonstration of vehicle specification data.	engines, Classification of IC engines, Principle, working and Difference of 2 & 4 -stroke engine (Compression ignition Engine (C.I)**)** &spark ignition engine (S.I). Direct injection and Indirect injection. Describe and explain components of Engine like cylinder block, cylinder head, crank shaft, cam shaft single overhead cam shaft (S.O.H.C),Dual overhead cam shaft (D.O.H.C), piston, connecting rod. Describe and explain Automotive terms like bore, Bottom dead center (B.D.C) top dead center (T.D.C), compression ratio, I.H.P, B.H.P, F.H.P, etc. wheel base, tread, ground clearance, turning radius etc. .
9.	**BATTERY & ELECTRICAL SYSTEM OF VEHICLE** Remove and connect battery terminal from a battery- clean terminals- check voltage of a battery- check cranking voltage- check charging voltage- top up distilled water up to the level- connecting two batteries in series- charging a battery – test battery- specific gravity test Check starting system wiring harness Check the operation of the charging system. Practice on Tracing wire harness for Electrical and related components of the vehicle.	Purpose of battery- types- construction and working principle of a lead acid battery- maintenance free batteries- battery ratings- battery charging methods Principle of starter- components of a starter- construction and working of starter- starter field coil design- solenoids- types and function Construction and working principle of alternator- description of voltage regulator operation. Describe and explain the function of lighting system and other component on vehicle like doors, windows, music system,
10.	**ENGINE MANAGEMENT SYSTEM** **Identification of ECU and Sensors** **FUEL INJECTION SYSTEM** Identification of Fuel injection system components. Tracing the high pressure and low pressure line.	Description of ECU, Functions of various sensors. Description of Fuel Injection system of vehicle - carburetor, single port fuel injection, multi-port fuel injection system, Injection system, Direct injection system, Indirect injection system, Diesel directs injection system, CRDI. High /low pressure line etc.
11-12.	**VEHICLE TRANSMISSION** Identification of transmission	Description and function of Clutch, transmission – Manual, Automatic and its components.

	components. Identifying brake components, locating air leaks in the brake lines. Demonstration on General maintenance and care of Brake in vehicle. **STEERING SYSTEM & WHEELS** Trace the layout of different parts of Mechanical and Hydraulic steering system. Identification and tracing the connections of steering system, universal joint, propeller shaft and differential	Transfer Case. Braking fundamentals Principles of braking Description on Braking system components— Drum, Disc and Hydraulic - Power booster or brake unit, Hydraulic valves. Applying brakes, Brake force, Brake light switch. Description of air brake system. Major components in Air brake system. Description and purpose of each part. Function and types of steering system. Description, construction and function of mechanical steering system, Description, working and principle of hydraulic steering system and its components. Description of Ackerman's angle, caster, camber toe-in and toe-out on turns, purpose and effects of these angles. Functions of Universal joints and propeller shaft Description and purpose of different types of rear axles Descriptions of differential and its principle of operation. Description & functions of final drive assembly crown wheel and tail pinion hypoid gear, Bevel type and worm & worm wheel. Description of different types of suspension system. Description of wheels and tyres-types selection of tyres, ply rating, inflation pressure and carrying capacity, storage of tyres.
13.	**COOLING, LUBRICATION AND AC SYSTEM OF VEHICLE** Identification of components of Cooling, lubrication and AC System.	Descriptions and types of cooling system - description of pump circulating system components- radiator and its types Functions of a lubricating system- description of different types of lubricating systems- forced feed and dry sump lubrication Descriptions of AC system, its components and functions.
	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)
1-2	**DRILLS & DRILLING OPERATIONS** Drilling Exercise- Mark off and drill through holes, drill and tap on M.S. flat, Punch letter and number (letter punch and number punch), use of different punches Exercises on Countersinking, Counter boring. Exercises on Tapping and Dieing	Introduction, nomenclature of drill &importance of angles. Different types of drills- Flat, straight fluted & twist drills & its specification. Different drilling operations & tools used. Importance & purpose of different drilling operations Drilling processes: common type (bench type, pillar type, radial type), Determination of Cutting Speed, Feed tap drill size. Definition & importance of finish & proper cutting speed & feed. Formula for calculating cutting speed. Different cutting speeds for different materials. Calculations on cutting speed & feed. Different forms of threads Tapping & Dieing Different grades of taps i.e. rougher, intermediate & finisher Tap drill size calculation. Reasons for tap breakage. Different types of dies. Precautions to observed while threading with die
3-4	PRESS Practice on Press work with simple objects.	Safety Related to press shop & Press shop working, Types of presses and their function, Types of Dies and their function, Care & Maintenance of dies, Press shop defects. Introduction of riveting process and sheet metal operations- Blanking, Piercing, Notching, Lancing Bending, Forming, Embossing ,flairing etc
5-6	WELDING Practice on basic welding operation- Practice on Spot and CO2 Welding – simple joints	Weld Shop processes, Safety related to weld shop Welding symbols, welding fixture. Spot welding, Co2 Welding Detail explanation about the welding process. Detailed description about the all

	Finding defects on Auto panel & Assessment	welding Detect the Types of defect occurs in different types of welding as mentioned.
7-8	MACHINING Practice on setting and machining simple job in Milling Machine Practice on Lathe operations- holding job in three jaw chuck, plain turn. Demo on CNC Machining operation.	Safely precautions to be observed while working in workshop. Milling Introduction and constructional features of milling machine. Different types of milling machines. Milling cutters. Cutting speed, feed. Up milling & Down milling Different common operations performed on milling m/c such as plain milling, slot milling, parting etc. Turning Introduction of constructional features of turning machine. Different types of turning machines. Lathe specifications, and constructional features. Lathe main parts descriptions- bed, head stock, carriage, tail stock, Lathe cutting tools- cutting speed and feed and comparison for H.S.S., carbide tools. Appropriate method of holding the tool on tool post or tool rest Use of coolants and lubricants. Chucks and chucking the independent four jaw chuck. General turning operations- parallel or straight, turning. Stepped turning, grooving, and shape of tools for the above operations. Taper – definition, use and method of expressing tapers. Standard tapers- taper, calculations Morse taper. Explain the basic CNC Operation performed in CNC Machine like turning, facing, cutting, threading, groove etc.
9-10	PAINT Practice on Manual Spray Painting Simulator. Sealant Application practice on vehicle body. Spray Pattern Setting & Manual Spray	Describe and Explain the Automotive painting process. Describe the Functioning of the Sealant application guns, Paint equipment's and parameters. Spray paint gun types, Surface preparation. Describe and detect

	painting on Flat Surface. Manual Spray Painting on Curve surface & on vehicle body parts Paint Inspection	the defect occurs in painting process. Describe the causes and remedies of the defects. Paint inspection methods.
11	ASSEMBLY PRACTICE Practice on Dexterity kits Practice on Sensing & Picking, Nut &bolt tightening station & Assessment Practice on Screw grommet insertion & screwing kit & Assessment Practice on Rubber grommet kit & Electrical connector fitment kit & Assessment Practice on Hose insertion kit & Flair nut assembly kit & Assessment Practice on Element work kit & Dynamic conveyor. Demo on Automotive assembly process and conveyors	Shop specific safety & importance of dexterity Sensing & Picking , bolt & Nut Tightening, Types of nut runners & care Screw grommet insertion, Screw tightening, Power tools Types & care Rubber grommet fitment & Electrical connectors fitment Hose insertion & Flair nut tightening Element work & Standardized work Function construction and working process of Assembly shop
12	VEHICLE INSPECTION Vehicle Inspection and testing, Testing parameters and its importance	Describe and explain the various test performed on finished vehicle Emission test, Brake test, Drum test, Shower test Road test etc.
13	QUALITY CONTROL Inspection Auto Parts Oils & Lubricants used in a vehicle	What is QC, Its importance? Different methods of Inspection.
	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.*

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.	**Unit**: 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
2.	**Fractions**: Fractions, Decimal fraction, Addition, Subtraction, Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems using Calculator.	**Drawing Instruments : their 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.
3.	**Properties of Material** : properties - Physical & Mechanical, Types –Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals, introduction of Iron, Cast Iron, Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous Alloys.	**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
4.	**Average :** Problems of Average. **Ratio & Proportion** : Simple calculation on related problems.	**Drawing of Geometrical Figures:** Drawing practice on: - Angle: Measurement and its types, method of bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.
5.	**Mass, Weight and Density**: Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density.	**Dimensioning:** - Definition, types and methods of dimensioning (functional, non-functional and auxiliary) - Types of arrowhead - Leader Line with text

6.	**Percentage**: Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	**Free hand drawing of** - Lines, polygons, ellipse, etc. - geometrical figures and blocks with dimension - Transferring measurement from the given object to the free hand sketches.
7.	- Forces definition. - Definition and example of compressive, tensile, shear forces, axial and tangential forces. Stress, strain, ultimate strength, factor of safety for MS. **Speed and Velocity**: Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation.	**Method of presentation of Engineering Drawing** - Pictorial View - Orthogonal View - Isometric view
8.	**Mensuration:** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle. Volume of solids – cube, cuboids, cylinder and Sphere. Surface area of solids – cube, cuboids, cylinder and Sphere. - Area of cut-out regular surfaces: circle and segment and sector of circle. - Volume of cut-out solids: hollow cylinders, frustum of cone, block section. - Volume of simple solid blocks.	**Symbolic Representation (as per BIS SP:46-2003) of :** - Fastener (Rivets, Bolts and Nuts) - Bars and profile sections - Weld, brazed and soldered joints. - Electrical and electronics element - Piping joints and fittings
9.	**Algebra** : Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables). - Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force.	**Dimensioning practice:** - Position of dimensioning (unidirectional, aligned, oblique as per BIS SP:46-2003) - Symbols preceding the value of dimension and dimensional tolerance.
10.	**Work, Power and Energy**: work, unit of work, power, unit of power, Horse power, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy.	**Construction of Geometrical Drawing Figures:** - Polygons and their values of included angles. Conic Sections (Ellipse)
11.		**Projections:** - Concept of axes plane and quadrant.

		- Orthographic projections - Method of first angle and third angle projections (definition and difference) - Symbol of 1st angle and 3rd angle projection as per IS specification. Drawing of Orthographic projection from isometric/3D view of blocks

Block – II		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration: - 30 hrs.)**
1.	**Trigonometry:** Trigonometric ratios, Trigonometric tables. - Finding the value of unknown sides and angles of a triangle by Trigonometrical method. - Finding height and distance by trigonometry.	- Machined components; concept of fillet & chamfer; surface finish symbols.
2.	**Friction** and its application in Workshop practice.	- Screw thread, their standard forms as per BIS, external and internal thread, conventions on the features for drawing as per BIS.
3.	**Heat & Temperature**: Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, scale of temperature, relation between different scale of temperature, Thermometer, pyrometer, transmission of heat, conduction, convection, radiation.	- Reading & interpretation of assembly drawing and detailing.
4.	**Basic Electricity**: Introduction, use of electricity, Types of current_ AC, DC, their comparison, voltage, resistance, their units. Conductor, insulator, Types of connections – series, parallel, electric power, Horse power, energy, unit of electrical energy. Concept of earthing.	- Reading of drawing. Simple exercises related to missing lines, dimensions and views. How to make queries.
5.	**Heat treatment** – Necessity, different common types of Heat treatment.	- Simple exercises related to trade related symbols. - Solution of NCVT test papers.
6.	**Graph:** - Read images, graphs, diagrams – bar chart, pie chart. - Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.	
7.	**Transmission of power:** By belt, pulleys & gear drive.	
8.	**Concept of pressure** – units of pressure, atmospheric pressure, gauge pressure – gauges used for measuring pressure. **Introduction to pneumatics & hydraulics systems.** Solution of NCVT test papers	

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. MEASURING PRACTICE – taper measurement of the given job and flatness of the given job
2. Practice on Hack sawing and filing to given dimensions.
3. Construction of simple electrical circuits
4. Diagnose series, parallel, series parallel circuits using Ohm's law,
5. Check electrical circuit with a test lamp.
6. Practical with wrench, screwdriver and pliers.
7. Use of Allen key
8. Understanding types and sizes of fasteners and picking of defined number of fasteners
9. Carryout the Filing operation on Mild steel piece
10. Fitment of vehicle identification number plate
11. Installation of electrical components in vehicle assembly line
12. Installation of wiring harness in vehicle
13. Installation of battery on Vehicle
14. Fitment of Fuel tanks and fuel lines
15. Fitment of Accelerator, brake and parking Brake, Clutch cables and pedals.
16. Practice drop of sub-assemblies like gear box, axles, cabin, car frame, etc. at the respective stations without damaging the components.
17. Fitment of Driving Shaft, Rear axle, shock Absorber,
18. Wheels and their alignments, steering wheel, Fitment of Muffler, and Exhaust pipe,
19. Battery and testing of battery with Hydrometer, doors on the vehicle and front and Rear seats.
20. Fitment of Electronic Controlled Module (ECM)/wiring harness and related components
21. Dismantle and assemble of Engine block Assembly (Crank shaft, connecting rod, piston fitment, oil pump, oil seal housing, fly wheel fitment, intake and Exhaust manifold etc.)
22. Fitment of engine Head Assembly (Intake and exhaust valve fitting, cam cap cover, rocker arm shaft, gallery blocking etc.)
23. Fitment of Radiator and cooling system, Bumpers,
24. Fitment of HVAC (Heater ventilation and air condition) system component in Vehicle.

Block – II

25. On the job training in various production shops to get acquainted to the vehicle manufacturing process

26. Practical with drill reamer and tap.
27. Produce the pressed components and inspect them for the surface defects.
28. Hands on training in Blanking and stamping shops
29. Practical on Riveting in frame
30. Carry out welding training and understanding of different types of welding
31. Fit and weld panel parts into place, using fixtures and Spot welding equipment, and grind down welds to smooth them, using power grinders and other tools.
32. Produce the structural members and reinforce them with the necessary reinforces using the CO2 welding process.
33. Set the welding parameters in CO2 and defect free panel bodies.
34. Practice working on spot welding
35. Detect the defect occurs during spot welding and its remedies.
36. Practice working on co2 welding
37. Detect the defect occurs during spot welding and its remedies
38. Practice working on Tig and Mig welding
39. Practice working on Brazing and soldering
40. Prepare the welded cabin and panels for the painting process through PTED processes.
41. Produce the painted cabins, doors as per the colour shade.
42. Finish the body using appropriate waxing and buffing processes.
43. Carryout painting operations in automotive paint shop and identify the various defects and their causes occurred during paint process of vehicle body
44. Pick the right fastening part and right tightening tool from the right tray/ kit
45. Trolley as identified in the Drawing/ Standard Operating Procedure/ Work
46. Instruction and is correctly placed in the designated slot/ space as indicated in the Work Instructions/ SOP
47. Assembly of bearings, seals and gears and Splined shafts
48. Shim selection
49. Correctly Position or align components for assembly, manually or using hoists
50. Practice the use hoists are used to lift the right material from the conveyors, bins, part trolleys etc.
51. Ensure part clearances as specified in the Work Instructions/ Standard Operating Processes.
52. Assemble the required parts using pneumatic, hydraulic/ PLC controlled assembly tools
53. Practice the assembly of trim fitments seats, windshield, dashboard components, door assembly and interiors.
54. Hands on training on conveyor line and sub assembly
55. Assembly of Automobile Components using pneumatic tools/electrical screw driver/torque wrenches.
56. Fitment of roof head lining and Rail component of Roof fitment.

57. Abnormality detection and correction at various stages of automotive manufacturing.
58. Final Vehicle inspection and identification of Abnormality in Finished product. And Visual inspection of interior, exterior and functional components as per inspection standards.
59. On the Job Training at Vehicle Assembly Shop and Quality Assurance department
60. Practice of pre-delivery inspections as per the specifications.

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

TECHNICIAN AUTOMOTIVE MANUFACTURING			
LIST OF TOOLS AND EQUIPMENT for Basic Training (For 16 Apprentices)			
A. TRAINEES TOOL KIT (For each additional unit trainees tool kit Sl. 1-18 is required additionally)			
Sl. no.	**Name of the Tool &Equipments**	**Specification**	**Quantity**
1.	Allen Key set of 12 pieces	(2mm to 14mm)	7
2.	Caliper inside	150 mm Spring	7
3.	Calipers outside	150 mm Spring	7
4.	Center Punch	10 mm. Dia. x 100 mm.	7
5.	Dividers	15 cm Spring	7
6.	Electrician Screw Driver	250mm	7
7.	Hammer ball peen	0.5 kg with handle	7
8.	Hands file	20 cm. Second cut flat	7
9.	Philips Screw Driver set	5 pieces (100 mm to 300 mm)	7
10.	Pliers combination	20 cm.	7
11.	Screw driver	20cm.X 9mm. Blade	7
12.	Screw driver	30 cm. X 9 mm. Blade	7
13.	Scriber	15 cm	7
14.	Spanner D.E. set of 12 pieces	6mm to 32mm)	7
15.	Spanner, ring set	of 12 metric sizes 6 to 32 mm.	7
16.	Spanners socket with speed handle, T-bar, ratchet and universal	upto 60 mm set of 28 pieces with box	7
17.	Steel rule	30 cm inch and metric	7
18.	Steel tool box with lock and key	folding type) 400x200x150 mm	7.
19.	Wire cutter and stripper		7
B : INSTRUMENTS & GENERAL SHOP OUTFIT			
20.	Adjustable spanner(Pipe Wrengch)	350 mm.	2
21.	Air blow gun	standard accessories	1
22.	Air impact wrench	standard accessories	4
23.	Air ratchet	standard accessories	4
24.	Allen Key set	12 pieces (2mm to 14mm)	4
25.	Alternator assembly		2
26.	Ammeter	300A/ 60A DC with external shunt	4
27.	Auto Electrical test bench		1
28.	Battery –charger		2
29.	Belt Tensioner gauge		1

30.	Caliper inside	15 cm Spring	4
31.	Calipers outside	15 cm spring	4
32.	Car Jet washer with	standard accessories	1
33.	Chisel	10 cm flat	4
34.	Chisels cross cut	200 mm X 6mm	4
35.	Cir clip pliers Expanding and contracting type	15cm and 20cm each	4
36.	Clamps	C 100mm	2
37.	Clamps	C 150mm	2
38.	Clamps	C 200mm	2
39.	Cleaning tray.	45x30 cm	4
40.	Compression testing gauge suitable for diesel Engine	standard accessories	2
41.	Connecting rod alignment fixture		1
42.	Cylinder bore gauge	capacity 20 to 160 mm	4
43.	Cylinder liner- Dry & wet liner, press fit & slide fit liner		1 each
44.	DC Ohmmeter	0 to 300 Ohms, mid scales at 20 Ohms	2
45.	Depth micrometer	0-25mm	4
46.	Dial gauge type 1 Gr. A (complete with clamping devices and with magnetic stand)		4
47.	Different type of Engine Bearing model		1 set
48.	Different type of piston model		1each
49.	Dividers	15 cm Spring	4
50.	Drift Punch Copper	15 Cm	4
51.	Drill twist 1.	5 mm to 15 mm (various sizes) by 0.5 mm	4
52.	Electric Soldering Iron		2 each
53.	Electric tester		4
54.	Engineer's square	15 cm. Blade	4
55.	Engineers stethoscope		1
56.	Executive Auto Electrical tool kit		1
57.	Feeler gauge	20 blades (metric)	4
58.	File flat	20 cm bastard	4
59.	File, half round	20 cm second cut	4
60.	File, Square	20 cm second cut	4
61.	File, Square	30 cm round	4
62.	File, triangular	15 cm second cut	4
63.	Files assorted sizes and types including safe edge file		2 set
64.	Flat File	25 cm second cut	4

65.	Flat File	35 cm bastard	4
66.	Fuel feed pump for diesel		1
67.	Fuel injection pump (Diesel) inline		1
68.	Fuel injection pump dismantling tool kit /Universal Vice		1
69.	Fuel injection pump, VE pump / Distributor fuel rotary pump (DPC) pumps / along with special tools and accessories.		1 each
70.	Functional/experiment model of different type of sensors.		1 set
71.	Gloves for Welding (Leather and Asbestos)		5 sets
72.	Glow plug tester		2
73.	Granite surface plate	1600 x 1000 with stand and cover	1
74.	Growler		2
75.	Hacksaw frame	Adjustable 20-30 cm	10
76.	Hammer Ball Peen	0.75 kg.	4
77.	Hammer Chipping	0.25 kg.	5
78.	Hammer copper with handle	1 Kg with handle	4
79.	Hammer Mallet		4
80.	Hammer Plastic		4
81.	Hand operated crimping tool	(i) for crimping up to 4mm and (ii) for crimping up to 10mm	2
82.	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	1 sets
83.	Hand vice –	37 mm	2
84.	Hollow Punch	set of seven pieces 6mm to 15mm	2 sets each
85.	Impact screw driver		2
86.	Injector – Multi hole type, Pintle type		4 each
87.	Injector cleaning unit		1
88.	Injector tester	(Hand tester)	1
89.	Insulated Screw driver	20 cm x 9mm blade	4
90.	Insulated Screw driver	30 cm x 9mm blade	4
91.	Magnifying glass	75mm	2
92.	Marking out table	90X60X90 cm.	1
93.	Multimeter digital		5
94.	Oil can	0.5/0.25 liter capacity	4
95.	Oil pump for dismantling and		2

	assembling.		
96.	Outside micrometer	0 to 25 mm	4
97.	Outside micrometer	25 to 50 mm	4
98.	Outside micrometer	50 to 75 mm	1
99.	Outside micrometer	75 to 100 mm ,100 to 125 mm, 125 to 150 mm	1
100.	Philips Screw Driver	set of 5 pieces (100 mm to 300 mm)	2
101.	Piston ring compressor		2
102.	Piston Ring expander and remover.		2
103.	Piston Ring groove cleaner.		2
104.	Pliers combination	20 cm.	2
105.	Pliers flat nose	15 cm	2
106.	Pliers round nose	15 cm	2
107.	Pliers side cutting	15 cm	2
108.	Portable electric drill Machine		1
109.	Prick Punch	15 cm	4
110.	Punch Letter)	4mm (Number	2 set
111.	Radiator cut section-down flow		1
112.	Radiator pressure cap		2
113.	Scraper flat	25 cm	2
114.	Scriber	15 cm	2
115.	Scriber with scribing black universal		2
116.	Spanner D.E.	set of 12 pieces (6mm to 32mm)	4
117.	Spanner	adjustable 15cm	2
118.	Spanner	ring set of 12 metric sizes 6 to 32 mm.	4
119.	Spanners socket with speed handle, T-bar, ratchet and universal	up to 32 mm set of 28 pieces with box	2
120.	Starter motor axial type, pre-engagement type & Co-axial type		1each
121.	Steel measuring tape	10 meter	4
122.	Steel rule	15 cm inch and metric	4
123.	Steel rule	30 cm inch and metric	4
124.	Straight edge gauge	2 ft.	2
125.	Straight edge gauge	4 ft.	2
126.	Stud extractor set of 3		2 sets
127.	Stud remover with socket handle		1
128.	Surface gauge	dial test indicator plunger type i.e. 0.01 mm	4
129.	Tachometer	(Counting type)	1
130.	Taps and Dies complete	sets BSF	1 set

131.	Taps and wrenches -	metric	2 sets
132.	Telescope gauge		4
133.	Thermostat		2
134.	Thread pitch gauge	metric, BSW	2
135.	Torque wrenches	5-35 Nm, 12-68 Nm & 50-225 Nm	1 each
136.	Turbocharger cut sectional view		1
137.	Universal puller for removing pulleys, bearings		1
138.	V' Block	75 x 38 mm pair with Clamps	2
139.	Vacuum gauge	read 0 to 760 mm of Hg	2
140.	Valve spring compressor universal.		1
141.	vernier caliper	0-300 mm with least count 0.02mm	4
142.	Vice grip pliers		2
143.	Wire Gauge (metric)		2
144.	Work bench	250 x 120 x 60 cm with 4 vices 12cm Jaw	4
145.	4 Point relays		2
146.	5 Point relays		2
147.	Vacuum pump gauge		1
148.	Glow plug wrench		1
149.	Oil seal remover		1
150.	Oil seal installer		1
151.	Valve guide remover		1
152.	Forceps		1
153.	Fly wheel holder		1
154.	Bearing puller		1
155.	Bearing installer		1
156.	Injection pump pulley remover		1
157.	Cam shaft pulley holder		1
158.	Cam shaft locking tool		1
159.	Oil filter wrench socket		1
160.	Oil pressure gauge		1
161.	Radiator pressure tester		1
162.	Fuel pressure gauge with adopters		1
C :GENERAL MACHINERY INSTALLATIONS:-			
163.	Engine (Petrol MPFI) for dismantling and assembly		2 Nos.
164.	Engine (Diesel DDIS) for dismantling and assembly		2 Nos.
165.	Transmission for assembly and disassembly training		2 Nos.

166.	4 Wheeler vehicle		2 Nos.
167.	Cut section of main parts and systems for training		2 Nos.
168.	Cut section Engine		2 Nos.
169.	Pump Assy Fuel		
170.	Column Assy with EPS		
171.	Manufacturing line with all modern manufacturing techniques and equipment to facilitate Hands on training for the students		
172.	Blanking line		
173.	Stamping presses		
174.	Weld equipments		
175.	Paint shop with all equipment and process		
176.	Assembly shop slat and overhead conveyors		
177.	vehicle testing line (head light, brake, drum and emission tester)		

***Note**: In case of basic training setup by the industry the tools, equipment and machinery available in the industry may also be used for imparting basic training.*

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: **TECHNICIAN AUTOMOTIVE MANUFACTURING**

LIST OF TOOLS& EQUIPMENTS FOR -16APPRENTICES

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		16
2.	Set square	celluloid 45^o (250 X 1.5 mm)	16
3.	Set square	celluloid 30^o-60^o (250 X 1.5 mm)	16
4.	Mini drafter		16
5.	Drawing board	(700mm x500 mm) IS: 1444	16
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 (15)	Workplace hygiene (5)	Attendance/ Punctuality (10)	Ability to follow Manuals/ Written instructions (5)	Application of Knowledge (10)	Skills to handle tools & equipment (10)	Economical use of materials (5)	Speed in doing work (10)	Quality in workmanship (15)	VIVA (15)	**Total internal assessment Marks**	**Result (Y/N)**
Maximum Marks (Total 100 Marks)			**15**	**5**	**10**	**5**	**10**	**10**	**5**	**10**	**15**	**15**		
1														
2														