

CURRICULUM

FOR THE TRADE OF

TECHNICIAN AUTOMOTIVE MANUFACTURING

UNDER

APPRENTICESHIP TRAINING SCHEME



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

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2. 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.

3. RATIONALE

(Need for Apprenticeship in AUTOMOTIVE MANUFACTURING trade)

The revised Apprenticeship Training Scheme (ATS) shall make the students more adapt to industry requirement through latest theoretical & practical inputs as:

1. The greater degree of relevance of the training with latest advancements of the industry will enhance the employability opportunities
2. It will enhance the ability to work with help of special hand tools, power tools and machines.
3. It will enhance the ability to work on conventional as well as state of the art machinery used in manufacturing
4. It helps to improve the practical skills acquired and the ability to perform highly specialized jobs related to mass production manufacturing
5. The training on best industrial practices and industrial culture helps to cater the present day manufacturing needs
6. Exposure to real time jobs will enhance the ability to complete the jobs in efficient and productive manner
7. Exposure to quality assurance practices which is integral part of any manufacturing or service industry will help produce flawless results
8. It provides exposure to advanced manipulator systems for risk management, fatigue reduction thus improve productivity
9. It helps to understand the production plans, logistics plans, target-achievements, problem solving by QC tools etc. in communication meetings
10. The multi skilled training develops confidence to work in diversified work conditions and helps in further progress
11. It will help develop the quality to work in a team work to easily achieve the desired targets
12. It will help to develop the ability to understand customer expectations and efforts required to meet the same

4. JOB ROLES: REFERENCE NCO

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: 8281.65, 8281.70

5. GENERAL INFORMATION

1. **Name of the Trade** : **TECHNICIAN (AUTOMOTIVE MANUFACTURING)**

2. **N.C.O. Code No.** : 8281.65, 8281.70

3. **Duration of Apprenticeship Training (Basic Training + Practical Training):** 2years

3.1 For Fresher :-

Duration of Basic Training: -

a) Block –I : 3 months

b) Block – II : 3 months

Total duration of Basic Training: 6 months

Duration of Practical Training (On -job Training): -

a) Block–I: 9 months

b) Block–II : 9 months

Total duration of Practical Training: 18 months

3.2 For ITI Passed :-

Duration of Basic Training: - NIL

Duration of Practical Training (On -job Training): 12 months

6. **Entry Qualification** : 10th Passed

7. **Selection of Apprentices:** The apprentices will be selected as per Apprentices Act amended time to time.

8. Rebate to ITI Passed out Trainees:One year for the trade of Technician Automotive Manufacturing .**One year** in the trade of **Fitter**.

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.

6. COURSE STRUCTURE

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

Duration of Training in Months

Components of Training	Duration of Training in Months																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Basic Training Block - I																								
Practical Training Block - I																								
Basic Training Block - II																								
Practical Training Block - II																								

7. SYLLABUS
7.1 BASIC TRAINING
(BLOCK – I &II)
DURATION: 06 MONTHS

GENERAL INFORMATION

- 1) **Name of the Trade** : **TECHNICIAN (AUTOMOTIVE MANUFACTURING)**
- 2) **Hours of Instruction** : 1000 Hrs. (500 hrs. in each block)
- 3) **Batch size** : 16 Nos.
- 4) **Power Norms** : 6 KW for Workshop
- 5) **Space Norms** : 88Sq.m.
- 6) **Examination** : The internal assessment will be held on completion of each Block.
- 7) **Instructor Qualification** :

i) Degree/Diploma in Mechanical/Automobile Engg. from recognized university/Board with one/two year post qualification experience respectively in the relevant Field.

OR

ii) NTC/NAC in the trade of Fitter with three year post qualification Experience in the relevant field.
Preference will be given to a candidate with Craft Instructor Certificate (CIC)

- 8) **Tools, Equipment & Machinery required** : - As per Annexure – I

7.1.1 DETAILSYLLABUS OF CORE SKILL

A. Block– I Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
1	Engineering Drawing: Introduction and its importance <ul style="list-style-type: none"> - Viewing of engineering drawing sheets. - Method of Folding of printed Drawing Sheet as per BIS SP:46-2003 	30	Unit: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	20
2	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.		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.	
3	Lines : <ul style="list-style-type: none"> - 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		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.	
4	Drawing of Geometrical Figures: Drawing practice on: <ul style="list-style-type: none"> - Angle: Measurement and its types, method of bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements. 		Average : Problems of Average. Ratio &Proportion : Simple calculation on related problems.	
5	Dimensioning: <ul style="list-style-type: none"> - Definition, types and methods of dimensioning (functional, non-functional and auxiliary) - Types of arrowhead - Leader Line with text 		Mass, Weight and Density: Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density.	
6	Free hand drawing of <ul style="list-style-type: none"> - Lines, polygons, ellipse, etc. - geometrical figures and blocks with dimension - Transferring measurement from the given object to the free hand sketches. 			

7	<p><u>Method of presentation of Engineering Drawing</u></p> <ul style="list-style-type: none"> - Pictorial View - Orthogonal View - Isometric view 		<p><u>Percentage:</u> Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.</p>	
8	<p><u>Symbolic Representation (as per BIS SP:46-2003) of :</u></p> <ul style="list-style-type: none"> - Fastener (Rivets, Bolts and Nuts) - Bars and profile sections - Weld, brazed and soldered joints. - Electrical and electronics element - Piping joints and fittings 		<ul style="list-style-type: none"> - Forces definition. - Definition and example of compressive, tensile, shear forces, axial and tangential forces. <p>Stress, strain, ultimate strength, factor of safety for MS.</p> <p><u>Speed and Velocity:</u> Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation.</p>	
9	<p><u>Dimensioning practice:</u></p> <ul style="list-style-type: none"> - Position of dimensioning (unidirectional, aligned, oblique as per BIS SP:46-2003) - Symbols preceding the value of dimension and dimensional tolerance. 		<p><u>Mensuration:</u> Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle.</p> <p>Volume of solids – cube, cuboids, cylinder and Sphere.</p> <p>Surface area of solids – cube, cuboids, cylinder and Sphere.</p> <ul style="list-style-type: none"> - 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. 	
10	<p><u>Construction of Geometrical Drawing Figures:</u></p> <ul style="list-style-type: none"> - Polygons and their values of included angles. <p>Conic Sections (Ellipse)</p>		<p><u>Algebra :</u> Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).</p> <ul style="list-style-type: none"> - Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force. 	
11	<p><u>Projections:</u></p> <ul style="list-style-type: none"> - 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. <p>Drawing of Orthographic projection from isometric/3D view of blocks</p>		<p><u>Work, Power and Energy:</u></p> <p>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.</p>	

B. Block- II

Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
1	- Machined components; concept of fillet & chamfer; surface finish symbols.	30	<p>Trigonometry: Trigonometric ratios, Trigonometric tables.</p> <p>- Finding the value of unknown sides and angles of a triangle by Trigonometrical method.</p> <p>- Finding height and distance by trigonometry.</p>	20
2	- Screw thread, their standard forms as per BIS, external and internal thread, conventions on the features for drawing as per BIS.		<p>Friction and its application in Workshop practice.</p>	
3	- Reading & interpretation of assembly drawing and detailing.		<p>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.</p> <p>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.</p> <p>Heat treatment – Necessity, different common types of Heat treatment.</p> <p>Graph:</p> <p>- Read images, graphs, diagrams – bar chart, pie chart.</p> <p>- Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.</p>	
4	- Reading of drawing. Simple exercises related to missing lines, dimensions and views. How to make queries.	30	<p>Transmission of power: By belt, pulleys & gear drive.</p>	20
5	- Simple exercises related to trade related symbols. - Solution of NCVT test papers.		<p>Concept of pressure – units of pressure, atmospheric pressure, gauge pressure – gauges used for measuring pressure.</p> <p>Introduction to pneumatics & hydraulics systems.</p> <p>Solution of NCVT test papers</p>	

7.1.2DETAIL SYLLABUS OF PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

A. Block –I

Basic Training

Week No.	Professional Skills	Professional Knowledge
1	<p>ADMISSION AND ORIENTATION OF THE COURSE Admission formalities and orientation of the course</p> <p>GENERAL SHOP SAFETY First aid and Fire safety, Use of fire extinguishers.</p> <p>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.</p>	<p>Admission & introduction to the trade: Introduction to the Course duration, course content, study of the syllabus.</p> <p>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.</p>
2	<p>MEASURING SYSTEMS AND MEASUREMENTS 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.</p>	<p>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.</p>
3	<p>BASIC HAND TOOLS Practice on marking and cutting of a given job- file the job to bring required size- repair damaged threads.</p> <p>Identify hand tools and Special purpose tools.</p>	<p>Details of various types of marking and cutting tools- punch, scribe, hammer and mallets, hack saw frame and blade, chisels etc. – marking media.</p> <p>Description of work holding devices like vices- details of screw extractors- details of bench grinders.</p> <p>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.)</p>
4	<p>FASTENERS AND BEARINGS Identify the different types of fastener. Practice on general cleaning, checking and on loosening and tightening of various types of screwing joints using screwing tools. Removal of broken stud /bolt from blind hole.</p>	<p>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 bearings.</p>

	Remove and replace bearings from the given jobs.	
5	<p>BASIC HYDRAULICS AND PNEUMATICS</p> <p>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.</p> <p>Exercise on using impact wrenches</p>	<p>Fundamentals of Hydraulics & Pneumatics.</p> <p>Symbols of various Hydraulics & Pneumatic elements.</p> <p>Application of different types of hydraulic components like actuators, directional control valves, flow control valves, hydraulic accumulator, etc.</p> <p>Description of air compressors, impact wrenches. Description of Power tools and equipment.</p> <p>Safety precautions to be observed while working with Hydraulic and pneumatics equipment.</p> <p>Define and Explain the construction and functioning of pneumatic and Special Purpose tools and lifting & carrying components and equipment.</p>
6	<p>BASIC ELECTRICAL AND ELECTRONICS</p> <p>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</p>	<p>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.</p>
7	<p>KNOWLEDGE ABOUT AUTOMOBILE INDUSTRY.</p> <p>Familiarization to various types of vehicles.</p> <p>Identification of vehicle information Number (VIN).</p>	<p>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.)</p> <p>Gasoline Commercial and Defence Vehicle, Earth Movers (Excavators, Backhole loaders, Bulldozers, Motor Graders etc.)</p> <p>Applications of vehicle (Passengers, Goods Carrier, Transportation, Agriculture etc.)</p>
8	<p>INTRODUCTION TO ENGINE</p> <p>Identification of major components of Engine and its accessories.</p> <p>Different types of Starting and Stopping</p>	<p>Description of internal & external combustion 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.</p>

	<p>Method of different Engine.</p> <p>Understanding Automotive technical terms by demonstration.</p> <p>Demonstration of vehicle specification data.</p>	<p>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.</p> <p>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.</p>
9	<p>BATTERY & ELECTRICAL SYSTEM OF VEHICLE</p> <p>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</p> <p>Check starting system wiring harness</p> <p>Check the operation of the charging system.</p> <p>Practice on Tracing wire harness for Electrical and related components of the vehicle.</p>	<p>Purpose of battery- types- construction and working principle of a lead acid battery- maintenance free batteries- battery ratings- battery charging methods</p> <p>Principle of starter- components of a starter- construction and working of starter- starter field coil design- solenoids- types and function</p> <p>Construction and working principle of alternator- description of voltage regulator operation.</p> <p>Describe and explain the function of lighting system and other component on vehicle like doors, windows, music system,</p>
10	<p>ENGINE MANAGEMENT SYSTEM Identification of ECU and Sensors</p> <p>FUEL INJECTION SYSTEM Identification of Fuel injection system components.</p> <p>Tracing the high pressure and low pressure line.</p>	<p>Description of ECU, Functions of various sensors.</p> <p>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 direct injection system, CRDI. High /low pressure line etc.</p>
11	<p>VEHICLE TRANSMISSION</p> <p>Identification of transmission components.</p> <p>Identifying brake components, locating air leaks in the brake lines.</p> <p>Demonstration on General maintenance and care of Brake in vehicle.</p>	<p>Description and function of Clutch, transmission – Manual, Automatic and its components. Transfer Case.</p> <p>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.</p> <p>Description of air brake system. Major</p>

		components in Air brake system. Description and purpose of each part
12	<p>STEERING SYSTEM & WHEELS</p> <p>Trace the layout of different parts of Mechanical and Hydraulic steering system.</p> <p>Identification and tracing the connections of steering system, universal joint, propeller shaft and differential</p>	<p>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.</p> <p>Description of Ackerman's angle, caster, camber toe-in and toe-out on turns, purpose and effects of these angles.</p> <p>Functions of Universal joints and propeller shaft</p> <p>Description and purpose of different types of rear axles</p> <p>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.</p> <p>Description of different types of suspension system.</p> <p>Description of wheels and tyres-types selection of tyres, ply rating, inflation pressure and carrying capacity, storage of tyres</p>
13	<p>COOLING, LUBRICATION AND AC SYSTEM OF VEHICLE</p> <p>Identification of components of Cooling, lubrication and AC System.</p>	<p>Descriptions and types of cooling system - description of pump circulating system components- radiator and its types</p> <p>Functions of a lubricating system- description of different types of lubricating systems- forced feed and dry sump lubrication</p> <p>Descriptions of AC system, its components and functions.</p>
Assessment / Exam-03 days		

B. Block –II
Basic Training

Week No.	Professional Skills	Professional Knowledge
1-2	<p>DRILLS & DRILLING OPERATIONS</p> <p>Drilling Exercise- Mark off and drill through holes, drill and tap on M.S. flat,</p> <p>Punch letter and number (letter punch and number punch), use of different punches</p> <p>Exercises on Countersinking, Counter boring.</p> <p>Exercises on Tapping and Dieing</p>	<p>Introduction, nomenclature of drill & importance of angles. Different types of drills- Flat, straight fluted & twist drills & its specification.</p> <p>Different drilling operations & tools used. Importance & purpose of different drilling operations</p> <p>Drilling processes: common type (bench type, pillar type, radial type),</p> <p>Determination of Cutting Speed, Feed tap drill size.</p> <p>Definition & importance of finish & proper cutting speed & feed. Formula for calculating cutting speed. Different cutting speeds for different materials. Calculations on cutting speed & feed.</p> <p>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</p>
2-3	<p>PRESS</p> <p>Practice on Press work with simple objects.</p>	<p>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 ,flairingetc</p>
4-5	<p>WELDING</p> <p>Practice on basic welding operation-</p> <p>Practice on Spot and CO2 Welding – simple joints</p> <p>Finding defects on Auto panel & Assessment</p>	<p>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 welding equipment's. Detailed description about the welding types Describe the Function of flux, shielding gas used in the welding.</p>

		Detect the Types of defect occurs in different types of welding as mentioned.
6-7	<p>MACHINING</p> <p>Practice on setting and machining simple job in Milling Machine</p> <p>Practice on Lathe operations- holding job in three jaw chuck, plain turn.</p> <p>Demo on CNC Machining operation.</p>	<p>Safely precautions to be observed while working in workshop.</p> <p>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.</p> <p>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.</p> <p>Appropriate method of holding the tool on tool post or tool rest</p> <p>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.</p>
8-9	<p>PAINT</p> <p>Practice on Manual Spray Painting Simulator.</p> <p>Sealant Application practice on vehicle body.</p> <p>Spray Pattern Setting & Manual Spray painting on Flat Surface.</p> <p>Manual Spray Painting on Curve surface & on vehicle body parts</p> <p>Paint Inspection.</p>	<p>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 the defect occurs in painting process. Describe the causes and remedies of the defects</p> <p>Paint inspection methods.</p>
10	<p>ASSEMBLY PRACTICE</p> <p>Practice on Dexterity kits</p>	<p>Shop specific safety & importance of dexterity Sensing & Picking , bolt & Nut Tightening,</p>

	<p>Practice on Sensing & Picking, Nut & bolt tightening station & Assessment</p> <p>Practice on Screw grommet insertion & screwing kit & Assessment</p> <p>Practice on Rubber grommet kit & Electrical connector fitment kit & Assessment</p> <p>Practice on Hose insertion kit & Flair nut assembly kit & Assessment</p> <p>Practice on Element work kit & Dynamic conveyer.</p> <p>Demo on Automotive assembly process and conveyors</p>	<p>Types of nut runners & care</p> <p>Screw grommet insertion, Screw tightening, Power tools Types & care</p> <p>Rubber grommet fitment & Electrical connectors fitment</p> <p>Hose insertion & Flair nut tightening</p> <p>Element work & Standardized work</p> <p>Function construction and working process of Assembly shop</p>
12	<p>VEHICLE INSPECTION</p> <p>Vehicle Inspection and testing, Testing parameters and its importance</p>	<p>Describe and explain the various test performed on finished vehicle</p> <p>Emission test, Brake test, Drum test, Shower test</p> <p>Road test etc.</p>
13	<p>QUALITY CONTROL</p> <p>Inspection Auto Parts</p> <p>Oils & Lubricants used in a vehicle</p>	<p>What is QC, Its importance?</p> <p>Different methods of Inspection</p>
Assessment /Exam-03 days		

7.1.3 EMPLOYABILITY SKILLS

GENERAL INFORMATION

- 1) **Name of the subject** : **EMPLOYABILITY SKILLS**
- 2) **Applicability** : **ATS- Mandatory for fresher only**
- 3) **Hours of Instruction** : **110 Hrs. (55 hrs. in each block)**
- 4) **Examination** : **The examination will be held at the end of two years Training by NCVT.**
- 5) **Instructor Qualification** :

i) MBA/BBA with two years experience or graduate in sociology/social welfare/Economics with two years experience and trained in Employability skill from DGET Institute.

And

Must have studied in English/Communication Skill and Basic Computer at 12th /diploma level

OR

ii) Existing Social Study Instructor duly trained in Employability Skill from DGET Institute.

7.1.3.1 SYLLABUS OF EMPLOYABILITY SKILLS

A. Block – I Basic Training

Topic No.	Topic	Duration (in hours)
English Literacy		
1	Pronunciation : Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)	15
2	Functional Grammar Transformation of sentences, Voice change, Change of tense, Spellings.	
3	Reading Reading and understanding simple sentences about self, work and environment	
4	Writing Construction of simple sentences Writing simple English	
5	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.	
I.T. Literacy		
1	Basics of Computer Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.	15
2	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.	
3	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	
4	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.	

Communication Skill

1	<p>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. Case study/Exercise</p>	25
2	<p>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.</p>	
3	<p>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. Case study/Exercise</p>	
4	<p>Facing Interviews Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview</p>	
5	<p>Behavioral Skills Organizational Behavior Problem Solving Confidence Building Attitude Decision making Case study/Exercise</p>	

B. Block-II
Basic Training

Topic No.	Topic	Duration (in hours)
	Entrepreneurship skill	10
1	Concept of Entrepreneurship Entrepreneurship- 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.	
2	Project Preparation & Marketing analysis Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of Product Life Cycle (PLC), Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.	
3	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.	
4	Investment Procurement Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.	
	Productivity	10
1	Productivity Definition, Necessity, Meaning of GDP.	
2	Affecting Factors Skills, Working Aids, Automation, Environment, Motivation How improves or slows down.	
3	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.	
4	Personal Finance Management Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.	
	Occupational Safety, Health & Environment Education	10
1	Safety & Health Introduction to Occupational Safety and Health importance of safety and health at workplace.	
2	Occupational Hazards Basic Hazards, Chemical Hazards, Vibro-acoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.	
3	Accident & safety Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.	

4	First Aid Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person	
5	Basic Provisions Idea of basic provision legislation of India. of safety, health, welfare under legislation of India.	
6	Ecosystem Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.	
7	Pollution Pollution and pollutants including liquid, gaseous, solid and hazardous waste.	
8	Energy Conservation Conservation of Energy, re-use and recycle.	
9	Global warming Global warming, climate change and Ozone layer depletion.	
10	Ground Water Hydrological cycle, ground and surface water, Conservation and Harvesting of water	
11	Environment Right attitude towards environment, Maintenance of in -house environment	
	Labour Welfare Legislation	5
1	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.	
	Quality Tools	5
1	Quality Consciousness : Meaning of quality, Quality Characteristic	
2	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.	
3	Quality Management System : Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.	
4	House Keeping : Purpose of Housekeeping, Practice of good Housekeeping.	
5	Quality Tools Basic quality tools with a few examples	
	Leadership and Team Building skills.	5
1	Leadership Discipline and Morale Team Work Case Study/ Exercise	
2	Meet the Mentor Role - play as a Supervisor	5
	Organizing and Planning.	5
1	Time Management Group Dynamics Case Study/ Exercise	

**7.2 PRACTICAL TRAINING (ON-JOB TRAINING)
(BLOCK – I&II)**

DURATION: 18 MONTHS (9 months in each block)

GENERAL INFORMATION

- 1) **Name of the Trade** : **TECHNICIAN (AUTOMOTIVE
MANUFACTURING)**
- 2) **Duration of On-Job Training** : As per Apprentices Act amended time to
time.
- 3) **Batch size** : 16 Nos.
- 4) **Examination** : i) The internal assessment will be held on
completion of each block
ii) NCVT exam will be conducted at the end of
2nd year.
- 5) **Instructor Qualification** :

iii) Degree/Diploma in Mechanical/Automobile Engg. from recognized university/Board with one/two year post qualification experience respectively in the relevant Field.

OR

iv) NTC/NAC in the trade of Fitter with three year post qualification Experience in the relevant field.
Preference will be given to a candidate with Craft Instructor Certificate (CIC)

- 6) **Tools, Equipments & Machinery required** : - As per Annexure – II

7.2.1 BROAD SKILL COMPONENT TO BE COVERED DURING ON-JOB TRAINING

A. 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.

B. BLOCK – II

1. On the job training in various production shops to get acquainted to the vehicle manufacturing process
2. Practical with drill reamer and tap.
3. Produce the pressed components and inspect them for the surface defects.
4. Hands on training in Blanking and stamping shops
5. Practical on Riveting in frame
6. Carry out welding training and understanding of different types of welding
7. 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.
8. Produce the structural members and reinforce them with the necessary reinforces using the CO2 welding process.
9. Set the welding parameters in CO2 and defect free panel bodies.
10. Practice working on spot welding
11. Detect the defect occurs during spot welding and its remedies.
12. Practice working on co2 welding
13. Detect the defect occurs during spot welding and its remedies
14. Practice working on Tig and Mig welding
15. Practice working on Brazing and soldering
16. Prepare the welded cabin and panels for the painting process through PTED processes.
17. Produce the painted cabins, doors as per the colour shade.
18. Finish the body using appropriate waxing and buffing processes.
19. Carryout painting operations in automotive paint shop and identify the various defects and their causes occurred during paint process of vehicle body
20. Pick the right fastening part and right tightening tool from the right tray/ kit
21. Trolley as identified in the Drawing/ Standard Operating Procedure/ Work
22. Instruction and is correctly placed in the designated slot/ space as indicated inthe Work Instructions/ SOP
23. Assembly of bearings, seals and gears and Splined shafts
24. Shim selection
25. Correctly Position or align components for assembly, manually or using hoists

26. Practice the use hoists are used to lift the right material from the conveyors, bins,part trolleys etc.
27. Ensure part clearances as specified in the Work Instructions/ Standard Operating Processes.
28. Assemble the required parts using pneumatic, hydraulic/ PLC controlled assembly tools
29. Practice the assembly of trim fitments seats, windshield, dashboard components, door assembly and interiors.
30. Hands on training on conveyor line and sub assembly
31. Assembly of Automobile Components using pneumatic tools/electrical screw driver/torque wrenches.
32. Fitment of roof head lining and Rail component of Roof fitment.
33. Abnormality detection and correction at various stages of Automotive manufacturing.
34. Final Vehicle inspection and identification of Abnormality in Finished product. And Visual inspection of interior , exterior and functional components as per inspection standards.
35. On the Job Training at Vehicle Assembly Shop and Quality Assurance department
36. Practice of pre-delivery inspections as per the specifications.

8. ASSESSMENT STANDARD

8.1 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 to be given while assessing for team work, avoidance/reduction of scrape/wastage and disposal of scarp/wastage as per procedure, behavioral attitude and regularity in training.

The following marking pattern to be adopted while assessing:

a)Weightage in the range of 60-75% to be allotted during assessment under following performance level:

For 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.

In this work there is evidence of:

- good skill levels in the use of hand tools, machine tools and workshop equipment
- many tolerances while undertaking different work are in line with those demanded by the component/job.
- a fairly good level of neatness and consistency in the finish
- occasional support in completing the project/job.

b)Weightage in the range of above75%- 90% to be allotted during assessment under following performance level:

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.

In this work there is evidence of:

- good skill levels in the use of hand tools, machine tools and workshop equipment
- the majority of tolerances while undertaking different work are in line with those demanded by the component/job.
- a good level of neatness and consistency in the finish
- little support in completing the project/job

c)Weightage in the range of above 90% to be allotted during assessment under following performance level:

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.

In this work there is evidence of:

- high skill levels in the use of hand tools, machine tools and workshop equipment
- tolerances while undertaking different work being substantially in line with those demanded by the component/job.
- a high level of neatness and consistency in the finish.
- minimal or no support in completing the project

8.2 FINAL ASSESSMENT- ALL INDIA TRADE TEST

SUBJECTS	Marks	Internal assessment based on competency	Full Marks	Pass Marks	Duration of Exam.
Professional Skill	300	100	400	240	08 hrs.
Professional Knowledge	100	20	120	48	3 hrs.
Workshop Cal. & Sc.	50	10	60	24	3 hrs.
Engineering Drawing	50	20	70	28	4 hrs.
Employability Skill	50	--	50	17	2 hrs.
Grand Total	550	150	700	--	

Note:-The candidate pass in each subject conducted under all India trade test

9. FURTHER LEARNING PATHWAYS

- On successful completion of the course trainees can opt for Diploma course (Lateral entry).
- On successful completion of the course trainees can opt for CITS course.

Employment opportunities:

On successful completion of this course, the candidates shall be gainfully employed in the following industries:

1. Production & Manufacturing industries of EMM
2. Automobile and allied industries
3. Self employment

TOOLS & EQUIPMENT FOR BASIC TRAINING**INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL
KNOWLEDGE****TRADE: AUTOMOTIVE MANUFACTURING****LIST OF TOOLS & EQUIPMENTS FOR 16 APPRENTICES****A : TRAINEES TOOL KIT:-**

Sl.No.	Item with specification	Qty (Nos.)
1.	Allen Key set of 12 pieces (2mm to 14mm)	(6+1)
2.	Caliper inside 15 cm Spring	7
3.	Calipers outside 15 cm 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 of 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 :TOOLS INSTRUMENTS AND GENERAL SHOP OUTFITS

Sl.No.	Item with specification	Qty (Nos.)
1.	Adjustable spanner (pipe wrench 350 mm)	2
2.	Air blow gun with standard accessories	1
3.	Air impact wrench with standard accessories	4
4.	Air ratchet with standard accessories	4
5.	Allen Key set of 12 pieces (2mm to 14mm)	4
6.	Alternator assembly	2
7.	Ammeter 300A/ 60A DC with external shunt	4
8.	Auto Electrical test bench	1
9.	Battery –charger	2
10.	Belt Tensioner gauge	1
11.	Caliper inside 15 cm Spring	4
12.	Calipers outside 15 cm spring	4
13.	Car Jet washer with standard accessories	1
14.	Chisel 10 cm flat	4
15.	Chisels cross cut 200 mm X 6mm	4
16.	Circlip pliers Expanding and contracting type 15cm and 20cm each	4
17.	Clamps C 100mm	2
18.	Clamps C 150mm	2
19.	Clamps C 200mm	2
20.	Cleaning tray 45x30 cm.	4
21.	Compression testing gauge suitable for diesel Engine with standard accessories	2
22.	Connecting rod alignment fixture	1
23.	Cylinder bore gauge capacity 20 to 160 mm	4
24.	Cylinder liner- Dry & wet liner, press fit &slidfit liner	1 each
25.	DC Ohmmeter 0 to 300 Ohms, mid scales at 20 Ohms	2
26.	Depth micrometer 0-25mm	4
27.	Dial gauge type 1 Gr. A (complete with clamping devices and with magnetic stand)	4
28.	Different type of Engine Bearing model	1 set
29.	Different type of piston model	1each
30.	Dividers 15 cm Spring	4
31.	Drift Punch Copper 15 Cm	4
32.	Drill twist 1.5 mm to 15 mm (various sizes) by 0.5 mm	4
33.	Electric Soldering Iron 230 V 60 watts 230 V 25 watts	2 each
34.	Electric tester	4
35.	Engineer's square 15 cm. Blade	4
36.	Engineers stethoscope	1
37.	Executive Auto Electrical tool kit	1

38.	Feeler gauge 20 blades (metric)	4
39.	File flat 20 cm bastard	4
40.	File, half round 20 cm second cut	4
41.	File, Square 20 cm second cut	4
42.	File, Square 30 cm round	4
43.	File, triangular 15 cm second cut	4
44.	Files assorted sizes and types including safe edge file	2 set
45.	Flat File 25 cm second cut	4
46.	Flat File 35 cm bastard	4
47.	Fuel feed pump for diesel	1
48.	Fuel injection pump (Diesel) inline	1
49.	Fuel injection pump dismantling tool kit /Universal Vice	1
50.	Fuel injection pump, VE pump / Distributor fuel rotary pump (DPC) pumps / along with special tools and accessories.	1 each
51.	Functional/experiment model of different type of sensors.	1 set
52.	Gloves for Welding (Leather and Asbestos)	5 sets
53.	Glow plug tester	2
54.	Granite surface plate 1600 x 1000 with stand and cover	1
55.	Growler	2
56.	Hacksaw frame adjustable 20-30 cm	10
57.	Hammer Ball Peen 0.75 Kg	4
58.	Hammer Chipping 0.25 Kg	5
59.	Hammer copper 1 Kg with handle	4
60.	Hammer Mallet	4
61.	Hammer Plastic	4
62.	Hand operated crimping tool (i) for crimping up to 4mm and (ii) for crimping up to 10mm	2
63.	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
64.	Hand vice – 37 mm	2
65.	Hollow Punch set of seven pieces 6mm to 15mm	2 sets each
66.	Impact screw driver	2
67.	Injector – Multi hole type, Pintle type	4 each
68.	Injector cleaning unit	1
69.	Injector tester (Hand tester)	1
70.	Insulated Screw driver 20 cm x 9mm blade	4
71.	Insulated Screw driver 30 cm x 9mm blade	4
72.	Magnifying glass 75mm	2
73.	Marking out table 90X60X90 cm.	1
74.	Multimeter digital	5
75.	Oil can 0.5/0.25 liter capacity	4
76.	Oil pump for dismantling and assembling.	2
77.	Outside micrometer 0 to 25 mm	4
78.	Outside micrometer 25 to 50 mm	4

79.	Outside micrometer 50 to 75 mm	1
80.	Outside micrometer 75 to 100 mm ,100 to 125 mm, 125 to 150 mm	1
81.	Philips Screw Driver set of 5 pieces (100 mm to 300 mm)	2
82.	Piston ring compressor	2
83.	Piston Ring expander and remover.	2
84.	Piston Ring groove cleaner.	2
85.	Pliers combination 20 cm.	2
86.	Pliers flat nose 15 cm	2
87.	Pliers round nose 15 cm	2
88.	Pliers side cutting 15 cm	2
89.	Portable electric drill Machine	1
90.	Prick Punch 15 cm	4
91.	Punch Letter 4mm (Number)	2 set
92.	Radiator cut section-down flow	1
93.	Radiator pressure cap	2
94.	Scraper flat 25 cm	2
95.	Scriber 15 cm	2
96.	Scriber with scribing black universal	2
97.	Spanner D.E. set of 12 pieces (6mm to 32mm)	4
98.	Spanner, adjustable 15cm.	2
99.	Spanner, ring set of 12 metric sizes 6 to 32 mm.	4
100.	Spanners socket with speed handle, T-bar, ratchet and universal upto 32 mm set of 28 pieces with box	2
101.	Starter motor axial type, pre-engagement type & Co-axial type	1 each
102.	Steel measuring tape 10 meter in a case	4
103.	Steel rule 15 cm inch and metric	4
104.	Steel rule 30 cm inch and metric	4
105.	Straight edge gauge 2 ft.	2
106.	Straight edge gauge 4 ft.	2
107.	Stud extractor set of 3	2 sets
108.	Stud remover with socket handle	1
109.	Surface gauge with dial test indicator plunger type i.e. 0.01 mm	4
110.	Tachometer (Counting type)	1
111.	Taps and Dies complete sets BSF	1 set
112.	Taps and wrenches - metric	2 sets
113.	Telescope gauge	4
114.	Thermostat	2
115.	Thread pitch gauge metric, BSW	2
116.	Torque wrenches 5-35 Nm, 12-68 Nm & 50-225 Nm	1 each
117.	Turbocharger cut sectional view	1
118.	Universal puller for removing pulleys, bearings	1
119.	V' Block 75 x 38 mm pair with Clamps	2
120.	Vacuum gauge to read 0 to 760 mm of Hg.	2

121.	Valve spring compressor universal.	1
122.	vernier caliper 0-300 mm with least count 0.02mm	4
123.	Vice grip pliers	2
124.	Wire Gauge (metric)	2
125.	Work bench 250 x 120 x 60 cm with 4 vices 12cm Jaw	4
126.	4 Point relays	2
127.	5 Point relays	2
128.	Vacuum pump gauge	1
129.	Glow plug wrench	1
130.	Oil seal remover	1
131.	Oil seal installer	1
132.	Valve guide remover	1
133.	Forceps	1
134.	Fly wheel holder	1
135.	Bearing puller	1
136.	Bearing installer	1
137.	Injection pump pulley remover	1
138.	Cam shaft pulley holder	1
139.	Cam shaft locking tool	1
140.	Oil filter wrench socket	1
141.	Oil pressure gauge	1
142.	Radiator pressure tester	1
143.	Fuel pressure gauge with adopters	1

C :GENERAL MACHINERY INSTALLATIONS:-

1		
2	Engine (Petrol MPFI) for dismantling and assembly	2 Nos.
3.	Engine (Diesel DDIS) for dismantling and assembly	2 Nos.
3.	Transmission for assembly and disassembly training	2 Nos.
4.	4 Wheeler vehicle	2 Nos.
5.	cut section of main parts and systems for training	2 Nos.
6.	Cut section Engine	2 Nos.
7.	Pump Assy Fuel	
8.	Column Assy with EPS	
9.	Manufacturing line with all modern manufacturing techniques and equipment to facilitate Hands on training for the students	
10.	Blanking line	
11.	Stamping presses	
12.	Weld equipments	
13..	Paint shop with all equipment and process	
14.	Assembly shop slat and overhead conveyors	
15.	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 16 APPRENTICES

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

2) **Infrastructure:**

A : TRAINEES TOOL KIT:-

Sl. No.	Name of the items	Quantity (indicative)
1.	Draughtsman drawing instrument box	16
2.	Set square celluloid 45 ⁰ (250 X 1.5 mm)	16
3.	Set square celluloid 30 ⁰ -60 ⁰ (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	Quantity (indicative)
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 & EQUIPMENT FOR ON-JOB TRAINING

**INFRASTRUCTURE FOR PROFESSIONAL SKILLS &
PROFESSIONAL KNOWLEDGE**

TRADE: TECHNICIAN (AUTOMOTIVE MANUFACTURING)

For Batch of 16 APPRENTICES

Actual training will depend on the existing facilities available in the establishments. However, the industry should ensure that the broad skills defined against On-Job Training part are imparted. In case of any short fall the concern industry may impart the training in cluster mode/ any other industry/ at ITI.

GUIDELINES FOR INSTRUCTORS AND PAPER SETTERS

1. Due care to be taken for proper & inclusive delivery among the batch. Some of the following some method of delivery may be adopted:

- A) LECTURE
- B) LESSON
- C) DEMONSTRATION
- D) PRACTICE
- E) GROUP DISCUSSION
- F) DISCUSSION WITH PEER GROUP
- G) PROJECT WORK
- H) INDUSTRIAL VISIT

2. Maximum utilization of latest form of training viz., audio visual aids, integration of IT, etc. may be adopted.

3. The total hours to be devoted against each topic may be decided with due diligence to safety & with prioritizing transfer of required skills.