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

**COMPETENCY BASED CURRICULUM**

# MECHANIC AUTO BODY REPAIR

**(Duration: One Year)**
**Revised in July 2022**

## CRAFTSMEN TRAINING SCHEME (CTS)

## NSQF LEVEL- 3

## SECTOR –AUTOMOTIVE

Directorate General of Training

# MECHANIC AUTO BODY REPAIR

**(Engineering Trade)**

**(Revised in July 2022)**

**Version: 2.0**

## CRAFTSMEN TRAINING SCHEME (CTS)

## NSQF LEVEL - 3

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

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# 1. COURSE INFORMATION

During the one-year duration a candidate is trained on subjects Professional Skill, Professional Knowledge, and Employability Skills related to job role. In addition to this a candidate is entrusted to make/do project work and Extra Curricular Activities to build up confidence. The broad components covered under Professional Skill subjects are as below:

After the completion of the one year course the trainee will be able to Check & perform Measuring & marking by using various Measuring & Marking tools. Plan & perform basic fastening & fitting operation by using correct hand tools, Machine tools &equipments. He will Trace and Test all Electrical & Electronic components & circuits and assemble circuit to ensure functionality of system. Repair Autobody panels by using Arc & Gas welding and Assess damage to Vehicle and identify repair and replacement needs. The trainee will also service, Repair and Maintenance of Air compressor and Air Lines. The trainee will be able operate welding and cutting equipment including plasma arc cutter. He will analyze minor body damage and perform repair following sequential procedures involved in metal damage repair and Evaluate and repair damage plastic part. The trainee will also be able to perform glasses, body parts and door fitting and repairing process and will demonstrate knowledge of the procedures for diagnosing structural collision damage and measuring systems to identify location and extent of damage. The trainee will be able to use advanced body repair techniques like how to use frame straightening equipment and re-alignment procedures along with various anchoring methods and ensuring the structural integrity of the vehicle and occupant safety.

## 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 Labour market. The vocational training programmes are running under aegis of Directorate General of Training (DGT). Craftsman Training Scheme (CTS) with variants and Apprenticeship Training Scheme (ATS) are two pioneer programmes under DGT for propagating vocational training.

Mechanic Auto Body Repair trade under CTS is one of the popular courses delivered nationwide through a network of ITIs. The course is of one-year duration. It mainly consists of Domain area and Core area. The Domain area (Trade Theory & Practical) imparts professional skills and knowledge, while Core area (Employability Skills) imparts requisite core skill, knowledge and life skills. After passing out of the training programme, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

### Candidates need broadly to demonstrate that they are able to:

- Read & interpret technical parameters/documentation, plan work, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional knowledge, core skills & employability skills while performing the job.
- 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 PROGRESSION PATHWAYS:

- Can join industry as Technician and will progress further as Senior Technician, Supervisor and can rise up to the level of Manager.
- Can become Entrepreneur in the related field.
- Can join Apprenticeship programme in different types of industries leading to National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.
- Can join advanced diploma (Vocational) courses conducted by DGTas applicable.

## 2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of one year:

| S No. | Course Element | Notional Training Hours |
|---|---|---|
| 1 | Professional Skill (Trade Practical) | 840 |
| 2 | Professional Knowledge (Trade Theory) | 240 |
| 3 | Employability Skills | 120 |
| | **Total** | **1200** |

Every year 150 hours of mandatory OJT (On the Job Training) at nearby industry, wherever not available then group project is mandatory.

| | | |
|---|---|---|
| 4 | On the Job Training (OJT)/ Group Project | 150 |

Trainees of one-year or two-year trade can also opt for optional courses ofup to 240 hours in each year for 10th/ 12th class certificate along with ITI certification, or, add on short term courses.

## 2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through formative assessment and at the end of the training programme through summative assessment as notified by the DGT from time to time.

a) The **Continuous Assessment (Internal)** 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 formative assessment template provided on www.bharatskills.gov.in

b) The final assessment will be in the form of summative assessment. The All India Trade Test for awarding NTC will be conducted by Controller of examinations, DGT as per the guidelines. The pattern and marking structure are being notified by DGT 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

For the purposes of determining the overall result, weightage of 100% is applied for six months and one year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percent for Trade Practical and Formative assessment is 60% & for all other subjects is 33%.

### 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 some of 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
- Computer based multiple choice question examination
- Practical Examination

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

| Performance Level | Evidence |
|---|---|
| (a) Marks 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<br>• 60-70% accuracy achieved while undertaking different work with those demanded by the component/job/set standards.<br>• A fairly good level of neatness and |

| | |
|---|---|
| | consistency in the finish<br>• Occasional support in completing the project/job. |
| (b)Marks 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<br>• 70-80% accuracy achieved while undertaking different work with those demanded by the component/job/set standards.<br>• A good level of neatness and consistency in the finish<br>• Little support in completing the project/job |
| (c) Marks 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<br>• Above 80% accuracy achieved while undertaking different work with those demanded by the component/job/set standards.<br>• A high level of neatness and consistency in the finish.<br>• Minimal or no support in completing the project. |

3. JOB ROLE

**Dent Remover/Auto Body Repair Technician/Denter;** Dent Remover; I dents from sheet metal parts such as mudguards, body panels, tanks, containers, trunks by beating with mallets, smoothens surface for painting and other operations. Gets parts dismantled, examines dents caused by stress or accidents and starts beating from highest point on inner side with mallet to bring it back to original shape. Supports outer surface with soft metal-piece, wood or broader mallet to avoid distortion in reverse direction. Manipulates support and uniformly beats inner portion till damaged portion is reformed to original shape. May engage an assistant to hold support and guide him in manipulating it. May also scrape or lightly file outer surface to remove further defects, if any, for obtaining finer finish.

**Welder, Gas;** fuses metal parts together using welding rod and oxygen acetylene flame. Examines parts to be welded, cleans portion to be joined, holds them together by some suitable device and if necessary makes narrow groove to direct flow of molten metal to strengthen joint. Selects correct type and size of welding rod, nozzle etc. and tests welding, torch. Wears dark glasses and other protective devices while welding. Releases and regulates valves of oxygen and acetylene cylinders to control their flow into torch. Ignites torch and regulates flame gradually. Guides flame along joint and heats it to melting point, simultaneously melting welding rod and spreading molten metal along joint shape, size etc. and rectifies defects if any. May join part at various spots to prevent distortion of shape, form dimension etc. May preheat materials like cast iron prior to welding. May also weld by other gases such as argon coal etc.

**Gas Cutter;** Flame Cutter cuts metal to required shape and size by gas flame either manually or by machine. Examines material to be cut and marks it according to instruction of specification. Mounts template and sets machine to cut to specifications. Makes necessary connections and fits required size of nozzle or burner in welding torch. Releases and regulates flow of gas in nozzle or burner, ignites and adjusts flame. Guides flame by hand or machine along cutting line at required speed and cuts metal to required size. May use oxyacetylene or any other appropriate gas flame.

Plan and organize assigned work and detect & resolve issues during execution in his own work area within defined limit. Demonstrate possible solutions and agree tasks within the team. Communicate with required clarity and understand technical English. Sensitive to environment, self-learning and productivity.

**Reference NCO-2015:**

i) 7213.0301 – Dent Remover/Auto Body Repair Technician/ Denter
ii) 7212.0100– Welder, Gas
iii) 7212.0400 – Gas Cutter

**Reference NOS:**

i) ASC/N1418
ii) ASC/N1412
iii) ASC/N1406
iv) ASC/N1412
v) ASC/N9415
vi) ASC/N1413
vii) ASC/N9401
viii) ASC/N9402

## 4. GENERAL INFORMATION

| | |
|---|---|
| **Name of the Trade** | **MECHANIC AUTO BODY REPAIR** |
| **Trade Code** | DGT/1083 |
| **NCO - 2015** | 7213.0301, 7212.0100, 7212.0400 |
| **NOS Covered** | ASC/N1418, ASC/N1412, ASC/N1406, ASC/N1412, ASC/N9415, ASC/N1413 , ASC/N9401, ASC/N9402 |
| **NSQF Level** | Level – 4 |
| **Duration of Craftsmen Training** | One Years (1200 hours + 150 hours OJT/Group Project) |
| **Entry Qualification** | Passed 10th class examination |
| **Minimum Age** | 14 years as on first day of academic session. |
| **Eligibility for PwD** | LD, LC, DW, AA, LV, DEAF |
| **Unit Strength (No. Of Student)** | 20 (There is no separate provision of supernumerary seats) |
| **Space Norms** | 210 Sq. m |
| **Power Norms** | 4 KW |
| **Instructors Qualification for** | |
| **1. Mechanic Auto Body Repair Trade** | B.Voc/Degree in Automobile/ Mechanical Engg. (with specialization in Automobile) from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field.<br>**OR**<br>03 years Diploma in Automobile/ Mechanical (specialization in automobile) AICTE/ recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field.<br>**OR**<br>NTC/NAC passed in the trade of "Mechanic Auto Body Repair" with three years' experience in the relevant field.<br><br>**Essential Qualification:**<br>Relevant Regular / RPL variants of National Craft Instructor Certificate (NCIC) under DGT.<br><br>***NOTE: - Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However, both of them must possess NCIC in any of its variants.*** |

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|---|---|
| **2. Workshop Calculation & Science** | B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field.<br>**OR**<br>03 years Diploma in Engineering from AICTE / recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field.<br>**OR**<br>NTC/ NAC in any one of the engineering trades with three years' experience.<br><br>**Essential Qualification:**<br>Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade<br>**OR**<br>Regular / RPL variants NCIC in RoDA or any of its variants under DGT |
| **3. Engineering Drawing** | B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field.<br>**OR**<br>03 years Diploma in Engineering from AICTE / recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field.<br>**OR**<br>NTC/ NAC in any one of the Mechanical group (Gr-I) trades categorized under Engg. Drawing'/ D'man Mechanical / D'man Civil' with three years' experience.<br><br>**Essential Qualification:**<br>Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade<br>**OR**<br>Regular / RPL variants of NCIC in RoDA / D'man (Mech /civil) or any of its variants under DGT. |
| **4. Employability Skill** | MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience **w**ith **short term ToT Course in** Employability Skills. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above)<br>**OR**<br>**Existing Social Studies Instructors in ITIs with short term ToT Course in** Employability Skills. |
| **5. Minimum Age for Instructor** | 21 Years |
| **List of Tools and Equipment** | As per Annexure – I |
| | |

5. LEARNING OUTCOME

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

## 5.1 LEARNING OUTCOMES

1. Check & perform Measuring & marking by using various Measuring & Marking tools following safety precaution (Vernier Calliper, Micrometer, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.) (ASC/N1418)
2. Plan & perform basic fastening & fitting operation by using correct hand tools, Machine tools &equipments. (ASC/N1412)
3. Trace and Test all Electrical & Electronic components & circuits and assemble circuit to ensure functionality of system. (ASC/N1406)
4. Check and Interpret Vehicle Specification data and VIN, Select & operate various Service Station Equipments. (ASC/N1412)
5. Assess damage to Vehicle and identify repair and replacement needs. (ASC/N1412)
6. Identify various vehicle parts and Service, Repair and Maintenance of Air compressor and Air Lines. (ASC/N9415)
7. Demonstrate the proper operation and methods of welding and cutting equipment including plasma arc cutting processes. (ASC/N1413)
8. Analyze minor body damage and perform repair following sequential procedures involved in metal damage repair. (ASC/N1412)
9. Evaluate and repair damage plastic part. (ASC/N1412)
10. Demonstrate glasses, body parts and door fitting and repairing process. (ASC/N1412)
11. Demonstrate knowledge of the procedures for diagnosing structural collision damage and measuring systems to identify location and extent of damage. (ASC/N1412)
12. Demonstrate how to use frame straightening equipment and re-alignment procedures along with various anchoring methods and ensuring the structural integrity of the vehicle and occupant safety. (ASC/N1413)
13. Read and apply engineering drawing for different application in the field of work ASC/N9401
14. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. ASC/N9402

6. ASSESSMENT CRITERIA

| LEARNING OUTCOMES | ASSESSMENT CRITERIA |
|---|---|
| 1. Check & perform Measuring & marking by using various Measuring & Marking tools following safety precaution (Vernier Calliper, Micrometer, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.) (ASC/N1418) | Plan the working principles of measuring instruments and special tools required for auto workshop. |
| | Select, care and use of measuring instrument. |
| | Set up the measured value with workshop manual and quality concepts and proper safety. |
| | Carry out decision on whether to replace or not. |
| | |
| 2. Plan & perform basic fastening & fitting operation by using correct hand tools, Machine tools & equipments. (ASC/N1412) | Describe the purpose, use of auto hand tools. |
| | List the safety rules for hand tools. |
| | Select the correct tool for the job. |
| | Set up the tacked pieces in specific position. |
| | Joint components by Brazing, Soldering, Riveting as per given drawing. |
| | Produce components by different operation (Drilling, Reaming, Taping, Dieting) |
| | |
| 3. Trace and Test all Electrical & Electronic components & circuits and assemble circuit to ensure functionality of system. Charge and test batteries used in vehicle. (ASC/N1406) | Plan and prepare as per procedure and safety methods of soldering the cable ends using an electric soldering iron. |
| | Use crimping tool to make a circuit joint. |
| | Explain the connection of an ammeter, voltmeter, and ohmmeter in a circuit trouble shooting. |
| | State open & short circuit, series and parallel circuits. |
| | Verify DC series & parallel circuits and its characteristics. |
| | Check out the open and short circuits in the lighting circuits. |
| | Verify ohm's law and measure resistance using rheostat. |
| | Check the voltage drop in the auto electrical system by using multimeter. |
| | Trace the auto electrical components by using vehicle wiring circuits. |
| | Check the condition of the solenoid switch in the starting system. |
| | Determine the forward to reverse resistance ratio of diodes and identify good / bad diodes. |
| | Perform battery charging and check. |
| | |
| 4. Check and Interpret | Identify of different type of vehicle. |

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| | Vehicle Specification data and VIN, Select & operate various Service Station Equipments. (ASC/N1412) | Identify the different vehicle specification data and information. |
| | | Demonstrate the garage, service station different equipment. |
| | | |
| 5. | Assess damage to Vehicle and identify repair and replacement needs. (ASC/N1412) | Prepare accident report. |
| | | Ascertain the damage and plan repair sequence. |
| | | Identify the vehicle parts and finalize the repair procedure to be followed. |
| | | |
| 6. | Identify various vehicle parts and Service, Repair and Maintenance of Air compressor and Air Lines. (ASC/N9415) | Ascertain basic working principles and safety aspect of Air Compressor. |
| | | Plan and perform removal of accessories fitted to the Air Compressor. |
| | | Dismantle the cylinder block parts. |
| | | Perform inspection to ascertain the serviceability of the dismantled parts. |
| | | Repair/replace defective parts. |
| | | Comply with safety rules when performing the above operations. |
| | | Assemble and check functionality of the components. |
| | | Service FRL unit and check air leaks on the Air compressor and installed pipelines. |
| | | |
| 7. | Demonstrate the proper operation and methods of welding and cutting equipment including plasma arc cutting processes. (ASC/N1413) | Plan and mark on surface for plasma cutting. |
| | | Select the torch/nozzle size, current and working pressure of gas as per requirement. |
| | | Set the marked plate properly on cutting table. |
| | | Set the plasma cutting machine and perform the cutting operation by adapting proper techniques and safety aspects. |
| | | Clean and inspect the cut surface for quality of cutting. |
| | | |
| 8. | Analyze minor body damage and perform repair following sequential procedures involved in metal damage repair. (ASC/N1412) | Perform minor repair using a hammer and dolly straighten damage on a door. |
| | | Pull out minor damage in the fender Using dent puller. |
| | | Remove dents in steel Panels Using a spot weld dent puller. |
| | | Select proper abrasive and carryout paint strip by single action sander. |
| | | Apply body filler and carryout sanding for quality body repair finish. |
| | | |
| 9. | Evaluate and repair damage plastic part. (ASC/N1412) | Identify common automotive plastics used in the industry. |
| | | Repair minor cuts and cracks using chemical adhesive. |
| | | Reshape a plastic part by heat application. |
| | | |
| 10. | Demonstrate glasses, body parts, door fitting and | Remove hood from a vehicle as per standard procedure. |
| | | Adjust hood and perform hood latch adjustments. |

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| repairing process. (ASC/N1412) | Replace bumper. |
| | Remove Fender, reinstall fender and adjust it properly, adjust Trunk lid and service trunk bed and align the panel. |
| | Remove windshield and service rubber gasket. |
| | Apply adhesive to windshield glass using a sealer gun. |
| | Align windshield into position and Install. |
| | Adjust Door glass, install door trim panel, service tailgate glass, station wagon tailgate, rear view mirror service, roof panel. |
| | |
| 11. Demonstrate knowledge of the procedures for diagnosing structural collision damage and measuring systems to identify location and extent of damage. (ASC/N1412) | Use trame gauge for upper body dimensioning. |
| | Measure and ascertain damage at the front body and body side panel, rear body Damage Using Gauge Measuring Systems. |
| | Determine the extent of impact damage using universal measuring system and computerized measuring system. |
| | |
| 12. Demonstrate how to use frame straightening equipment and re-alignment procedures along with various anchoring methods and ensuring the structural integrity of the vehicle and occupant safety. (ASC/N1413) | Analyze Length damage, Width damage and Height damage. |
| | Repair the vehicle for front-end damage, rear damage, side damage, sag damage, twist damage, diamond damage, straightening strut, tower damage. |
| | Relieve stress with heat, stress concentrators, and Frame Straightening Equipment by anchoring the vehicle using pulling clamps and chains. |
| | |
| 13. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. | Solve different mathematical problems |
| | Explain concept of basic science related to the field of study |
| | |
| 14. Read and apply engineering drawing for different application in the field of work. | Read & interpret the information on drawings and apply in executing practical work. |
| | Read & analyze the specification to ascertain the material requirement, tools and assembly/maintenance parameters. |
| | Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work. |
| | |

| SYLLABUS FOR MECHANIC AUTO BODY REPAIR | | | |
|---|---|---|---|
| **DURATION: ONE YEAR** | | | |
| **Duration** | **Reference Learning Outcome** | **Professional Skills (Trade Practical) With Indicative Hours** | **Professional Knowledge (Trade Theory)** |
| Professional Skill 86 Hrs; Professional Knowledge 13 Hrs | Check & perform Measuring & marking by using various Measuring & Marking tools following safety precaution (Vernier Caliper, Micrometer, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.) (Mapped NOS: ASC/N1418) | 1. Familiarization with institute, Job opportunities in the automobile sector.(04 hrs)<br>2. Machinery used in Trade. (08 hrs)<br>3. Types of work done by the students in the shop floor. (10hrs) | **Admission & introduction to the trade:** Introduction to the Course duration, course content, study of the syllabus. General rule pertaining to the Institute, facilities available- Hostel, Recreation, Medical and Library working hours and time table. (03 hrs) |
| | | 4. Practical related to Safety and Health.(5 hrs)<br>5. Importance of maintenance and cleanliness of Workshop. (2 hrs)<br>6. Use of fire extinguishers. (5 hrs)<br>7. Demonstration on safe handling and Periodic testing of lifting equipment. (5 hrs)<br>Safety disposal of used engine oil. Energy saving Tips/Audit of ITI electricity Usage.(5 hrs) | **Occupational Safety & Health**<br>Importance of Safety and general Precautions to be observed in the shop. Basic first aid, safety signs - for Danger, Warning, caution & personal safety message. Safe handling of Fuel Spillage, Fire extinguishers used for Different types of fire. safe disposal of toxic dust, safe handling and Periodic testing of lifting equipment, Safety disposal of Used engine oil, Electrical safety tips.<br>Hazard identification, spatter hazard etc and countermeasure to eliminate them & importance of usage of PPEs. (03 hrs) |

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| | | 8. Practice using all marking aids, like steel rule with spring calipers, dividers, scriber, punches, Chisel etc.(12 hrs)<br>9. Layout a work piece- for line, circle, arcs and circles.(10 hrs)<br>10. Practice to measure a wheel base of a vehicle with measuring tape.(5 hrs)<br>11. Practice to remove wheel lug nuts with use of an air impact wrench. (05 hrs)<br>Practice on General workshop tools & power tools and equipments. (10hrs) | **Hand Tools**<br>Marking scheme, Marking material-chalk, Prussian blue. Cleaning tools- Scraper, wire brush, Emery paper, Description, care and use of Surface plates, steel rule, measuring tape, try square. Calipers-inside and outside. Dividers, surface gauges, scriber, punches- prick punch, center punch, pin punch, hollow punch, number and letter punch. Chisel-flat, cross-cut. Hammer- ball pein, lump, mallet. , Different type of - body hammers, pick hammers, , Bumping hammers, finishing hammers, dolly block, and body spoon, body picks, body pullers and pull rods, suction cup, scratch awl, Screw drivers-blade screwdriver, Phillips screw driver, Ratchet screwdriver. Allen key, bench vice & C-clamps, Spanners- ring spanner, open end spanner & the combination spanner, universal adjustable open end spanner. Sockets & accessories, Pliers - Combination pliers, multi grip, long nose, flat-nose, Nippers or pincer pliers, Metal cutting shears- Tin snips, sheet metal cutting pliers, (Aviation snips), panel cutters, trim and upholstery tools, Door handle tool ( clip pullers), Metal files-reveal file, surform file, sanding board, sanding block, spreaders and squeegees. (07 hrs) |

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|---|---|---|---|
| Professional Skill 46 Hrs; Professional Knowledge 10 Hrs | Plan & perform basic fastening & fitting operation by using correct hand tools, Machine tools & equipments. (Mapped NOS: ASC/N1412) | 12. Practice on General workshop tools & power tools and equipments. (05 hrs)<br>13. Practice on visual Identification of materials used in workshop.(08 hrs)<br>14. Trouble shooting for Air drills- Tool will not run, Tool locked up, spindle will not run, tool will not shutoff, Trouble shooting for Air hammers-tool will not run, chisel stack in nozzle.(10hrs)<br>15. Trouble shooting for Air ratchet-Motor runs, spindle does not turn or turns erratically, motor will not run, Trouble shooting for Air Wrenches-Tools run slowly & not at all.(10hrs)<br>16. Tool will not retract tool leaks under pressure. (08 hrs)<br>17. Handle kickback, works properly onetime but not the next.(5 hrs) | **Power Tools:-**<br>Air powered tools - Advantage over electrical powered tools, Construction and its parts of air spray gun, Air drill, air screw drivers, air sanders-disc type and dual action(finishing) sander, Different type of air grinders, air saw, air scraper, air shear, air nibblers, air chuck, air polishers/buffers, media blasting (sand blasting), plastic media blasting, soda blasters, maintenance of pneumatic tools.<br>air impact wrench, air ratchet, air drill, spot weld remover air drill, spot weld cutter-drill type & Hole saw type, air chisel, air blowgun, Spray guns, wrenches- Torque wrenches, pipe wrenches, car jet washers Pipe flaring & cutting tool. Vacuum cleaner, power washers, Heat gun, Hydraulically powered shop equipment-Hand or bottle jacks, Transmission jack, service jack, Frame rack, Maintenance of hydraulic tools, hydraulic lifts. Engine crane. (10 hrs) |

| | | | |
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| Professional Skill 20 Hrs; Professional Knowledge 04 Hrs | Check & perform Measuring & marking by using various Measuring & Marking tools following safety precaution *(Vernier Calliper, Micrometer, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.)* (Mapped NOS: ASC/N1418) | 18. Measuring practice on different components. (20 hrs) | **Systems of measurement:** Description, care & use of Micrometers - Outside and depth micrometer, Micrometer adjustments, Vernier calipers. (04 hrs) |
| Professional Skill 98 Hrs; Professional Knowledge 15 Hrs | Plan & perform basic fastening & fitting operation by using correct hand tools, Machine tools & equipments. (Mapped NOS: ASC/N1412) | 19. Practice on General cleaning, checking and use of nut , bolts, & studs etc.(12 hrs)<br>20. Removal of stud/bolt from blind hole.(08 hrs) | **Fasteners-** Study of different types of screws, nuts, studs & bolts, locking devices, Such as lock nuts, cotter, split pins, keys, circlips, lock rings, lock washers and locating where they are used. Washers & chemical compounds can be used to help secure these fasteners. Description of Riveting tools. (03 hrs) |
| | | 21. Practice on cutting tools like Hacksaw, file, chisel, OFF-hand grinding with sander, bench and pedestal grinders, safety precautions while grinding.(15 hrs)<br>Practice on Hacksawing and filing to given dimensions.(10 hrs) | **Cutting tools** :- Study of different type of cutting tools like Hacksaw, File- Definition, parts of a file, specification, Grade, shape, different type of cut and uses., chisel, OFF-hand grinding with sander, bench and pedestal grinders, safety precautions while grinding. (03 hrs) |

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| | | 22. Practice on Marking and Drilling clear and Blind Holes, Sharpening of Twist Drill.(10hrs)<br>23. Safety precautions to be observed while using a drilling machine. (08 hrs)<br>24. Practice on Tapping a Clear and Blind Hole, Selection of tape drill Size, use of Lubrication.(10hrs)<br>25. Use of tap extractor, Cutting Threads on a Bolt/ Stud.(10hrs)<br>26. Practice on making Rectangular Tray. (05 hrs)<br>Soldering and Brazing of Pipes. (10 hrs) | **Drilling machine** - Description and study of Bench type Drilling machine, Portable electrical Drilling machine, drill holding devices, Drill bits.<br>**Taps and Dies:** Hand Taps and wrenches, Different type of Die and Die stock. Screw extractors.<br>**Hand Reamers** - Different Type of hand reamers.(05 hrs)<br>**Sheet metal** - State the various common metal Sheets used in Sheet Metal shop. Sheet metal operations - Shearing, bending, Drawing, Squeezing.<br>Sheet metal joints - Hem & Seam Joints Fastening Methods - Riveting, soldering, Brazing. fluxes used on common joints. Sheet and wire-gauges. The blow lamp- its uses and pipe fittings. (04 hrs) |
| Professional Skill 38 Hrs; Professional Knowledge 05 Hrs | Trace and Test all Electrical & Electronic components & circuits and assemble circuit to ensure functionality of system. (Mapped NOS: ASC/N1406) | 27. Practice in joining wires using soldering Iron. (4 hrs)<br>28. Measuring of current, voltage and resistance. (03 hrs)<br>29. Using digital multimeter, practice continuity test for fuses, jumper wires, fusible links, circuit breakers. (6 hrs) | **Basic electricity,** Electricity principles, Ohm's law, Voltage, Current, Resistance, Power, Energy. Voltmeter, ammeter, Ohmmeter Multimeter, Conductors & insulators, Wires.<br>(03 hrs) |

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| | | 30. Perform voltage drop test in circuits using multimeter, measure current flow using multimeter /ammeter. (10hrs)<br>Identification of Hydraulic and pneumatic components used in vehicle. (15hrs) | **Introduction to Hydraulics & Pneumatics: -** Definition of Pascal law, pressure, Force, viscosity. Pneumatic Symbols. (02 hrs) |
| Professional Skill 25 Hrs; Professional Knowledge 03 Hrs | Check & Interpret Vehicle Specification data and VIN<br>Select & operate various Service Station Equipments. (Mapped NOS: ASC/N1412) | 31. Identification of different type of Vehicle. (5 hrs)<br>32. Demonstration of vehicle specification data. (5 hrs)<br>33. Identification of vehicle information Number (VIN). (5 hrs)<br>34. Demonstration of Garage, Service station equipments.(5 hrs)<br>35. Vehicle hoists – Two post and four post hoist, Engine hoists, Jacks, Stands. (5 hrs) | Auto Industry - History, leading manufacturers, development in automobile industry, trends, new product. Brief about Ministry of Road transport & Highways, The Automotive Research Association of India (ARAI), National Automotive Testing and R&D Infrastructure Project (NATRIP), & Automobile Association.<br>Definition: - Classification of vehicles on the basis of load as per central motor vehicle rule, wheels, final drive, and fuel used, axles, position of engine and steering transmission, body and load. Brief description and uses of Vehicle hoists – Two post and four post hoist, Engine hoists, Jacks**,** Stands. (03 hrs) |

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| Professional Skill 75 Hrs; Professional Knowledge 14 Hrs | Assess damage to Vehicle and identify repair and replacement needs. (Mapped NOS: ASC/N1412) | 36. Practice on preparation of accident report. (15hrs)<br>37. Preparation of Body shop repair sequence procedures. Washing of vehicle.(5 hrs)<br>38. Identification of different type body, chassis, Drive lines.(05 hrs)<br>39. Identify the location of parts and panels. (5 hrs)<br>40. Identify the parts of unibody design vehicle. (5 hrs)<br>41. Identify the front body structural components of a transverse-mounted engine of FWD vehicle. Identify the rear body structural components of a unibody sedan. (5 hrs)<br>42. Identify the under body front and rear section structural components of a unibody sedan. (5 hrs)<br>43. Identity the front, rear body structural components of mid-engine vehicle. (5 hrs)<br>44. Identify the parts of a full frame of pickup truck and Sports utility vehicle (SUV). (10 hrs)<br>45. Practice on use of computer-based service information, service manuals, collision repair guides, refinishing guides, vehicle dimension manual, color matching guides, parts interchange guides. (15 hrs) | **Introduction to Engine:** Description of internal & external combustion engines, Classification of IC engines, Principle & working of 2&4-stroke diesel engine (Compression ignition Engine (C.I)), Principle of Spark Ignition Engine(SI), differentiate between 2-stroke and 4 stroke, C.I engine and S.I Engine, Technical terms used in engine, Engine specification..<br>**Vehicle construction Technology** Definition of collision repair, body shop, classification of body shop-Independent body shop, dealership body shop, specialty body shop. Description of Repair order(RO) Description of vehicle Body and Chassis, Vehicle Frame- definition, Body- over- frame (Independent frame) construction, Hydro formed frame, Unibody construction; Major Body Sections-Front, Center, rear section, and vehicle left and right sides; Drive line configuration-Transverse engine, longitudinal engine, front-engine front wheel drive (FWD), front-engine rear wheel drive (RWD), Rear-engine rear wheel drive (RRD), Mid-engine rear wheel drive (MRD), Four-wheel drive (4WD); Body Classifications- Based on Car size, Roof designs; Body panels, Description of Unibody Panels and their parts, Unibody Design Factors, Advantage of Aerodynamic design, General unibody characteristics, Plastic parts and panels, composite |

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| Professional Skill 41 Hrs; Professional Knowledge 06 Hrs | Identify various vehicle parts and Service, Repair and Maintenance of Air compressor and Air Lines. (Mapped NOS: ASC/N9415) | 46. Identify the parts of a piston type stationary compressor, Overhauling of Air compressor, Overhauling of service (FRL) unit, Drain the air receiver and the moisture separator/regulator or air transformer. (10 hrs)<br>47. Check the level of the oil in the crankcase, clean air filters, Clean or blow off fins on cylinders, heads, intercoolers, After coolers. (08 hrs)<br>48. Check the oil filter in the air line and change the filter element if necessary, Adjust the pressure switch cut-in and cut-out settings if Needed, Check the relief valve for exhausting of head pressure each time the motor stops. Tighten belts to prevent slippage. (12 hrs)<br>49. Check and align a loose motor pulley or compressor. (03 hrs)<br>50. Check for air leaks on the compressor outfit and air piping system. (08 hrs) | **Compressor Air system :** Basic requirement for compressed air systems, Type of Compressor- Description and construction of Diaphragm compressor, piton type compressor- single stage and two stage, rotary screw air compressor, Performance of air compressor- Description of Horse power, delivery volume, displacement, Free air delivery, compressor volumetric efficiency, tank size, Air and Fluid Control Equipment – In take air filter, Distribution system, regulator, lubricator, different type air purification method, Compressor Accessories – Hose type, hose size, maintenance of hose, connectors, adapters and couplings, Air System Maintenance. Study the typical piping arrangement found in a body shop, colour coding of airline, water line and fuel line. (06 hrs) |

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| Professional Skill 102 Hrs; Professional Knowledge 25 Hrs | Demonstrate the proper operation and methods of welding and cutting equipment including plasma arc cutting processes. (Mapped NOS: ASC/N1413) | 51. Identify the parts of an oxyacetylene welding and cutting outfit. (08 hrs)<br>52. Practice on Oxyacetylene welding process, Practice on Soldering and brazing. (10 hrs).<br>53. Practice on torch flame adjustment. (02 hrs)<br>54. Identify the different parts on MIG welding machine, Selection of weld specification as per manual, selection of MIG wire size. (5 hrs)<br>55. Compare the welding methods used in vehicle production, practice on surface preparation and setting of welding parameter, use of clamping and MIG welding of sample panel, practice on plug weld hole for body panel replacement.(10 hrs)<br>56. Practice on Spraying antispatter compound into a MIG nozzle will help protect the tip and prevent the wire from sticking in the gun, Practice on Flat, Horizontal, vertical and overhead welding position. (10 hrs)<br>57. Practice on continuous, plug, stitch, MIG spot, lap, tack welding techniques, Identify the different parts on SPOT welding machine.(20 hrs)<br>58. Practice on resistance spot welding process on different thickness materials. (10 hrs)<br>59. Practice tip dressing, tip change, chisel test nugget test for spot welding to ensure the spot weld quality.(15 | **Welding:**<br>Introduction to joining of metals, Welding characteristics, weld terminology, weld symbols, Common Auto body welding techniques- MIG, TIG, Soft brazing, Factory weld specification, Typical Auto body MIG wire sizes, Typical Auto body shielding gases, Heat affected Zone (HAZ), Auto body MIG welding -Principles & characteristics, MIG welding equipments, Welding lens, MIG operation methods, MIG welding equipment, MIG welding current, MIG Arc voltage, MIG Tip to base metal distance, MIG gun angle and welding direction, MIG shield gas flow volume, MIG welding speed, MIG wire speed, MIG gun nozzle adjustment, Heat buildup penetration, clamping tools for welding, Welding position. welding Technique-Tack weld, Continuous weld, plug weld, spot weld, lap weld, stitch weld, intermittent weld, Base welding method-Butt welds lap & flange welding, plug weld, stitch weld, MIG welding of Galvanized metals & Aluminum, Welding Aluminum, MIG weld defects, Testing the MIG weld. FCAW (Flux cored Arc welding) , TIG Welding, Resistance spot welding, Resistance spot welding components, Spot welder adjustments, Operating a squeeze-type resistance spot welder, Other spot welding functions, stud spot welds for dent removal, Oxyacetylene welding, |

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| Professional Skill 66 Hrs; Professional Knowledge 15 Hrs | Analyze minor body damage and perform repair following sequential procedures involved in metal damage repair. (Mapped NOS: ASC/N1412) | 61. Practice on minor repair of damaged car. (5 hrs)<br>62. Practice on using a hammer and dolly straighten damage on a door. (8 hrs)<br>63. Using long spoon to pry out a fender to allow for hammer straightening. (8 hrs)<br>64. Using Pry picks remove small dents in hard-to-reach areas. (09 hrs)<br>65. Practice on Using dent puller to pull out minor damage along a lip in the fender. (8 hrs)<br>66. Using a spot weld dent puller remove dents in steel Panels. (8 hrs)<br>67. Perform Paint Stripping using single action sander, Abrasive selection.(05 hrs)<br>68. Carry out maintenance of single action sander.(05 hrs)<br>69. Perform Body Filler application & Sanding to ensure body repair quality. (10 hrs) | **Sheet metal repair.** Automotive sheet metal, basic steps for correcting minor sheet metal damage, Low carbon steel, high strength steels (HSS)- Type of HSS- High tensile strength steel (HTSS), Type of loading- Tensile, compress, shear, cleavage, peel, Properties of sheet metal- Yield strength, Compressive strength, shear strength, torsional strength, effect of impact forces (Yield point), elastic deformation, plastic deformation, work hardening, Classifying body damage- direct damage, indirect damage, work hardening, analyzing sheet metal damage, Buckles- simple hinge buckles, pressure forces, single crown panels-door dings, Determining the direction of damage - metal straightening technique- using body hammer, Bumping dent with dollies, Hammer-on-dolly method, Hammer-off-dolly method, picking dents, unlocking on a hammer & dolly, straightening with body spoons, other metal straightening method-paint removal, pulling dents, spot-weld dent pullers, metal shrinking, stress reliving, stretched metal, Principle of shrinking , shrinking steel panel with heat, Kinking, shrinking a gouge, filing the repair area, working Aluminum panels, working Aluminum with hammer and dolly, straightening aluminum with hammer, filling and grinding aluminum, straightening aluminum by heat shrinkage, Paint less dent removal |

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| Professional Skill 23 Hrs; Professional Knowledge 07 Hrs | Evaluate and repair damage plastic part. (Mapped NOS: ASC/N1412) | 70. Identify the thermoplastics, thermosetting plastics. (5 hrs)<br>71. Identify common automotive plastics used in the industry. (5 hrs)<br>72. Practice on using chemical adhesive bonding techniques to repair of minor cuts and cracks. (5 hrs)<br>73. Practice on using heat to reshape plastics, (08 hrs) | Repairing Plastics Introduction to plastics, Types of Plastics- Thermoplastics, thermosetting plastics, safety points observed while working with plastic repair, common automotive plastics identification, plastic repair, chemical adhesive bonding techniques- repair of minor cuts and cracks, repair of tears, and punctures, using the right adhesive, Flexible part repair- Plastic welding, Hot air plastic welding, High speed plastic welds, plastic welder setup shutdown, and servicing, Airless plastic welding, ultrasonic plastic welding, plastic welding procedures, general plastic welding, techniques, Plastic tack welding, plastic welding procedures, airless melt-flow plastic welding, plastic stitch- tamp welding, single-sided plastic welds, two sided plastic welds, repairing vinyl, using heat to reshape plastics, ultrasonic stud welding, reinforced plastic repairs. (07 hrs) |

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| Professional Skill 100 Hrs; Professional Knowledge 20 Hrs | Demonstrate glasses, body parts and door fitting and repairing process. (Mapped NOS: ASC/N1412) | 74. Practice on Hood removal as per procedure. (5 hrs).<br>75. Practice on Hood adjustment, Hood-to-hinge adjustment, hood height adjustment, hood latch mechanism, hood latch adjustments, and Bumper replacements. (10 hrs)<br>76. Practice on Fender removal, installing fenders, fender adjustments, grille service, Trunk lid adjustments, panel alignment, Truck bed service. (20 hrs) | Hood, Bumper, Fender, Lid, And Trim Service Part removal Sequence, Hood service- Hood removal, Hood adjustment, Hood-to-hinge adjustment, hood height adjustment, hood latch mechanism, hood latch adjustments, Bumper replacements, Fender service- Fender removal, installing fenders, fender adjustments, grille service, Trunk lid adjustments, panel alignment, Truck bed service, sound- Deadening pads, custom body panels, installing body trim and moldings, removing adhesive held moldings, installing adhesive body sine moldings. (07 hrs) |

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| | | 77. Practice on removing windshield, Practice on windshield rubber gasket service. (5 hrs)<br>78. Practice to align windshield into position during Installation(5 hrs)<br>79. Practice on using a sealer gun to apply adhesive to windshield glass. (08 hrs)<br>80. Identify the basic parts of a door assembly. (5 hrs)<br>81. Practice on door removal. Practice on repair of modern power window regulator, door lock & latch, Door & Door glass adjustments, servicing welded door hinges, bolted door hinge adjustment. (10hrs)<br>Practice on Door glass adjustment, door trim panel installation tailgate glass service, station wagon tailgate adjustment, rear view mirror service, roof panel service. (12 hrs) | Door, roof, and glass Service Vehicle Glass Technology- Introduction, type of glass- laminated, plate glass, tempered glass, glass service- removing windshield molding, windshield rubber gasket service, Glass adhesive-full cut-out method, glass adhesive, partial cutout method, windshield wiper service, rear and quarter window service, service doors-door construction, manual & power regulators, checking door operation, door removal, door weather strip service, Door inner trim panel Door window regulator service, door lock & latch service, Door reinforcements, panel adhesive technology, Replacing bonded door skins, replacing SMC( Sheet molded compound) Door skins, Door & Door glass adjustments, servicing welded door hinges, bolted door hinge adjustment, Door glass service- Door glass adjustment, door trim panel installation tailgate glass service, station wagon tailgate adjustment, Glass element repairs, rear view mirror service, roof panel service, fastened roof panel service, convertible top service, Sun roof service. (8 hrs) |

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| | | 82. Identify the different parts of Passenger Compartment, practice on seat service. (5 hrs)<br>83. Front seat service, Rear bench seat service, seat cover service, carpeting service, dash panel service, console service. (5 hrs)<br>84. Instrument cluster service, Headliner service, locating air and water leaks(5 hrs)<br>Checking drain hoses, wind noise, repairing leaks, Rattle elimination, Fixing rattle. (05 hrs) | Passenger compartment Service Major parts of Passenger Compartment - dash assembly, instrument cluster, seat assemblies, interior trim, steering column assembly, headliner assembly, carpeting, weather stripping, Interior trim-pillar trim panels, dash panel, door trim panels, Glass trim panels, sill plates, interior trim service-procedure, roll bars, seat service- Front seat service, Rear bench seat service, seat cover service, carpeting service, dash panel service, console service, Instrument cluster service, Headliner service, locating air and water leaks- checking drain hoses, wind noise. (05 hrs) |

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| Professional Skill 70 Hrs; Professional Knowledge 13 Hrs | Demonstrate knowledge of the procedures for diagnosing structural collision damage and measuring systems to identify location and extent of damage. (Mapped NOS: ASC/N1412) | 85. Practice on use of trame gauge, upper body dimensioning. (25hrs)<br>86. Measurement of the front body, measurement of the body side panel, measurement of the rear body Damage Using Gauge Measuring Systems, Strut Centerline Gauge. (15 hrs)<br>87. Identify the condition of collision, influence of impact on a body-over-frame vehicle, visually determine the extent of impact damage.(15hrs)<br>88. Inspecting for damage from passengers & luggage, Universal Measuring Systems, Computerized Measuring Systems. (15hrs) | Major Body/ frame damage Measurement Vehicle measurement-collision repair process, diagnostic procedure for collision damage, impact and its effects on a vehicle-Determining the condition of collision, influence of impact on a body-over-frame vehicle, Frame deformation-sideway damage, sag damage, mash damage, diamond damage, twist damage, impact effect on unibody vehicles- primary damage area, secondary damage area, collision damage sequence, visually determine the extent of impact damage, inspecting for damage from passengers & luggage, body dimensions-body dimension charts, vehicle measuring basics, measurement importance, Gauge measuring system-trame gauge, upper body dimensioning, measurement of the front body, measurement of the body side panel, measurement of the rear body, digital tram gauges, dimensional references, the centre panel, zero planes, diagnosing damage, measuring Vehicle Impact and Its Effects on a vehicle, Visually Determining the Extent of Impact Damage, Measurement of Body Dimensions, Gauge Measuring System, Tram Gauges, Digital Tram Gauges, Centering Gauges. (13 hrs) |

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| Professional Skill 50 Hrs; Professional Knowledge 10 Hrs | Demonstrate how to use frame straightening equipment and re-alignment procedures along with various anchoring methods and ensuring the structural integrity of the vehicle and occupant safety. (Mapped NOS: ASC/N1413) | 89. Practice on analyzing damage-Length damage, Width damage, Height damage. (20 hrs)<br>90. Practice on repair method for front-end damage, rear damage, side damage, sag damage, twist damage, diamond damage, straightening strut, tower damage, stress relieving, straightening strut tower damage, stress relieving with heat, stress concentrators, Frame Straightening Equipment, anchoring the vehicle using pulling clamps and chains. (30 hrs) | Unibody/ frame alignment Realignment basics-vehicle anchoring and pulling, pulling direction, single-pull method, multiple-pull Method, visualizing front-end Collisions, rear-end collisions, side collision, rollover damage, angled impacts, unibody / Frame Straightening Equipment, in-floor straightening equipment-anchor-pot system and the modular rail frame system. portable body and frame pullers, rack (floor) straightening systems, bench straightening systems, anchoring the vehicle using pulling clamps and chains, other straightening accessories- restraint bar , door aligner, engine holder, portable hydraulic rams, strut plate, straightening and realigning techniques-sequence for a total structure realignment procedure, unibody / frame realignment safety, measuring when pulling, computerized measuring systems, procedure for planning the pull, making pulls-single-pull setup, multiple-pull setups, executing a pulling sequence, purpose of overpulling. (10 hrs) |
| **ENGINEERING DRAWING: (40 Hrs.)** | | | |

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| Professional Knowledge ED- 40 Hrs. | Read and apply engineering drawing for different application in the field of work. | **ENGINEERING DRAWING:**<br>Introduction to Engineering Drawing and Drawing Instruments –<br>Conventions<br>Sizes and layout of drawing sheets<br>Title Block, its position and content<br>Drawing Instrument<br>Lines- Types and applications in drawing<br>Free hand drawing of –<br>Geometrical figures and blocks with dimension<br>Transferring measurement from the given object to the free hand sketches.<br>Free hand drawing of hand tools and measuring tools.<br>Drawing of Geometrical figures:<br>Angle, Triangle, Circle, Rectangle, Square, Parallelogram.<br>Lettering & Numbering – Single Stroke.<br>Dimensioning<br>Types of arrowhead<br>Leader line with text<br>Position of dimensioning (Unidirectional, Aligned)<br>Symbolic representation –<br>Different symbols used in the related trades of Mechanic Auto Body Repair / Electrical and Electronics / Diesel / Tractor / Two and Three-wheeler.<br>Concept and reading of Drawing in<br>Concept of axes plane and quadrant<br>Concept of Orthographic and Isometric projections<br>Method of first angle and third angle projections (definition and difference)<br>Reading of Job drawing related to Mechanic Auto Body Repair / Electrical and Electronics / Diesel / Tractor / Two and Three-wheeler trades. |
| **WORKSHOP CALCULATION & SCIENCE: (40 Hrs)** | | |

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| WCS- 40 Hrs. | Demonstrate basic mathematical concept and principles to perform practical operations.<br>Understand and explain basic science in the field of study. | **WORKSHOP CALCULATION & SCIENCE:**<br>**Unit, Fractions**<br>Classification of unit system<br>Fundamental and Derived units F.P.S, C.G.S, M.K.S and SI units<br>Measurement units and conversion<br>Factors, HCF, LCM and problems<br>Fractions - Addition, substraction, multiplication & division<br>Decimal fractions - Addition, subtraction, multiplication & division<br>Solving problems by using calculator<br>**Square root, Ratio and Proportions, Percentage**<br>Square and square root<br>Simple problems using calculator<br>Applications of Pythagoras theorem and related problems<br>Ratio and proportion<br>Ratio and proportion - Direct and indirect proportions<br>Percentage<br>Precentage - Changing percentage to decimal and fraction<br>**Material Science**<br>Types metals, types of ferrous and non ferrous metals<br>Physical and mechanical properties of metals<br>Introduction of iron and cast iron<br>Difference between iron & steel, alloy steel and carbon steel<br>Properties and uses of rubber, timber and insulating materials<br>**Mass, Weight, Volume and Density**<br>Mass, volume, density, weight and specific gravity.<br>**Speed and Velocity, Work, Power and Energy**<br>Work, power, energy, HP, IHP, BHP and efficiency<br>Potential energy, kinetic energy<br>**Heat & Temperature and Pressure**<br>Concept of heat and temperature, effects of heat, difference between heat and temperature, boiling point & melting point of different metals<br>Scales of temperature, Celsius, Fahrenheit, kelvin and conversion between scales of temperature<br>Heat &Temperature - Temperature measuring instruments, types of thermometer, pyrometer and transmission of heat - Conduction, convection and radiation<br>Concept of pressure - Units of pressure, gauge pressure and gauges used for measuring pressure<br>**Basic Electricity**<br>Introduction and uses of electricity, electric current AC,DC their comparison, voltage, resistance and their units<br>Conductor, insulator, types of connections - series and parallel<br>Electrical power, HP, energy and units of electrical energy<br>**Levers and Simple machines**<br>Lever & Simple machines - Lever and its types<br>**Trigonometry**<br>Measurement of angles |

**In plant Training/Project Work**

| SYLLABUS FOR CORE SKILLS |
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| 1. Employability Skills (Common for all CTS trades) (120 Hrs.) |

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

**ANNEXURE-I**

| LIST OF TOOLS AND EQUIPMENT | | | |
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| **MECHANIC AUTO BODY REPAIR (For batch of 20 Candidates)** | | | |
| **S No.** | **Name of the Tool & Equipment** | **Specification** | **Quantity (No. /Nos.)** |
| **A. TRAINEES TOOL KIT** | | | |
| 1. | Allen Key set of 12 pieces | (2 mm to 14 mm) | 7 (6+1) |
| 2. | Body hammer (long pick) | | 7 (6+1) |
| 3. | Body hammer, cross chisel (finishing hammer) | | 7 (6+1) |
| 4. | Body hammer, utility pick (short pick) | | 7 (6+1) |
| 5. | Caliper inside 15 cm Spring | | 7 (6+1) |
| 6. | Calipers outside 15 cm spring | | 7 (6+1) |
| 7. | Center Punch | 10 mm. Dia. x 100 mm. | 7 (6+1) |
| 8. | Different type of spoon | | 7 (6+1) |
| 9. | Dividers 15 cm Spring | | 7 (6+1) |
| 10. | Electrician Screw Driver | 250mm | 7 (6+1) |
| 11. | General purpose dolly | | 7 (6+1) |
| 12. | Hammer ball peen | 0.5 kg with handle | 7 (6+1) |
| 13. | Hands file 20 cm. Second cut flat | | 7 (6+1) |
| 14. | Pliers combination. | 20 cm | 7 (6+1) |
| 15. | Safety glasses | | 7 (6+1) |
| 16. | Screw driver | 20cm.X 9mm. Blade | 7 (6+1) |
| 17. | Screw driver | 30 cm. X 9 mm. Blade | 7 (6+1) |
| 18. | Scriber | 15 cm | 7 (6+1) |
| 19. | Spanner D.E. set of 12 pieces | (6mm to 32mm) | 7 (6+1) |
| 20. | Spanner, ring set of 12 metric sizes | 6 to 32 mm. | 7 (6+1) |
| 21. | Spanners socket with speed handle, T-bar, ratchet and universal upto 32 mm set of 28 pieces with box | | 7 (6+1) |
| 22. | Steel rule 30 cm inch and metric | | 7 (6+1) |
| 23. | Steel tool box with lock and key | (folding type) 400x200x150 mm | 7 (6+1) |
| 24. | Toe dolly | | 7 (6+1) |
| 25. | Wire cutter and stripper | | 7 (6+1) |
| **B. INSTRUMENTS AND GENERAL SHOP OUTFIT** | | | |
| **TOOLS & EQUIPMENT** | | | |

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| 26. | Adjustable spanner | (pipe wrench 350 mm) | 2 |
| 27. | Air blow gun with standard accessories | | 1 |
| 28. | Air impact wrench with standard accessories | | 4 |
| 29. | Air ratchet with standard accessories | | 4 |
| 30. | Allen Key set of 12 pieces | (2mm to 14mm) | 2 |
| 31. | Ammeter 300A/ 60A DC with external shunt | | 5 |
| 32. | Angle plate adjustable | 250x150x175 | 1 |
| 33. | Angle plate | size 200x100x200mm | 2 |
| 34. | Anvil 50 Kgs with Stand | | 1 |
| 35. | Blow Lamp 1 litre | | 2 |
| 36. | Calliper inside 15 cm Spring | | 4 |
| 37. | Calliper outside 15 cm spring | | 4 |
| 38. | Car Jet washer with standard accessories | | 1 |
| 39. | Chain Pulley Block-3 ton capacity with tripod stand | | 1 |
| 40. | Chisel 10 cm flat | | 4 |
| 41. | Chisels cross cut | 200 mm X 6mm | 4 |
| 42. | Circlip pliers Expanding and contracting type | 15cm and 20cm each | 4 |
| 43. | Clamps C | 100mm | 4 |
| 44. | Clamps C | 150mm | 4 |
| 45. | Clamps C | 200mm | 4 |
| 46. | Cleaning tray | 45x30 cm. | 4 |
| 47. | Collapsible panel stands | | 2 |
| 48. | Copper bit soldering iron | 0.25 Kg | 4 |
| 49. | Crow bar | 910 x25mm | 2 |
| 50. | Depth micrometer | 0-25mm | 4 |
| 51. | Different type of Bumping hammers | | 1 set |
| 52. | Different type of -body hammers | | 1 set |
| 53. | Different type of body picks | | 1 set |
| 54. | Different type of body spoon | | 1 set |
| 55. | Different type of dolly block | | 1 set |
| 56. | Different type of finishing hammers | | 1 set |
| 57. | Different type of pick hammers | | 1 set |

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| 58. | Divider 15 cm Spring | | 4 |
| 59. | Door handle tool (clip pullers) | | 1 |
| 60. | Drift Punch Copper | 15 cm | 4 |
| 61. | Drill point angle gauge | | 1 |
| 62. | Drill twist 1.5 mm to 15 mm (various sizes) by 0.5 mm | | 4 |
| 63. | Electric Soldering Iron | 230 V 60 watts 230 V 25 watts | 2 each |
| 64. | Electric testing screw driver | | 2 |
| 65. | Engineer's square 15 cm Blade | | 4 |
| 66. | File flat 20 cm bastard | | 4 |
| 67. | File, half round 20 cm second cut | | 4 |
| 68. | File, Square 20 cm second cut | | 4 |
| 69. | File, Square 30 cm round | | 4 |
| 70. | File, triangular 15 cm second cut | | 4 |
| 71. | Files assorted sizes and types including safe edge file (20 Nos) | | 2 set |
| 72. | Flat File 25 cm second cut | | 4 |
| 73. | Flat File 35 cm bastard | | 4 |
| 74. | Garage rack | | 2 |
| 75. | Gloves for Welding (Leather and Asbestos) | | 5 sets |
| 76. | Granite surface plate | 1600 x 1000 with stand and cover | 1 |
| 77. | Grease Gun | | 2 |
| 78. | Grip Wrench | 200mm | 2 |
| 79. | Growler | | 1 |
| 80. | Hacksaw frame adjustable | 20-30 cm | 10 |
| 81. | Hammer Ball Peen | 0.75 Kg | 2 |
| 82. | Hammer Chipping | 0.25 Kg | 5 |
| 83. | Hammer copper | 1 Kg with handle | 4 |
| 84. | Hammer Mallet | | 4 |
| 85. | Hammer Plastic | | 4 |
| 86. | Hand operated crimping tool | (i) for crimping up to 4mm and (ii) for crimping up to 10mm | 2 |
| 87. | Hand reamers adjustable | 10.5 to 11.25 mm, 11.25 to 12.75 mm, 12.75 to 14.25 mm and 14.25 to 15.75 mm | 2sets |
| 88. | Hand Shear Universal | 250mm | 2 |
| 89. | Hand vice | 37 mm | 2 |

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| 90. | Hollow Punch set of seven pieces | 6mm to 15mm | 2 sets each |
| 91. | Insulated Screw driver | 20 cm x 9mm blade | 4 |
| 92. | Insulated Screw driver | 30 cm x 9mm blade | 4 |
| 93. | Interchangeable driver set | | 1 set |
| 94. | Lead light | | 2 |
| 95. | Left cut snips | 250mm | 4 |
| 96. | Lifting jack screw type | 3 ton capacity | 4 |
| 97. | Magneto spanner set with 8 spanners | | 1 set |
| 98. | Magnifying glass | 75mm | 2 |
| 99. | Marking out table | 90X60X90 cm. | 1 |
| 100. | Multimeter digital | | 5 |
| 101. | Oil can 0.5/0.25 liter capacity | | 2 |
| 102. | Oil Stone | 15 cm x 5 cm x 2.5 cm | 1 |
| 103. | Outside micrometer | 0 to 25 mm | 4 |
| 104. | Outside micrometer | 25 to 50 mm | 4 |
| 105. | Outside micrometer | 50 to 75 mm | 1 |
| 106. | Outside micrometer | 75 to 100 mm | 1 |
| 107. | Paint measuring / mixing stick & jug sets | | 4 each |
| 108. | Panel assembly hold/support arms | | 2 |
| 109. | Panel cutter (two-way nibbler) | | 1 |
| 110. | Philips Screw Driver set of 5 pieces | 100 mm to 300 mm | 2 sets |
| 111. | Pliers flat nose | 15 cm | 2 |
| 112. | Pliers round nose | 15 cm | 2 |
| 113. | Pliers side cutting | 15 cm | 2 |
| 114. | Portable electric drill Machine | | 1 |
| 115. | Prick Punch | 15 cm | 4 |
| 116. | Punch Letter 4mm (Number) | | 2 set |
| 117. | Right cut snips | 250 mm | 4 |
| 118. | Rivet sets snap and Dolly combined | 3mm, 4mm, 6mm | 4 |
| 119. | Scraper flat | 25 cm | 2 |
| 120. | Scraper half round | 25 cm | 4 |
| 121. | Scraper Triangular | 25 cm | 4 |
| 122. | Scriber | 15 cm | 4 |
| 123. | Scriber with scribing black universal | | 2 |

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| 124. | Set of stock and dies - Metric | | 2 sets |
| 125. | Shear Tin Man's | 450 mm x 600mm | 4 |
| 126. | Sheet metal cutting pliers-left , right hand and straight -jaw | | 1 set |
| 127. | Sheet Metal Gauge | | 2 |
| 128. | Sher Tinman's | 300 mm | 4 |
| 129. | Soldering Copper Hatchet type | 500gms | 4 |
| 130. | Spanner D.E. set of 12 pieces | 6 mm to 3 2mm | 4 |
| 131. | Spanner T. flocks for screwing up and up-screwing inaccessible | | 2 |
| 132. | Spanner, adjustable | 15 cm | 2 |
| 133. | Spanner, ring set of 12 metric sizes | 6 to 32 mm | 2 |
| 134. | Spanners socket with speed handle, T-bar, ratchet. | | 2 |
| 135. | Spark lighter | | 2 |
| 136. | Spirit level | 2 V 250, 05 meter | 2 |
| 137. | Steel measuring tape | 10 meter in a case | 4 |
| 138. | Steel rule 15 cm inch and metric | | 4 |
| 139. | Steel rule 30 cm inch and metric | | 4 |
| 140. | Steel wire Brush | 50mmx150mm | 4 |
| 141. | Straight edge gauge | 2 ft. | 2 |
| 142. | Straight edge gauge | 4 ft. | 2 |
| 143. | Stud extractor set of 3 | | 2 sets |
| 144. | Stud remover with socket handle | | 1 |
| 145. | Suction cup | | 2 |
| 146. | Surface gauge with dial test indicator plunger type i.e. 0.01 mm | | 2 |
| 147. | Taps and Dies complete sets | 5 types | 1 set |
| 148. | Taps and wrenches - Metric | | 2 sets |
| 149. | Torque wrenches | 5-35 Nm, 12-68 Nm & 50-225 Nm | 1 each |
| 150. | Trammel | 30 cm | 2 |
| 151. | Trim and upholstery tools | | 1 set |
| 152. | 'V' Block 75 x 38 mm pair with Clamps | | 2 |
| 153. | Various sanding blocks-soft, hard, speed file & de-nibbling tools | | 2 sets |
| 154. | Vernier caliper | 0-300 mm with least count 0.02mm | 4 |
| 155. | Vice grip pliers | | 2 |

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| 156. | Voltmeter | 50V/DC | 5 |
| 157. | Wire Gauge (metric) | | 5 |
| 158. | Work bench | 250 x 120 x 60 cm with 4 vices 12cm Jaw | 4 |
| **C. GENERAL INSTALLATION/ MACHINERIES** | | | |
| 159. | Angle grinder (10-12 cm) - for cutting and grinding | | 2 |
| 160. | Belt sander (Narrow surface) | | 2 |
| 161. | Bench lever shears | 250 mm Blade x 3mm Capacity | 1 |
| 162. | Body repair hand tools - Various hammers, dollies, spoons, files, line chisel, hacksaw, clamps, & sanding blocks | | 2 each |
| 163. | Body shell - Light Motor vehicle of different Manufactures | | 4 |
| 164. | Bonded auto glass removal & replacement tools | | 2 |
| 165. | Caulking / panel seam sealer / panel adhesive application gun | | 2 |
| 166. | Chassis alignment equipment (incorporating measurement system) | | 1 |
| 167. | Compressed air line | 10m (on retractable reel, with high flow connectors) with FRL unit | 2 |
| 168. | Disc sander | 18 cm | 2 |
| 169. | Drilling machine bench to drill up to 12mm dia along with accessories | | 1 |
| 170. | Dual Magnetization Yoke | AC / HWDC, 230 VAC, 50Hz | 1 set |
| 171. | Dust extraction connections (Vacuum) | | 2 |
| 172. | Electronic heat shrinking equipment (carbon rod, induction or copper | | 1 |
| 173. | Gas Welding Table | 1220mm x760mm | 1 |
| 174. | Grinding machine (general purpose) D.E. pedestal with 300 mm dia wheels rough and smooth | | 1 |
| 175. | Hydraulic jack HI-LIFT type - | 3 ton capacity, 5 ton capacity | 1each |
| 176. | Infrared drying lamp unit | | 1 |
| 177. | Liquid penetrant Inspection kit | | 1 set |

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| 178. | MIG welding machine complete set 400Amps | | 2 |
| 179. | Motor Vehicle suitable for Body shop repair -Light Motor vehicle of different Manufactures | | 2 |
| 180. | Oxy-acetylene welding equipment with complete accessories (Low& high) | | 2 |
| 181. | Plasma cutter | | 1 |
| 182. | Pneumatic rivet gun | | 2 |
| 183. | Power hacksaw kit | | 2 |
| 184. | Random /dual action orbital sander | 12-15 cm | 2 |
| 185. | Spot weld cutter- Drill type, Hole saw type | | 1 |
| 186. | Spot weld removal kit / drill along with accessories | | 2 |
| 187. | Spot welder (single and double sided) | | 2 |
| 188. | Tin smiths bench folder | 600 x 1.6mm | 1 |
| 189. | Trolley type portable air compressor single cylinder with 45 liters capacity Air tank, along with accessories & with working pressure 6.5 kg/sq cm | | 1 |
| 190. | Weld through primer application equipment | | 2 |
| 191. | Welding plant Oxy-Acetylene complete (high pressure) | | 2 |
| 192. | Welding Transformer | 200 to 400 Amps | 2 |
| 193. | Weld-on pin/ ring panel puller kit | | 2 |
| 194. | Desktop Computer | CPU: 32/64 Bit i3/i5/i7 or latest processor, Speed: 3 GHz or Higher. RAM:-4 GB DDR-III or Higher, Wi-Fi Enabled. Network Card: Integrated Gigabit Ethernet, with USB Mouse, USB Keyboard and Monitor (Min. 17 Inch. Licensed Operating System and Antivirus compatible with trade related software. | 1+1 |
| 195. | Internet connection with all accessories | | As required |

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| 196. | Laser printer | | 1 |
| 197. | LCD projector/ LED /LCD TV | 42" | 1 |
| 198. | Online UPS 2KVA | | As required |
| **D. CONSUMABLE** | | | |
| 199. | Chalk, Prussian blue. | | As required |
| 200. | Chemical compound for fasteners | | As required |
| 201. | Diesel | | As required |
| 202. | Different type gasket material | | As required |
| 203. | Drill Twist (assorted) | | As required |
| 204. | Emery paper - | 36-60 grit , 80-120 | As required |
| 205. | Hacksaw blade (consumable) | | As required |
| 206. | Lapping abrasives | | As required |
| 207. | Holders, lamp teakwood boards, plug sockets, | | As required |
| 208. | Safety glasses | | As required |
| 209. | Steel wire Brush | 50mmx150mm | As required |
| 210. | Gloves for Welding (Leather and Asbestos) | | As required |
| 211. | Cotton waste/ cloth | | As required |
| 212. | Body filler (Consumable) | | As required |
| 213. | Masking paper / plastic & back-masking tape | | As required |
| 214. | Refinishing material (consumable) | | As required |
| **E. WORKSHOP FURNITURE** | | | |
| 215. | Book shelf (glass panel) | $6^1/_2$' x 3' x $I^1/_2$' | As required |
| 216. | Computer Chair | | 1+1 |
| 217. | Computer Table | | 1+1 |
| 218. | Discussion Table | 8' x 4' x $2^1/_2$' | 2 |
| 219. | Fire Extinguishers. first- aid box | Arrange all proper NOCs and equipment from Municipal/Competent authorities. | |
| 220. | LCD Projector/LCD TV/Interactive smart board | | 01 no. |
| 221. | Stools | | 21 |
| 222. | Storage Rack | $6^1/_2$ ' x 3' x 2’ | As required |
| 223. | Storage shelf | 6 ' x 3' x 1' | As required. |
| 224. | Suitable class room furniture | | As required |
| 225. | Suitable Work Tables with vices | | As required |

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| 226. | Tool Cabinet - | 6 ' x 3' x 1' | 2 |
| 227. | Trainees locker | 6' x 3' x 1' | 2 Nos. |

**ANNEXURE-II**

# ABBREVIATIONS

| | |
|---|---|
| CTS | Craftsmen Training Scheme |
| ATS | Apprenticeship Training Scheme |
| CITS | Craft Instructor Training Scheme |
| DGT | Directorate General of Training |
| MSDE | Ministry of Skill Development and Entrepreneurship |
| NTC | National Trade Certificate |
| NAC | National Apprenticeship Certificate |
| NCIC | National Craft Instructor Certificate |
| LD | Locomotor Disability |
| CP | Cerebral Palsy |
| MD | Multiple Disabilities |
| LV | Low Vision |
| HH | Hard of Hearing |
| ID | Intellectual Disabilities |
| LC | Leprosy Cured |
| SLD | Specific Learning Disabilities |
| DW | Dwarfism |
| MI | Mental Illness |
| AA | Acid Attack |
| PwD | Person with disabilities |


कौशलं बलम्