

**SYLLABUS OF SEMESTER SYSTEM
FOR THE TRADE OF**

Mechanic Auto body Repair

Under

**Craftsmen Training Scheme (CTS)
(One year / Two Semesters)**

**Redesigned in
2014**

**By
Government of India
Ministry of Labour & Employment (DGE&T)**

GENERAL INFORMATION

1. Name of the Trade : Mechanic, Auto Body Repair
2. N.C.O. Code No. : **7213.30, 7212.10, 7212.40**, ASC/ Q 1405, ASC/ Q 1410
3. Duration of Craftsmen Training : 1 Year (Two Semester having duration of six months each)
4. Power Norms : 4 Kw
5. Space Norms : 210 Sq. mtr. (Including Parking Area)
6. Entry Qualification : Passed 10th class examination with maths and Science.
7. Unit strength : 16 + 30% super Numeric
8. Instructors Qualification : a) Degree in Automobile/ Mechanical Engg. (with specialization in Automobile) from recognised college/University with one year experience in the automobile Body/painting industry and should possess valid LMV driving license.
OR
Diploma in Automobile/Mechanical (specialization in automobile) from recognized board of technical education with two years experience in the automobile Body/painting industry and should possess valid LMV driving license
OR
10th Passed + NTC/NAC in the Trade of “**Mechanic Auto Body Repair**” with 3 years post qualification experience in the relevant field and should possess valid LMV driving license

and
b) With “**National Crafts Instructor Certificate**”.

- * **Note:**
- 1) At least one Instructor must have Degree/Diploma in Automobile/ Mechanical Engg. when applied for 02 units.
 - 2) Instructor Qualification for WCS & E.D, as per the Training manual

9. For Employability Skills One Contract/Part Time/Guest Faculty for Generic Module .
 i) MBA/ BBA with two years experience **OR** Graduate in Sociology / Social Welfare / Economics with Two years experience **OR** Graduate / Diploma with Two years experience and trained in Employability Skills from DGET institutes

AND

Must have studied English / Communication Skills and Basic Computer at 12th / Diploma level and above

OR

Existing Social Study Instructors duly trained in Employability Skills from DGET institutes

Distribution of training on Hourly basis:

Total hours /week	Trade practical	Trade theory	Work shop Cal. &Sc.	Engg. Drawing	Employability skills	Extra curricular activity
42 Hours	27 Hours	5 Hours	3 Hours	3 Hours	2 Hours	2 Hours

COURSE INFORMATION (MECHANIC AUTO BODY REPAIR)

1.Introduction :

- An intensive industrial survey was made to ascertain the requirements of skill-gap in the automobile sector, a scientifically designed survey covering labour-market survey web-survey was conducted. Based on the data obtained the skills are identified and accordingly the syllabus has been drafted. Subsequently the Trade expert committed reviewed.

2. Terminal Competencies/Deliverables :

After successful completion of the above course, the trainee shall be able to perform the following skills with proper sequence.

- **Removes** 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.
- **Fuses** metal parts together using welding rod and oxy-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.
- 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.
- 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.

3. Employment opportunities:

On successful completion of the course the candidates can either get employed, or become a self-employed Entrepreneur in any one of the following fields.

a) Wage Employment

1. Mechanic Auto body repairer
2. Welder in Auto Body shop
3. Gas cutter in Auto body shop
4. Dealers service mechanic
5. Spare Parts Sales Assistant / Manufacturers' Representative
6. Laboratory Assistant

b) Self Employment

1. Auto Body repair
2. Auto Body welder
3. Spare Parts Salesman
4. Spare Parts Dealer

4. Further learning pathways:

- On successful completion of the course trainee can get themselves enrolled in Apprenticeship training in reputed Industrial organisation.
- The qualified candidates have scope for lateral entry into the Diploma courses offered by some of the State Governments
- The qualified candidates can also get themselves upgraded by taking up the Second Semester at his own convenience in the CTS scheme, since the first semester is common to the following trades.

Craftsman Training Scheme

1. Mechanic Auto body Repair - 1 Year (2 Sem)
2. Mechanic Auto body painting – 1 Year (2 Sem)

TRADE: Mechanic Auto Body Repair

First Semester (Semester code No.)

Duration: Six Months. Syllabus for Trade practical and Trade Theory

Weeks	Trade Practical (27 Hrs/week)	Trade Theory (5 Hrs/week)
1	Familiarisation with institute, Job opportunities in the automobile sector, Machinery used in Trade. Types of work done by the students in the shop floor.	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
2	Practical related to Safety and Health, Importance of maintenance and cleanliness of Workshop. Interaction with health center and fire service station to provide demo on First aid and Fire safety, Use of fire extinguishers. Demonstration on safe handling and Periodic testing of lifting equipment, and Safety disposal of Used engine oil. Energy saving Tips/Audit of ITI electricity Usage	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. 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, Authorization of Moving & road testing vehicles; Energy conservation-Definition, Energy Conservation Opportunities(ECOs)-Minor ECos and Medium ECos, Major ECos), Safety disposal of Used engine oil, Electrical safety tips.
3-5	Practice using all marking aids, like steel rule with spring calipers, dividers, scribe, punches, Chisel etc., Layout a work piece- for line, circle, arcs and circles. Practice to measure a wheel base of a vehicle with measuring tape. Practice to remove wheel lug nuts with use of an air impact wrench Practice on General workshop tools & power tools and equipments.	Hand Tools 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, scribe, punches-prick punch, center punch, pin punch, hollow punch, number and letter punch. Chisel-flat, cross-cut. Hammer- ball peen, 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.
6-8	<p>Practice on General workshop tools & power tools and equipments.</p> <p>Practice on visual Identification of materials used in workshop. Trouble shooting for Air drills- Tool will not run, Tool locked up, spindle will not run, tool will not shutoff,</p> <p>Trouble shooting for Air hammers- tool will not run, chisel stuck in nozzle;</p> <p>Trouble shooting for Air ratchet- Motor runs, spindle does not turn or turns erratically, motor will not run,</p> <p>Trouble shooting for Air Wrenches- Tools run slowly & not at all, Tool will not run, exhaust air flows freely, socket will not stay on, tool shows premature shank wear, Tool will not shut off.</p> <p>Trouble shooting for hydraulic tools for- Spongy effect, Tool will not extend, Tool will not retract tool leaks under pressure, Handle kickback, works properly onetime but not the next.</p>	<p>Power Tools:-</p> <p>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.</p> <p>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.</p> <p>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.</p>
9	Measuring practice on engine components with aid of instrument studied.	<p>Systems of measurement:</p> <p>Description, care & use of :- Micrometers- Outside and depth mirometer, Micrometer adjustments, Vernier calipers, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.</p>
10	<p>Practice on General cleaning, checking and use of nut , bolts, & studs etc.,</p> <p>Removal of stud/bolt from blind hole.</p>	<p>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. Selection of materials for gaskets and packing, Description of Riveting tools</p>
11	<p>Practice on cutting tools like Hacksaw, file, chisel, OFF-hand grinding with sander, bench and pedestal grinders, safety precautions while grinding.</p> <p>Practice on Hacksawing and filing to given dimensions.</p>	<p>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.</p>

		Limits, Fits & Tolerances:- Definition of limits, fits & tolerances with examples used in auto components.
12-13	Practice on Marking and Drilling clear and Blind Holes, Sharpening of Twist Drills Safety precautions to be observed while using a drilling machine. Practice on Tapping a Clear and Blind Hole, Selection of tap drill Size, use of Lubrication. Use of tap extractor, Cutting Threads on a Bolt/ Stud. Adjustment of two piece Die. Reaming a hole/ Bush to suit the given pin/ shaft, scraping a given machined surface.	Drilling machine -Description and study of Bench type Drilling machine, Portable electrical Drilling machine, drill holding devices, Drill bits. Taps and Dies: Hand Taps and wrenches, Calculation of Tap drill sizes for metric and inch taps. Different type of Die and Die stock. Screw extractors. Hand Reamers – Different Type of hand reamers, Lapping, Lapping abrasives, type of Laps. Function of Gaskets, Selection of materials for gaskets and packing, oil seals.
14	Practice on making Rectangular Tray. Pipe bending, Fitting nipples unions in pipes. Soldering and Brazing of Pipes.	Sheet metal - State the various common metal Sheets used in Sheet Metal shop. Sheet metal operations - Shearing, bending, Drawing, Squeezing. 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.
15	Practice in joining wires using soldering Iron, Construction of simple electrical circuits, Measuring of current, voltage and resistance using digital multimeter, practice continuity test for fuses, jumper wires, fusible links, circuit breakers.	Basic electricity , Electricity principles, Ground connections, Ohm's law, Voltage, Current, Resistance, Power, Energy. Voltmeter, ammeter, Ohmmeter Multimeter, Conductors & insulators, Wires, Shielding, Length vs. resistance, Resistor ratings
16	Diagnose series, parallel, series-parallel circuits using Ohm's law, Check electrical circuit with a test lamp, perform voltage drop test in circuits using multimeter, measure current flow using multimeter /ammeter, use of service manual wiring diagram for troubleshooting.	Fuses & circuit breakers, Ballast resistor, Stripping wire insulation, cable colour codes and sizes, Resistors in Series circuits , Parallel circuits and Series-parallel circuits, Electrostatic effects, Capacitors and its applications, Capacitors in series and parallel.
17	Cleaning and topping up of a lead acid battery, Testing battery with hydrometer, Connecting battery to a charger for battery charging, Inspecting & testing a battery after charging, Measure and Diagnose the cause(s) of excessive Key-off battery drain (parasitic draw) and do corrective action. Testing of relay and solenoids and its circuit.	Description of Chemical effects, Batteries & cells, Lead acid batteries & Stay Maintenance Free (SMF) batteries, Magnetic effects, Heating effects, Thermo-electric energy, Thermistors, Thermo couples, Electrochemical energy, Photo-voltaic energy, Piezo-electric energy, Electromagnetic induction, Relays, Solenoids, Primary & Secondary windings, Transformers, stator and rotor coils.
18	Identify and test power and signal connectors for continuity, Identify and test different type of Diodes, NPN &	Basic electronics: Description of Semi conductors, Solid state devices- Diodes, Transistors, Thyristors, Uni Junction

	PNP Transistors for its functionality, Construct and test simple logic circuits OR, AND & NOT and Logic gates using switches.	Transistors (UJT), Metal Oxide Field Effect Transistors (MOSFETs), Logic gates-OR, AND & NOT and Logic gates using switches.
19-20	<p>Film on Heat treatment process</p> <p>Practice on Liquid penetrant testing method and Magnetic particle testing method.</p> <p>Identification of Hydraulic and pneumatic components used in vehicle. Tracing of hydraulic circuit on hydraulic jack, hydraulic power steering, and Brake circuit. Identification of components in Air brake systems.</p>	<p>Introduction to Heat Treatment & NDT</p> <p>Heat Treatment Process– Introduction, Definition of heat treatment, Definition of Annealing, Normalizing, Hardening and tempering. Case hardening, Nitriding, Induction hardening and Flame Hardening process used in auto components with examples.</p> <p>Non-destructive Testing Methods-Importance of Non-Destructive Testing In Automotive Industry, Definition of NDT, Liquid penetrant and Magnetic particle testing method – Portable Yoke method</p> <p>Introduction to Hydraulics & Pneumatics:</p> <p>- Definition of Pascal law, pressure, Force, viscosity. Description, symbols and application in automobile of Gear pump-Internal & External, single acting, double acting & Double ended cylinder; Directional control valves-2/2, 3/2, 4/2, 4/3 way valve, Pressure relief valve, Non return valve, Flow control valve used in automobile.</p> <p>Pneumatic Symbols, Description and function of air Reciprocating Compressor. Function of Air service unit (FRL-Filter, Regulator & Lubricator).</p>
21	<p>Identification of different type of Vehicle.</p> <p>Demonstration of vehicle specification data;</p> <p>Identification of vehicle information Number (VIN). Demonstration of Garage, Service station equipments.- Vehicle hoists – Two post and four post hoist, Engine hoists, Jacks, Stands.</p>	<p>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.</p> <p>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.</p>

22-23	In plant Training
24-25	Revision and Test
26	NCVT EXAM

Automobile Group – 1 year Trade
1st Semester
Workshop Calculation and Science
Syllabus for the trade of Mechanic Auto Body Repair

Week No.	Workshop calculation and Science (3 Hrs/week)
1	Units, Derived and fundamental, types of system FPS, CGS, MKS and their conversion. Metric weights and measurements, units conversion factors
2	Fractions- Addition and subtraction, Fractions and whole numbers, Combined addition and subtraction, Multiplication and division of fractions. Operations in problems involving fractions.
3	Order of performing (BODMAS) Mathematical operators , Integers – Rules for dealing with integers, Addition, subtraction, Multiplication and division.
4 & 5	Ratio and proportion. Percentages, Examples of ratios in Automotive technology
6	profit and loss, Discount .
7	simple interest and compound interest
8	depreciation calculation
9-10	Time and work problem , Time and distance, clocks and calendar,
11	Brief description of manufacturing process of steel, and aluminum
12	Meaning of elasticity, malleability, brittleness, hardness, compressibility & ductility and their examples , Properties and uses of cast iron, ferrous metal, gray cast iron, white cast iron, wrought iron, and plain carbon steel, high speed steel and alloy steel.
13	Properties and uses in automobile industries- copper, zinc, lead, tin, aluminum, brass, bronze, solder bearing metals, timber and rubber. Nylon, P.V.C., PP (poly prop line, polymer).
14-15	Materials – Stress, strain,- Definition of Stress, Types of stress- Tensile, compressive, shear , Examples of the three basic stresses in automotive components , calculation of stress and strain in automotive application, Stress raisers, Strain-, Tensile, compressive, Shear strain, Tensile strength, Factor of safety, Torsional stress, Strain energy.
16	Definition of cold working and Hot working and its properties on sheet metal. Advantage of Deep drawing material. Importance of Iron- carbon diagram in heat treatment process.
17	Different Type of cutting fluids and their properties. Calculation of cutting speed, feed and drilling time.
18-19	Forces – Definition of Force, Types of force -examples,- Direct forces, Attractive forces, Explosive forces, Describing forces, Graphical representation of a force, Addition of forces, Parallelogram of forces ,Triangle of forces, Resolution of forces, Mass, Equilibrium, Pressure, Pressure in hydraulic systems, Hooke’s law, Practical applications.
20-21	Work energy, power– Definition and calculation of Work, Power and Work done by a torque, Definition and calculation of Energy -Potential energy, Chemical energy, Conservation of energy, Energy equation, Kinetic energy, Energy of a falling body, Kinetic energy of rotation.

Automobile Group – 1 year Trade
1st Semester Engineering Drawing
Syllabus for the trade of Mechanic Auto Body Repair

Week No.	<u>Engineering Drawing</u> (3 Hrs/week) 1st Semester
1	Importance of engineering drawing as a communication medium, different types of drawing - Machine Drawing, Production Drawing, Part Drawing, Assembly Drawing, Drawing instruments, equipment and materials and their uses
2&3	Scales - Recommended scales, reduced & enlarged Drawing Sheet sizes: A0, A1, A2, A3, A4, A5, Layout of drawing sheet, sizes of title block and its contents. Using drawing instruments to draw straight lines, rectangles, squares, circles, polygons.
4&5	Lettering and Dimensioning - Types of Lettering, Guide Lines for lettering, Recommended sizes of letters and numbers, Single stroke letters, Dimensioning - rules and systems of dimensioning – dimensioning a given drawing.
6&7	Identify the alphabet of lines- Read and Interpret the meaning of various line types with examples- Object Lines, Hidden Lines, Center Lines, Phantom Lines, Dimension Lines, Extension Lines, Leaders, Break Lines -Long-break Line, Round, Solid, Hollow Cross Section, Section Lines – Common Manufacturing Materials, Cutting Plane Lines
8-11	Geometric Construction - Bisecting a line - perpendiculars - parallel lines - division of a line; Angles - bisection, trisection, Tangent lines touching circles internally and externally Polygons - Regular polygons - circumscribed and inscribed in circles. Conic sections - Definitions of focus, directrix, eccentricity, Construction of Ellipse by Concentric circles method, Construction of parabola by rectangular method.
12&13	Orthographic Projection - Definition - Planes of Projection - Four quadrants – Reference Line, First angle projection - Third angle projection.
14-17	Isometric Projection - Definition - Isometric axes, lines and planes, Isometric Scale - Isometric view. Drawing of isometric views of plane figures, Drawing of isometric views of prisms and pyramids, Drawing of isometric view of cylinders and cones
18-21	Development of Surfaces - Need for preparing development of surface, Concept of true length - Principal methods of development, Development of simple solids like cubes, prisms, cylinders, pyramids, cones.

SYLLABUS FOR EMPLOYABILITY SKILLS

SEMESTER-I

(pl ref to www.dget.nic.in)

TRADE: Mechanic Auto Body Repair
Second Semester (Semester code No.)

Duration: Six Months.

Syllabus for Trade Practical and Trade Theory

Weeks	Trade Practical (27 Hrs/week)	Trade Theory (5Hrs/week)
1-3	<p>Practice on preparation of accident report.</p> <p>Preparation of Body shop repair sequence procedures. Washing of vehicle.</p> <p>Identification of different type body, chassis, Drive lines.</p> <p>Identify the location of parts and panels.</p> <p>Identify the parts of unibody design vehicle.</p> <p>Identify the front body structural components of a transverse-mounted engine of FWD vehicle.</p> <p>Identify the rear body structural components of a unibody sedan.</p> <p>Identify the under body front and rear section structural components of a unibody sedan.</p> <p>Identify the front, rear body structural components of mid-engine vehicle.</p> <p>Identify the parts of a full frame of pickup truck and Sports utility vehicle (SUV)</p>	<p>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, Direct injection and Indirect injection, Technical terms used in engine, Engine specification..</p> <p>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 unibody frame, Aluminium vehicle construction, , Body-Over-Frame Considerations –characteristics of body-over-frame vehicles, Full frame designs- Ladder frame, Perimeter frame, X-frame (or backbone frame), Crash Testing-Types of crash tests.</p>

4-6	<p>Practice on use of computer-based service information, service manuals, collision repair guides, refinishing guides, vehicle dimension manual, color matching guides, parts interchange guides</p> <p>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, Check the level of the oil in the crankcase, Clean air filters, Clean or blow off fins on cylinders, heads, intercoolers, Aftercoolers, 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, Check and align a loose motor pulley or compressor, Flywheel, Check for air leaks on the compressor outfit and air piping system.</p>	<p>Service information, Specifications, and Measurements - Study of Service Information, basic steps to using refinishing materials information, Vehicle paint code, study of service symbols, diagnosis charts, wiring diagram, Collision Repair Measurements</p> <p>Compressor Air system :</p> <p>Basic requirement for compressed air systems, Type of Compressor- Description and construction of Diaphragm compressor, piston 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,</p> <p>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.</p> <p>Study the typical piping arrangement found in a body shop, colour coding of airline, water line and fuel line.</p>
7-9	<p>Identify the different parts on MIG welding machine, Selection of weld specification as per manual, selection of MIG wire size,</p> <p>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, 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, Practice on continuous, plug, stitch,</p>	<p>Welding:</p> <p>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.</p> <p>welding Technique- Tack weld, Continuous weld, plug weld, spot weld, lap weld, stitch</p>

	<p>MIG spot, lap, tack welding techniques, Identify the different parts on SPOT welding machine, Practice on resistance spot welding process on different thickness materials. Identify the parts of an oxyacetylene welding and cutting outfit, practice on torch flame adjustment, Practice on Oxyacetylene welding process, Practice on Soldering and brazing. Practice on plasma cutting operation.</p>	<p>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, welding & cutting equipment, types of flame and adjustment, welding torch flame adjustment, gas cutting torch flame adjustment, cutting HSS for salvage purposes, Heat crayons, Cleaning with a torch, Probable causes and remedies for flame abnormalities, Brazing, interaction of flux and brazing rods, Brazing joint strength, Brazing operations, Treatment after brazing, Soldering (soft brazing) soldering procedure, plasma arc cutting, operating a plasma arc cutter. Advantage and disadvantage over different type of welding methods.</p>
<p>10 & 11</p>	<p>Practice on minor repair of damaged car. Practice on using a hammer and dolly straighten damage on a door. Using long spoon to pry out a fender to allow for hammer straightening. Using Pry picks remove small dents in hard-to-reach areas. Practice on Using dent puller to pull out minor damage along a lip in the fender. Using a spot weld dent puller remove dents in steel Panels.</p>	<p>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, Buckels-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 relieving, 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</p>

		aluminum with hammer, filling and grinding aluminum, straightening aluminum by heat shrinkage, Paint less dent removal method.
12& 13	<p>Identify the thermoplastics, thermosetting plastics.</p> <p>Identify common automotive plastics used in the industry.</p> <p>Practice on using chemical adhesive bonding techniques to repair of minor cuts and cracks.</p> <p>practice on using heat to reshape plastics,</p>	<p>Repairing Plastics</p> <p>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.</p>
14	<p>Practice on Hood removal as per procedure,</p> <p>Practice on Hood adjustment, Hood-to-hinge adjustment, hood height adjustment, hood latch mechanism, hood latch adjustments, and Bumper replacements.</p> <p>Practice on Fender removal, installing fenders, fender adjustments, grille service, Trunk lid adjustments, panel alignment, Truck bed service,</p>	<p>Hood, Bumper, Fender, Lid, And Trim Service</p> <p>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.</p>
15 & 16	<p>Practice on removing windshield,</p> <p>Practice on windshield rubber gasket service,</p> <p>Practice on windshield into position during Installation,</p> <p>Practice on using an sealer gun to apply adhesive to windshield glass..</p> <p>Identify the basic parts of a door assembly,</p> <p>Practice on door removal.</p> <p>Practice on repair of modern power window regulator, door lock & latch, Door & Door glass adjustments, servicing welded door hinges, bolted</p>	<p>Door, roof, and glass Service</p> <p>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)</p>

	door hinge adjustment, practice on Door glass adjustment, door trim panel installation tailgate glass service, station wagon tailgate adjustment, rear view mirror service, roof panel service.	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.
17	Identify the different parts of Passenger Compartment, practice on 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, repairing leaks, Rattle elimination, Fixing rattle.	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.
18 & 19	Practice on use of trame gauge, upper body dimensioning, measurement of the front body, measurement of the body side panel, measurement of the rear body, Damage Using Gauge Measuring Systems, Strut Centerline Gauge. During the Industrial visit student to learn Identify the condition of collision, influence of impact on a body-over-frame vehicle, visually determine the extent of impact damage, inspecting for damage from passengers & luggage, Universal Measuring Systems, Computerized Measuring Systems.	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.

20 & 21	<p>Practice on analyzing damage-Length damage, Width damage, Height damage.</p> <p>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.</p> <p>During the Industrial visit student to observe Frame Straightening Equipment, anchoring the vehicle using pulling clamps and chains.</p>	<p>Unibody/frame alignment</p> <p>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.</p>
22-23	In plant training	
24-25	Revision and Test	
26	NCVT Exam	

2nd Semester
Workshop Calculation and Science
Syllabus for the trade of Mechanic Auto Body Repair

Week No.	Workshop calculation and Science (3 Hrs/week)
1 & 2	Factorisation and quadratics: multiply expressions in brackets by a number, symbol or by another expression in a bracket; by extraction of a common factor eg $ax + ay$, $a(x + 2) + b(x + 2)$; by grouping eg $ax - ay + bx - by$; quadratic expressions eg $a^2 + 2ab + b^2$; roots of an equation eg quadratic equations with real roots by factorisation, and by the use of formula
3	Geometry – Use of scientific calculator./logarithmic table Angles -Angular measurement, Angles and rotation, Examples of angles in automotive work, Adding and subtracting angles. Types of angle- Adjacent angles, Opposite angles, Corresponding angles, Alternate angle
4-6	Trigonometry - Types of triangle - Acute angled triangle, Obtuse angled triangle, Equilateral triangle, Isosceles triangle, Scalene triangle, Right angled triangle, Labelling sides and angles of a triangle, Sum of the three angles of a triangle. Pythagoras' theorem, Circles, Ratio of diameter and circumference, Length of arc, Timing marks, Wheel revolutions and distance travelled, Valve opening area. Trigonometry- Using sines, cosines and tangents to solve vehicle problems.
7 -10	Formulae for Perimeter and Area of Plane figure - Rectangle, Square, Parallelogram, Triangle, Hexagon, any regular polygon, Trapezium, Circle, sector, Fillet, Ellipse, segment of a circle; Formulae for Volume and surface area of solids- Rectangular solid, Prism, cylinder, pyramids and cones, Frustum of pyramid and cones, sphere, Hollow sphere, segment of sphere, circular ring, spherical sector, Calculation of volume and weight of simple solid bodies such as cubes, square and hexagonal prism-shop problem.
11-13	Statistics – Collecting and sorting raw data, Definition of Discrete variable, continuous variable with Shop examples. Constructing pictographs-pie chart, Bar chart. Frequency and tally Charts. Importance of the shape of a frequency distribution- histogram, frequency polygon, Cumulative frequency plot. Interpreting statistics- sampling, arithmetic mean, median,
14 & 15	Heat and temperature –Temperature-Thermodynamic temperature scale (Kelvin), Cooling system temperature; Standard temperature and pressure (STP); Thermal expansion with calculation; Heat- Sensible heat, Latent heat, Specific latent heat, Specific heat capacity, Quantity of heat with calculation; Heat transfer – Conduction, Convection, Radiation ;
16 & 17	Heating, expansion and compression of gases - Absolute pressure, Absolute temperature; Laws relating to the compression and expansion of gases -Heating a gas at constant volume, Heating a gas at constant pressure, Charles' law. Expansion or compression at constant temperature – isothermal

18-20	<p>Internal combustion engines- Engine power-Brake power, Horsepower, PS – the DIN, Indicated power, Mean effective pressure, Calculation of indicated power, Cylinder pressure vs. crank angle, Mechanical efficiency of an engine, Volumetric efficiency, Torque vs. engine speed, Specific fuel consumption vs. engine speed, Brake power, torque and sfc(Specific fuel consumption) compared, Brake mean effective pressure, Thermal efficiency, Indicated thermal efficiency, Brake thermal efficiency petrol vs. Diesel.</p>
21	<p>Fuels and combustion- Calorific value, Combustion-Products of combustion, Relevant combustion equations. Air–fuel ratio-Petrol engine combustion, Detonation, Pre-ignition, Octane rating, Diesel fuel, Flash point , Pour point, Cloud point, Biofuels, Liquefied petroleum gas (LPG) ,Hydrogen, Zero emissions vehicles (ZEVs)</p>

Automobile Group –
2nd Semester
Engineering Drawing
Syllabus for the trade of Mechanic Auto Body Repair

Week Nos.	<u>Engineering Drawing (3 Hrs/week)</u> 2nd Semester
1-4	Read and interpret drawings- Determine information from the title block, Read and interpret industrial prints, Read and interpret detailed and assembly drawings, Identify casting drawings and machining drawings, Read and interpret diagrams, Distinguish between a monodetail and a multidetail drawing.
5-8	Identify different drawing projections - Interpret pictorial and multi-view drawings. Interpret auxiliary and section views, Determine views in a drawing and the significance of the view being shown. Identify missing lines and missing views.
9-12	Free hand sketching of key and screw threads. Read and interpret three Types of screw thread representation: pictorial, schematic and simplified presentation. Terms used in describing a threaded Part, Designation of Thread Specifications, Left-Hand Thread Notations, read and interpret the different type of Finish Symbols, Fillets and Rounds and Machine Slots-
13	Layout of an automobile chassis. Drawing the layout of body shop. Free hand sketching of major outer body panels, viewed from outside.
14	Free hand sketching of symbols are used in service information
15	Free hand sketching of block diagram compressor and its parts.
16	Block diagram of spot weld dent pullers and its parts.
17	Block diagram of MIG welding set up. Oxyacetylene welding and Brazing setup. Free hand sketching of the types of flames that can be Produced with a gas torch.
18	Drawing the exploded view of Hood, bumper, fender assembly.
19	Drawing the exploded view of door, roof and wind shield assembly.
20	Drawing of exploded view of a dash assembly
21	Free hand sketching of frame deformation- sideway damage, sag damage, mash damage, diamond damage, twist damage. Free hand sketching of tram gauge and centering gauges

SYLLABUS FOR EMPLOYABILITY SKILLS

SEMESTER-II
(Pl ref to www.dget.nic.in)

TRADE: Mechanic Auto Body Repair

LIST OF TOOLS & EQUIPMNT

A. TRAINEES TOOL KIT per 4 Trainees FOR 20 TRAINEES +1 ISTRUCTOR

Sl.No.	Item with specification	Qty (Nos.)
1.	Allen Key set of 12 pieces (2mm to 14mm)	(5+1)
2.	Body hammer (long pick)	6
3.	Body hammer, cross chisel (finishing hammer)	6
4.	Body hammer, utility pick (short pick)	6
5.	Caliper inside 15 cm Spring	6
6.	Calipers outside 15 cm spring	6
7.	Center Punch 10 mm. Dia. x 100 mm.	6
8.	Different type of spoon	6
9.	Dividers 15 cm Spring	6
10.	Electrician Screw Driver 250mm	6
11.	General purpose dolly	6
12.	Hammer ball peen 0.5 kg with handle	6
13.	Hands file 20 cm. Second cut flat	6
14.	Pliers combination 20 cm.	6
15.	Safety glasses	6
16.	Screw driver 20cm.X 9mm. Blade	6
17.	Screw driver 30 cm. X 9 mm. Blade	6
18.	Scriber 15 cm	6
19.	Spanner D.E. set of 12 pieces (6mm to 32mm)	6
20.	Spanner, ring set of 12 metric sizes 6 to 32 mm.	6
21.	Spanners socket with speed handle, T-bar, ratchet and universal upto 32 mm set of 28 pieces with box	6
22.	Steel rule 30 cm inch and metric	6
23.	Steel tool box with lock and key (folding type) 400x200x150 mm	6
24.	Toe dolly	6
25.	Wire cutter and stripper	6

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)	2
6.	Ammeter 300A/ 60A DC with external shunt	5
7.	Angle plate adjustable 250x150x175	1
8.	Angle plate size 200x100x200mm	2
9.	Anvil 50 Kgs with Stand	1
10.	Battery –charger	2
11.	Blow Lamp 1 litre	2
12.	Caliper inside 15 cm Spring	4
13.	Calipers outside 15 cm spring	4

14.	Car Jet washer with standard accessories	1
15.	Chain Pulley Block-3 ton capacity with tripod stand	1
16.	Chisel 10 cm flat	4
17.	Chisels cross cut 200 mm X 6mm	4
18.	Circlip pliers Expanding and contracting type 15cm and 20cm each	4
19.	Clamps C 100mm	4
20.	Clamps C 150mm	4
21.	Clamps C 200mm	4
22.	Cleaning tray 45x30 cm.	4
23.	Collapsible panel stands	2
24.	Copper bit soldering iron 0.25 Kg	4
25.	Crow bar 910 x25mm	2
26.	Cylinder bore gauge capacity 20 to 160 mm	2
27.	DC Ohmmeter 0 to 300 Ohms, mid scales at 20 Ohms	2
28.	Depth micrometer 0-25mm	4
29.	Dial gauge type 1 Gr. A (complete with clamping devices and stand)	4
30.	Different type of Bumping hammers	1 set
31.	Different type of -body hammers	1 set
32.	Different type of body picks	1 set
33.	Different type of body spoon	1 set
34.	Different type of dolly block	1 set
35.	Different type of finishing hammers	1 set
36.	Different type of pick hammers	1 set
37.	Digital thermometer	2
38.	Dividers 15 cm Spring	4
39.	Door handle tool (clip pullers)	1
40.	Drift Punch Copper 15 Cm	4
41.	Drill point angle gauge	1
42.	Drill twist 1.5 mm to 15 mm (various sizes) by 0.5 mm	4
43.	Electric Soldering Iron 230 V 60 watts 230 V 25 watts	2 each
44.	Electric testing screw driver	2
45.	Engineer's square 15 cm. Blade	4
46.	Feeler gauge 20 blades (metric)	2
47.	File flat 20 cm bastard	4
48.	File, half round 20 cm second cut	4
49.	File, Square 20 cm second cut	4
50.	File, Square 30 cm round	4
51.	File, triangular 15 cm second cut	4
52.	Files assorted sizes and types including safe edge file (20 Nos)	2 set
53.	Flat File 25 cm second cut	4
54.	Flat File 35 cm bastard	4
55.	Garage rack	2
56.	Granite surface plate 1600 x 1000 with stand and cover	1
57.	Grease Gun	2
58.	Grip Wrench 200mm	2
59.	Growler	1
60.	Hacksaw frame adjustable 20-30 cm	10
61.	Hammer Ball Peen 0.75 Kg	2
62.	Hammer Chipping 0.25 Kg	5

63.	Hammer copper 1 Kg with handle	4
64.	Hammer Mallet	4
65.	Hammer Plastic	4
66.	Hand operated crimping tool (i) for crimping up to 4mm and (ii) for crimping up to 10mm	2
67.	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
68.	Hand Shear Universal 250mm	2
69.	Hand vice – 37 mm	2
70.	Hollow Punch set of seven pieces 6mm to 15mm	2 sets each
71.	Insulated Screw driver 20 cm x 9mm blade	4
72.	Insulated Screw driver 30 cm x 9mm blade	4
73.	Interchangeable driver set	1 set
74.	Lead light	2
75.	Left cut snips 250mm	4
76.	Lifting jack screw type 3 ton capacity	4
77.	Magneto spanner set with 8 spanners	1 set
78.	Magnifying glass 75mm	2
79.	Marking out table 90X60X90 cm.	1
80.	Multimeter digital	5
81.	Oil can 0.5/0.25 liter capacity	2
82.	Oil Stone 15 cm x 5 cm x 2.5 cm	1
83.	Outside micrometer 0 to 25 mm	4
84.	Outside micrometer 25 to 50 mm	4
85.	Outside micrometer 50 to 75 mm	1
86.	Outside micrometer 75 to 100 mm	1
87.	Panel assembly hold/support arms	2
88.	Panel cutter (two-way nibbler)	1
89.	Philips Screw Driver set of 5 pieces (100 mm to 300 mm)	2 sets
90.	Pipe cutting tool	2
91.	Pipe flaring tool	2
92.	plastic feeler gauges	2
93.	Pliers combination 20 cm.	2
94.	Pliers flat nose 15 cm	2
95.	Pliers round nose 15 cm	2
96.	Pliers side cutting 15 cm	2
97.	Portable electric drill Machine	1
98.	Prick Punch 15 cm	4
99.	Punch Letter 4mm (Number)	2 set
100.	Right cut snips 250mm	4
101.	Rivet sets snap and Dolly combined 3mm, 4mm, 6mm	4
102.	Scraper flat 25 cm	2
103.	Scraper half round 25 cm	4
104.	Scraper Triangular 25 cm	4
105.	Scriber 15 cm	4
106.	Scriber with scribing black universal	2
107.	Set of stock and dies - Metric	2 sets
108.	Shear Tin Man's 450 mm x 600mm	4
109.	Sheet metal cutting pliers-left , right hand and straight –jaw	1 set

110.	Sheet Metal Gauge	2
111.	Sher Tinmans 300mm	4
112.	Soldering Copper Hatchet type 500gms	4
113.	Solid Parallels in pairs (Different size) in Metric	2
114.	Spanner Clyburn 15 cm	1
115.	Spanner D.E. set of 12 pieces (6mm to 32mm)	4
116.	Spanner T. flocks for screwing up and up-screwing inaccessible	2
117.	Spanner, adjustable 15cm.	2
118.	Spanner, ring set of 12 metric sizes 6 to 32 mm.	2
119.	Spanners socket with speed handle, T-bar, ratchet and universal upto	2
120.	Spark lighter	2
121.	Spark plug spanner 14mm x 18mm x Size	2
122.	Spirit level 2V 250, 05 metre	2
123.	Steel measuring tape 10 meter in a case	4
124.	Steel rule 15 cm inch and metric	4
125.	Steel rule 30 cm inch and metric	4
126.	Steel wire Brush 50mmx150mm	4
127.	Straight edge gauge 2 ft.	2
128.	Straight edge gauge 4 ft.	2
129.	Stud extractor set of 3	2 sets
130.	Stud remover with socket handle	1
131.	Suction cup	2
132.	Surface gauge with dial test indicator plunger type i.e. 0.01 mm	2
133.	Taps and Dies complete sets (5 types)	1 set
134.	Taps and wrenches - Metric	2 sets
135.	Telescope gauge	4
136.	Thread pitch gauge metric, BSW	1
137.	Torque wrenches 5-35 Nm, 12-68 Nm & 50-225 Nm	1 each
138.	Trammel 30 cm	2
139.	Trim and upholstery tools	1 set
140.	Tyre pressure gauge with holding nipple	2
141.	Universal puller for removing pulleys, bearings	1
142.	V' Block 75 x 38 mm pair with Clamps	2
143.	Vacuum gauge to read 0 to 760 mm of Hg.	2
144.	vernier caliper 0-300 mm with least count 0.02mm	4
145.	Vice grip pliers	2
146.	Voltmeter 50V/DC	5
147.	Wire Gauge (metric)	5
148.	Work bench 250 x 120 x 60 cm with 4 vices 12cm Jaw	4

C. General Installation/ Machineries

Sl.No.	Item with specification	Qty (Nos.)
1.	Angle grinder (10-12 cm) - for cutting and grinding	2
2.	Arbor press hand operated 2 ton capacity	1
3.	Belt sander (Narrow surface)	2
4.	Bench lever shears 250mm Blade x 3mm Capacity	1
5.	Body measurement tools- Gunsight, trammel gauge, 2m straight edge & Measuring tape	2 each

6.	Body repair hand tools – Various hammers, dollies, spoons, files, line chisel, hacksaw, clamps, & sanding blocks	2 each
7.	Body shell - Light Motor vehicle of different Manufactures	4
8.	Bonded auto glass removal & replacement tools	2
9.	Caulking / panel seam sealer / panel adhesive application gun	2
10.	Chassis alignment equipment (incorporating measurement system)	1
11.	compressed air line -10m (on retractable reel, with high flow connectors) with FRL unit	2
12.	Die Grinding kit	2
13.	Disc sander – 18cm	2
14.	Discrete Component Trainer / Basic Electronics Trainer	1
15.	Drilling machine bench to drill up to 12mm dia along with accessories	1
16.	Dual Magnetization Yoke : AC / HWDC, 230 VAC, 50Hz	1 set
17.	Dust extraction connections (Vacumm)	2
18.	Electronic heat shrinking equipment (carbon rod, induction or copper	1
19.	Gas Welding Table 1220mm x760mm	1
20.	Grinding machine (general purpose) D.E. pedestal with 300 mm dia wheels rough and smooth	1
21.	Hydraulic jack HI-LIFT type -3 ton capacity, 5 ton capacity	1each
22.	Infrared drying lamp unit	1
23.	Liquid penetrant Inspection kit	1 set
24.	MIG welding machine complete set 400Amps	2
25.	Motor Vehicle suitable for Body shop repair –Light Motor vehicle of different Manufactures	2
26.	Oxy-acetylene welding equipment with complete accessories (Low & high	2
27.	Pipe Bending Machine (Hydraulic type) 12mm to 30mm	1
28.	Plasma cutter	1
29.	Pneumatic rivet gun	2
30.	Power hacksaw kit	2
31.	Random /dual action orbital sander (12-15 cm)	2
32.	Spot weld cutter- Drill type, Hole saw type	1
33.	Spot weld removal kit / drill along with accessories	2
34.	Spot welder (single and double sided)	2
35.	Tin smiths bench folder 600 x 1.6mm	1
36.	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
37.	Weld through primer application equipment	2
38.	Welding plant Oxy-Acetylene complete (high pressure)	2
39.	Welding Transformer (200 to 400 Amps)	2
40.	Weld-on pin/ ring panel puller kit	2

D. List of consumable:

Sl. No.	Description	Quantity
1.	Battery- SMF	As required
2.	Brake fluids	As required
3.	Chalk, Prussian blue.	As required
4.	Chemical compound for fasteners	As required
5.	Diesel	As required
6.	Different type gasket material	As required
7.	Different type of oil seal	As required
8.	Drill Twist (assorted)	As required
9.	Engine Coolant	As required
10.	Engine oil	As required
11.	Emery paper - 36–60 grit , 80–120	As required
12.	Gear oils	As required
13.	Hacksaw blade (consumable)	As required
14.	Hand rubber gloves tested for 5000 V	As required
15.	Holdes, lamp teakwood boards, plug sockets,	As required
16.	Hvdrometer	As required
17.	Lapping abrasives	As required
18.	Leather Apron	As required
19.	Petrol	As required
20.	Power steering oil	As required
21.	Radiator Coolants	As required
22.	Safety glasses	As required
23.	Steel wire Brush 50mmx150mm	As required
24.	Gloves for Welding (Leather and Asbestos)	As required

E. Workshop Furniture

Sl. No.	Description	Quantity
1.	Book shelf (glass panel) 6½ ‘ x 3’ x 1½’	As required
2.	Computer Chair	1+1
3.	Computer Table	1+1
4.	Desktop computer and related MS office software	1+1
5.	Discussion Table 8’ x 4’ x 2½ ‘	2
6.	Fire Extinguishers, first- aid box	As required
7.	Instructional Material – NIMI Books/Ref.books	As required
8.	Internet connection with all accessories	As required
9.	Laser printer	1
10.	LCD projector/ LED /LCD TV (42”)	1
11.	Multimedia DVD for Automotive application/subjects	As required
12.	Online UPS 2KVA	1
13.	Stools	21
14.	Storage Rack 6½ ‘ x 3’ x 1½’	As required
15.	Storage shelf 6½ ‘ x 3’ x 1½’	As required.

16.	Suitable class room furniture	As required
17.	Suitable Work Tables with vices	As required
18.	Tool Cabinet - 6½ ' x 3' x 1½'	2
19.	Trainees locker 6½ ' x 3' x 1½'	2 Nos. to accommodate 20 Lockers

**List of tools & Equipment for the Trade of
Mechanic Auto Body Repair - Engineering Drawing
(Note : Facilities available in Draughtsman trade can be utilized)**

TRAINEE'S TOOLS KIT

Sl. No.	Name of the items	Quantity
1.	Draughtsman drawing instrument box	20+1 set
2.	Set square celluloid 45 ⁰ (250 X 1.5 mm)	20+1 set
3.	Set square celluloid 30 ⁰ -60 ⁰ (250 X 1.5 mm)	20+1 set
4.	Mini drafter	20+1 set
5.	Drawing board (700mm x500 mm) IS: 1444	20+1 set

GENERAL MACHINERY SHOP OUTFIT

Sl. No.	Name & Description of Machine	Quantity
1.	Draughtsman table	20 Nos.
2.	Draughtsman stool	20Nos.