

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

Mechanic Auto body Painting

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 painting
2. N.C.O. Code No. : **7142.20, 7142.70**
3. Duration of Craftsmen Training : 1Year (Two Semester having duration of six months each)
4. Power Norms : 4.8 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
- 8a. 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 Painting**” 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 PAINTING)

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.

- Applies decorative or protective materials such as paint, enamel or lacquer including synthetic paint on articles of wood, metal etc., using spray painting equipment.
- Selects and mixes paints to produce desired colour consistency, strains and puts coating liquid into spray-gun tank, couples gun to air-hose and adjusts air-pressure valves and nozzle.
- Press trigger and directs spray of prime and finish coats of paint over surfaces and ensures smooth and even finish.
- Covers with tape areas not to be painted or where painting is to be done in second colouring.
- Cleans gun and hose with solvent before changing colour and on completion of work.
- May prepare surfaces for painting, using scrapers, abrasives, chemical removers or other means. May be designated according to article coated or material used.
- Prepares paints, varnishes and other protective and decorative materials by mixing ingredients according to specifications and matching them with samples.
- Pours pigments, oils, thinner and other ingredients in proper proportions into can and stirs mixer manually or by mechanical device.
- Checks mixed liquid with desired colour sample and ensures that it matches and has correct consistency.
- May blend colours to get desired shades. May test specific gravity of mixture using hydrometer.

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 Painting
2. Painter in Auto Body shop
3. Dealers service mechanic
5. Spare Parts Sales Assistant / Manufacturers' Representative
5. Laboratory Assistant

b) Self Employment

1. Auto Body Painter
2. Auto paint 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) |

Syllabus for the trade of Mechanic Auto Body Painting
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 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.

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. 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	<p>Measuring practice on engine components with aid of instrument studied.</p>	<p>Systems of measurement:</p> <p>Description, care & use :- Micrometers- Outside and depth micrometer, Micrometer adjustments, Vernier calipers,</p> <p>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> <p>Limits, Fits & Tolerances:-Definition of limits, fits & tolerances with examples used in auto components.</p>
12-13	<p>Practice on Marking and Drilling clear and Blind Holes, Sharpening of</p>	<p>Drilling machine -Description and study of Bench type Drilling machine, Portable electrical Drilling</p>

	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.	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 & PNP Transistors for its functionality, Construct and test simple logic circuits OR, AND & NOT and Logic gates using switches.	Basic electronics: Description of Semi conductors, Solid state devices- Diodes, Transistors, Thyristors, Uni Junction 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.</p> <p>Tracing of hydraulic circuit on hydraulic jack, hydraulic power steering, and Brake circuit.</p> <p>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: - 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,</p> <p>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 Painting

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 Painting

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)

**Syllabus for the trade of Mechanic Auto Body Painting
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 & 2	<p>Washing of vehicle.</p> <p>Identification of different type body, chassis, Drive lines.</p> <p>Identify the location of parts and panels.</p> <p>Practice on use of computer-based service information, service manuals, refinishing guides, vehicle dimension manual, color matching guides, parts interchange guides</p>	<p>Introduction to Engine:</p> <p>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>Body shop & paint shop safety procedures.</p> <p>Vehicle construction Technology</p> <p>Definition of body shop, classification of body shop-Independent body shop, dealership body shop, specialty body shop. Description of vehicle Body and Chassis.</p> <p>Service information, Specifications, and Measurements</p> <p>Study of Service Information, basic steps to using refinishing materials information, Vehicle paint code, study of service symbols, diagnosis charts, wiring diagram.</p>
3 & 4	<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</p> <p>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>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,</p> <p>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/paint shop, colour coding of airline, water line and fuel line.</p>

5 & 6	<p>Identify the different type of refinishing material- paint binders, paint solvents, Paint additives</p> <p>Select the right repair materials for a particular job,</p> <p>Select the right type of primer and paint.</p> <p>Identify various type masking material available in body shop.</p> <p>Identify different type of body filler,</p> <p>Identify various type masking material available in body shop.</p> <p>Identify various type of grit rating available in the workshop.</p> <p>Identify the open and closed coat grit.</p>	<p>Refinishing Materials:-</p> <p>Primer-sealer, top coats, paint material types- Lacquer, enamel, water base, Content of paint-pain pigments, paint binders, paint solvents, Paint additives, Definition of Drying, curing, flash, retarder, accelerator, catalyst, adhesion promoter, blending solvent, Toners, Primers & sealers- self-etching primer, UV primer</p> <p>Primer-surfacer, Epoxy primers, sealers, Other paint materials- prep solvent, flattener, fish-eye eliminator, flex agent, Antichip coating (Vinyl coating), Metal conditioner, Paint stripper, tack cloth, Different type of Body filler- body filler (plastic filler), light body filler, fiberglass reinforced body filler, cream hardeners, Fiberglass resin, Glazing putty, Masking materials- Masking paper, Primer masking paper, paint masking paper, masking plastic, masking tape, Fine line masks, Wheel masks.</p> <p>Abrasives-Abrasive material, grit, grit Ratings, open and closed coat grit, Grinding discs, sand paper- dry and wet type, scuff pads, Compounds- Rubbing compound, polishing compound, Adhesives, Epoxies.</p>
7 & 8	<p>Identify the different type of body filler, hardeners, and putties, used in industry.</p> <p>Practice on a mixing board for applying Body filler.</p> <p>Practice on preparation of damaged surface area of sheet metal.</p> <p>Practice on applying the body filler on a damaged sheet metal area.</p> <p>Using Hand-block sanding to smooth and level a repair area properly.</p> <p>Practice repairing paint surface imperfections, Repairing paint scratches, repairing nicks, repairing dings, preparing surface rust free.</p>	<p>Using Body Fillers</p> <p>Description of Body Fillers (Plastic filler), Body filler ingredients, Body filler hardeners, Putties, light weight fillers, premium fillers, spot putties, polyester glazing putty, applying body filler, preparation surface for filler, Ingredient, characteristics and application of body filler & putties, Mixing filler, kneading the hardener, mixing filler and hardener, Spreading body filler, Grating and Sanding Body Filler-grating the filler, coarse, sandy filler, blowoff sanding dust, checking filler repair, applying second filler coat, feathered giving body filler, applying filler to body lines, applying filler to panel joint, applying filler to body lines, applying lead filler, priming filler area, applying glazing putty, using a guide coat. Rust repair procedures.</p>
9	<p>Practice on corrosion treatment of sheet metal, interior and exterior surface.</p> <p>Preparation of repair estimate information by using an estimating guide book.</p> <p>Identify how an estimating guide gives part pricing and labour time information.</p>	<p>Corrosion Protection</p> <p>What Is Corrosion, Causes for Loss of Factory protection,</p> <p>Anticorrosion Materials, Basic Surface Preparation,</p> <p>Corrosion Treatment Areas, Corrosion-Protection Primers, Exposed Joints, Exposed Interior Surfaces,</p> <p>Exposed Exterior Surfaces, Exterior Accessories,</p> <p>Estimating Repair Costs</p>

		Description of estimate, Direct repair programs, Estimate time factor, work orders, Using Estimate Guides, Part prices, Labor costs, Job overlap, and Included operation.
10 - 12	<p>Practice on different ways to mix paint or other materials paint mixing sticks, practice on use of viscosity cup.</p> <p>Practice on Adjusting Knobs, Testing Spray Pattern, Effect of Spray on Gun stroke, Gun Speed, Gun Triggering, Gun Direction, Spray Overlap, Gun Handling Problems - Heeling, Arcing, Practice on spray gun cleaning tank, manual spray gun cleaning, and spray gun lubrication.</p> <p>Practice on maintains on spray booth</p> <p>Practice on use of Air-supplied respirators,.</p>	<p>Refinishing equipment Technology</p> <p>Painting environment variable, Steps to keep dirt from finish during body repairs, Description of spray gun and its parts, basic stages of Atomization, High-Volume, Low-Pressure (HVLV) Spray Gun, Type of air spray gun- Gravity feed, Suction (siphon) feed, Pressure feed, Pressure-assist feed (gravity or suction cup spray guns) and their paint feed method, advantage and disadvantages.</p> <p>Spray gun air supply system, importance of spraying material viscosity, Different ways to mix paint or other materials paint mixing sticks, viscometer, or viscosity cup, effect on finish-material temperature, film thickness, spray gun setup- Air Supply, Adjustments, Distance, Adjustment Knobs, Testing Spray Pattern, Effect of Spray on Gun stroke, Gun Speed, Gun Triggering, Gun Direction, Spray Overlap, Gun Handling Problems - Heeling , Arcing , Spray Gun Maintenance- spray gun cleaning tank, manual spray gun cleaning, spray gun lubrication, other spray systems,- airless spray gun system, electrostatic spraying system, touch-up guns, airbrushes, spray booths- one- and two-room spray booths, air makeup or air replacement system- Regular flow booth , Reverse flow booth, Crossdraft booth, Downdraft booth,</p> <p>Air Filtration Systems- wet filtration system and the dry filtration system, spray booth maintenance, Description of drying room- types of infrared drying equipment- Near drying equipment. Far drying equipment.</p> <p>Description of Air-supplied respirators, type of air-supplied respirators- hood type and the face shield type.</p> <p>Other paint shop equipment and tools- wet sanding stand , Paint hangers, Panel drying ovens, Paint shakers, blade agitator, Churning knives, Paint scales, Paint cabinets, Tack cloths, purpose of strainer, Masking tape.</p>
13 & 14	Practice to correcting of an Air Spray Gun- Spray pattern top heavy or bottom heavy, Spray pattern heavy to right or to left, Spray pattern heavy at center, Spray pattern split, Pinholes, Blushing or a whitish coat, Orange peel	Probable causes and remedies for Spray pattern top heavy or bottom heavy, Spray pattern heavy to right or to left, Spray pattern heavy at center, Spray pattern split, Pinholes, Blushing or a whitish coat, Orange peel (surface looks like orange peel), Excessive spray fog or overspray,

	(surface looks like orange peel), Excessive spray fog or overspray, No control over size of pattern, Sags or runs, Streaks Gun sputters constantly, Uneven spray pattern, Fluid leaks from spray gun, Fluid leaks from packing nut, Fluid leaks through fluid tip when trigger is released, Excessive fluid, Fluid will not come from spray gun, Fluid will not come from fluid tank or canister, Sprayed coat short of liquid material, Spotty, uneven pattern, slow to build, Unable to get round spray, Dripping from fluid tip, Excessive overspray, Excessive fog, Will not spray on pressure feed, Will not spray on suction feed, Air continues to flow through gun when trigger has been released (on nonbleeder guns only), Air leak at canister gasket, Leak at setscrew in canister top, Leak between top of canister cover and gun body.	No control over size of pattern, Sags or runs, Streaks Gun sputters constantly, Uneven spray pattern, Fluid leaks from spray gun, Fluid leaks from packing nut, Fluid leaks through fluid tip when trigger is released, Excessive fluid, Fluid will not come from spray gun, Fluid will not come from fluid tank or canister, Sprayed coat short of liquid material, Spotty, uneven pattern, slow to build, Unable to get round spray, Dripping from fluid tip, Excessive overspray, Excessive fog, Will not spray on pressure feed, Will not spray on suction feed, Air continues to flow through gun when trigger has been released (on nonbleeder guns only), Air leak at canister gasket, Leak at setscrew in canister top, Leak between top of canister cover and gun body.
15 & 16	Practice on Checking Paint Thickness, Practice on paint removal using Chemical stripping, Media blasting, Practice on Preparing Bare Metal using metal conditioners, preparing hard chrome Surfaces, preparing metal Replacement parts, using self-etch primer, Practice on applying spot putty, or glazing putty. Practice on final sanding, using the right grit, power sanding, hand sanding, dry sanding, wet sanding, Surface Cleaning. Practice to mask the parts of a vehicle by using different masking techniques.	Vehicle surface preparation and masking Importance of surface preparation, Evaluate Surface Condition, Checking Paint Thickness, Paint Removal method- Chemical stripping, Media blasting- procedure for operating a blaster, type of grit and numbering system. Sanding or grinding, Importance of Preparing Bare Metal- using metal conditioners, preparing hard chrome Surfaces, preparing metal Replacement parts, using self-etch primer, apply seam sealer Primecoat Selection, applying primecoats applying spot putty, or glazing putty. final sanding, using the right grit, Masking, surface sanding methods, power sanding, hand sanding, dry sanding, wet sanding, comparison between wet and dry sanding, surface scuffing, Surface Cleaning. Masking, basic ways to mask the parts of a vehicle, liquid masking material, liquid masking system, Procedure, plastic sheet masking, masking paper and tape, masking aids-wheel masks, masking panel gaps, masking openings, Reverse masking, or blend masking, Masking rope, (aperature tape), surface cleaning, using wax-and-grease remover.
17	Identify different type of paint for topcoat refinishing, paint used for refinishing. Practice on applying Prime coats, Refinishing Plastic Parts,	Refinishing Procedures : Functions of paint, OEM paint finishes procedures, different between OEM and refinish painting types of paint for topcoat refinishing, properties of paint used for refinishing. Topcoats, Prime coats, Preparing

	<p>Basecoat/Clearcoat Repairs, Practice on applying Single Stage Paints, Panel Repairs, Overall Refinishing, Removal of Masking Materials.</p>	<p>Refinish Materials, Pre-painting Preparations, Applying Prime coats, Refinishing Plastic Parts, Flash Times, Basic Spray Coats, Methods of Refinishing, Basecoat/Clearcoat Repairs, Applying Single Stage Paints, Panel Repairs, Overall Refinishing, Removal of Masking Materials.</p>
18 & 19	<p>Practice on colour evaluations using sunlight & colour corrected light bulb, Practice on practice on matching Basic Paint Colors.</p> <p>Practice on Spraying Metallic Colours, Practice on let-down test panel for a three-stage finish, Practice on a repair with a multistage mica or pearl finish.</p> <p>Practice on use of Spectrophotometer or electronic colour Analyzer, use of Computerized Paint Matching Custom.</p>	<p>Color matching and Customized painting Introduction, Color Theory, Lighting-colour evaluations using sunlight & colour corrected light bulb, dimensions of colour- Value—lightness or darkness, Hue—color, cast, or tint, Chroma—saturation, richness, intensity, or muddiness, standard colour chips, variance colour chips, Matching Basic Paint Colors- use of colour test panel, spray-out test panel procedure, color spraying variables in the shop, positive and Negative variable, matching solid colors and metallic finishes, Spraying Metallic Colours- Wet Coats of Metallic Colour, Dry Coats of Metallic Colour, importance of metallic colour mixed, Metallic Colour Variables to darken & lighten, steps for spot repair with a fluorine clearcoat system, procedure for a let-down test panel for a three-stage finish, method for a spot or partial repair on a three-stage paint system, steps for a panel repair with a multistage mica or pearl finish, mica mid-coat blending procedure for a three-stage paint, Tinting, basic reasons for tinting a paint colour, three angles to determine whether a colour adjustment is necessary, Spectrophotometer or electronic colour Analyzer, Computerized Paint Matching Custom Painting.</p>
20 & 21	<p>Practice on removing foreign matter in wet paint, wet sanding between coats. Practice to correcting of - paint colour mismatch, orange peel, runs and sags, sand scratch swelling, bull's-eye featheredge , featheredge splitting, water spotting, chemical spotting, curing or drying failure, paint fish-eyes, blushing, bleeding, prime coat show-through, blistering, solvent popping, paint cracking, line checking, crazing, micro checking, lifting, paint wrinkling, mottling, pin holing, peeling, chalking, paint colour fade, dulled finish, debris in the finish, rust under the finish.</p> <p>Repairing paint runs, repairing chipped</p>	<p>Paint Problems and Final Detailing Repairing Paint Problems-problems in wet paint, removing foreign matter in wet paint, wet sanding between coats, Causes, prevention and correcting of - paint colour mismatch, orange peel, runs and sags, sand scratch swelling, bull's-eye featheredge , featheredge splitting, water spotting, chemical spotting, curing or drying failure, paint fish-eyes, blushing, bleeding, prime coat show-through, blistering, solvent popping, paint cracking, line checking, crazing, micro checking, lifting, paint wrinkling, mottling, pin holing, peeling, chalking, paint colour fade, dulled finish, debris in the finish, rust under the finish.</p> <p>Final detailing- Detail sanding procedure, Repairing paint runs, repairing chipped paint, panel detail sanding procedure, Paint</p>

	<p>paint, panel detail sanding. Practice on visualising of painted surface in three different angles for final detailing.</p>	<p>compounding- purpose, rubbing compound, machine compounding, using buffers and polishers, avoiding paint burn-through, machine buffing procedures, hand and machine Glazing and polishing procedure, Final cleaning, steps for caring for a new finish.</p>
22-23	Industrial Training / Project work	
24-25	Revision & Test	
26	NCVT Exam	

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

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 Angles. Supplementary angles, Complementary angles,
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	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.

21	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)
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Automobile Group –
2nd Semester
Engineering Drawing
Syllabus for the trade of Mechanic Auto Body Painting

Week Nos.	<u>Engineering Drawing</u> (3 Hrs/week) 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	Colour sketching of single stage and double stage paint sectional view.
17	Drawing Block diagram of plastic welding set up and position, Free hand sketching of Intermittent tack weld and shallow continuous tack.
18	Block Block diagram of air spray gun, Gravity feed, Suction (siphon) feed, Pressure feed Pressure-assist feed (gravity or suction cup spray guns).
19	Lay out of downdraft spray booth.
20	Free hand sketching of Compare how light reflects off solid color paints and metallic paints. Free hand sketching of colours of the spectrum. When white light shines through a glass prism.
21	Drawing of different type of paint defect using colouring aids (sketch pen/ colour pencil)

SYLLABUS FOR EMPLOYABILITY SKILLS

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

TRADE: Mechanic Auto Body Painting

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.	Bucket, sponge, squeegee, chamois & tack rags	6
3.	Caliper inside 15 cm Spring	6
4.	Calipers outside 15 cm spring	6
5.	Center Punch 10 mm. Dia. x 100 mm.	6
6.	Different type of spoon	6
7.	Dividers 15 cm Spring	6
8.	Electrician Screw Driver 250mm	6
9.	General purpose dolly	6
10.	Hammer ball peen 0.5 kg with handle	6
11.	Hands file 20 cm. Second cut flat	6
12.	Paint scrapper, putty mixing board, putty applicator /knife	6
13.	Pliers combination 20 cm.	6
14.	Safety glasses	6
15.	Screw driver 20cm.X 9mm. Blade	6
16.	Screw driver 30 cm. X 9 mm. Blade	6
17.	Scriber 15 cm	6
18.	Spanner D.E. set of 12 pieces (6mm to 32mm)	6
19.	Spanner, ring set of 12 metric sizes 6 to 32 mm.	6
20.	Spanners socket with speed handle, T-bar, ratchet and universal upto 32 mm set of 28 pieces with box	6
21.	Steel rule 30 cm inch and metric	6
22.	Steel tool box with lock and key (folding type) 400x200x150 mm	6
23.	Toe dolly	6
24.	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.	Bucket, sponge, squeegee, chamois & tack rags	2 each
13.	Caliper inside 15 cm Spring	4

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

63.	Hammer Ball Peen 0.75 Kg	4
64.	Hammer Chipping 0.25 Kg	5
65.	Hammer copper 1 Kg with handle	4
66.	Hammer Mallet	4
67.	Hammer Plastic	4
68.	Hand operated crimping tool (i) for crimping up to 4mm and (ii) for crimping up to 10mm	2
69.	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
70.	Hand Shear Universal 250mm	2
71.	Hand vice – 37 mm	2
72.	Hollow Punch set of seven pieces 6mm to 15mm	2 sets each
73.	Insulated Screw driver 20 cm x 9mm blade	2
74.	Insulated Screw driver 30 cm x 9mm blade	2
75.	Interchangeable driver set	1 set
76.	Lead light	2
77.	Left cut snips 250mm	4
78.	Lifting jack screw type 3 ton capacity	4
79.	Magneto spanner set with 8 spanners	1 set
80.	Magnifying glass 75mm	2
81.	Marking out table 90X60X90 cm.	1
82.	Multimeter digital	5
83.	Oil can 0.5/0.25 liter capacity	2
84.	Oil Stone 15 cm x 5 cm x 2.5 cm	1
85.	Outside micrometer 0 to 25 mm	4
86.	Outside micrometer 25 to 50 mm	4
87.	Outside micrometer 50 to 75 mm	1
88.	Outside micrometer 75 to 100 mm	1
89.	Paint measuring / mixing stick & jug sets	4 each
90.	Paint scrapper, putty mixing board, putty applicator /knife	2 each
91.	Panel buffing machine (18 cm)	2
92.	Philips Screw Driver set of 5 pieces (100 mm to 300 mm)	2 sets
93.	Pipe cutting tool	2
94.	Pipe flaring tool	2
95.	plastic feeler gauges	2
96.	Pliers combination 20 cm.	2
97.	Pliers flat nose 15 cm	2
98.	Pliers round nose 15 cm	2
99.	Pliers side cutting 15 cm	2
100.	Portable electric drill Machine	1
101.	Prick Punch 15 cm	4
102.	Punch Letter 4mm (Number)	2 set
103.	Right cut snips 250mm	4
104.	Rivet sets snap and Dolly combined 3mm, 4mm, 6mm	4
105.	Scraper flat 25 cm	4
106.	Scraper half round 25 cm	4
107.	Scraper Triangular 25 cm	2
108.	Scriber 15 cm	4
109.	Scriber with scribing black universal	2

110.	Set of stock and dies - Metric	2 sets
111.	Shear Tin Man's 450 mm x 600mm	4
112.	Sheet metal cutting pliers-left , right hand and straight –jaw Configuration	1 set
113.	Sheet Metal Gauge	2
114.	Sher Tinmans 300mm	4
115.	Soldering Copper Hatchet type 500gms	5
116.	Solid Parallels in pairs (Different size) in Metric	2
117.	Spanner Clyburn 15 cm	1
118.	Spanner D.E. set of 12 pieces (6mm to 32mm)	4
119.	Spanner T. flocks for screwing up and up-screwing inaccessible	2
120.	Spanner, adjustable 15cm.	2
121.	Spanner, ring set of 12 metric sizes 6 to 32 mm.	2
122.	Spanners socket with speed handle, T-bar, ratchet and universal upto	2
123.	Spark lighter	2
124.	Spark plug spanner 14mm x 18mm x Size	2
125.	Spirit level 2V 250, 05 metre	2
126.	spring scale	2
127.	Steel measuring tape 10 meter in a case	2
128.	Steel rule 15 cm inch and metric	4
129.	Steel rule 30 cm inch and metric	4
130.	Steel wire Brush 50mmx150mm	4
131.	Straight edge gauge 2 ft.	1
132.	Stud extractor set of 3	2 sets
133.	Stud remover with socket handle	1
134.	Suction cup	2
135.	Surface gauge with dial test indicator plunger type i.e. 0.01 mm	2
136.	Taps and Dies complete sets (5 types)	1 set
137.	Taps and wrenches - Metric	2 sets
138.	Telescope gauge	4
139.	Thread pitch gauge metric, BSW	1
140.	Torque wrenches 5-35 Nm, 12-68 Nm & 50-225 Nm	1 each
141.	Trammel 30 cm	2
142.	Trim and upholstery tools	1 set
143.	Tyre pressure gauge with holding nipple	2
144.	Universal puller for removing pulleys, bearings	1
145.	V' Block 75 x 38 mm pair with Clamps	2
146.	Vacuum gauge to read 0 to 760 mm of Hg.	2
147.	Various sanding blocks-soft, hard, speed file & de-nibbling tools	2 set
148.	vernier caliper 0-300 mm with least count 0.02mm	4
149.	Vice grip pliers	2
150.	Voltmeter 50V/DC	5
151.	Wire Gauge (metric)	5
152.	Work bench 250 x 120 x 60 cm with 4 vices 12cm Jaw	1

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 shell for painting - Light Motor vehicle of different Manufactures	4
6.	compressed air line -10m (on retractable reel, with high flow connectors) with FRL unit	2
7.	Computerised colour retrieval unit (Spectrophotometer)	1
8.	Die Grinding kit	2
9.	Disc sander – 18cm	2
10.	Discrete Component Trainer / Basic Electronics Trainer	1
11.	Down draft spray booth (7.5 X 5 m, combi spray/oven or separate spray /oven)	1
12.	Drilling machine bench to drill up to 12mm dia along with accessories	1
13.	Dual Magnetization Yoke : AC / HWDC, 230 VAC, 50Hz	1 set
14.	Dust extraction connections (Vacumm)	2
15.	Electronic paint mixing scales (accurate to 0.1 grams, explosion proof &	1
16.	Grinding machine (general purpose) D.E. pedestal with 300 mm dia wheels rough and smooth	1
17.	High pressure hot / cold water blasting unit	1
18.	Hydraulic jack HI-LIFT type -3 ton capacity, & % ton capacity	1 each
19.	Infrared drying lamp unit	1
20.	Liquid penetrant Inspection kit	1 set
21.	Motor Vehicle suitable for Body painting –Light Motor vehicle of different	2
22.	Paint surface film thickness gauge (electronic)	2
23.	Paint tinting system mixing machine (exposition proof)	1
24.	Parts spray booth cabin (ventilated to 30 cubic m / minute)	1
25.	Pipe Bending Machine (Hydraulic type) 12mm to 30mm	1
26.	Pneumatic rivet gun	2
27.	Random /dual action orbital sander (12-15 cm)	2
28.	Spray gun & mixing equipment cleaning machine(explosion proof) & bench	2 each
39.	Spray guns (gravity feed primer, COB/2K colour & clear coat, touch-up set)	4
29.	Tin smiths bench folder 600 x 1.6mm	1
30.	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
31.	Underbody sealer & corrosion proofing materials & spray units	2 each
32.	Ventilated preparation bays (fully illuminated, down or end draught	1
33.	Water & oil separation system	1
34.	Weld through primer application equipment	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 Oil	As required
10.	Engine Coolant	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.	Hydrometer	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
25.	Cotton waste/ cloth	As required
26.	Body filler (Consumable)	As required
27.	Body filler (Consumable)	As required
28.	Masking paper / plastic & back-masking tape	As required
29.	Refinishing material (consumable)	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 Painting - 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.