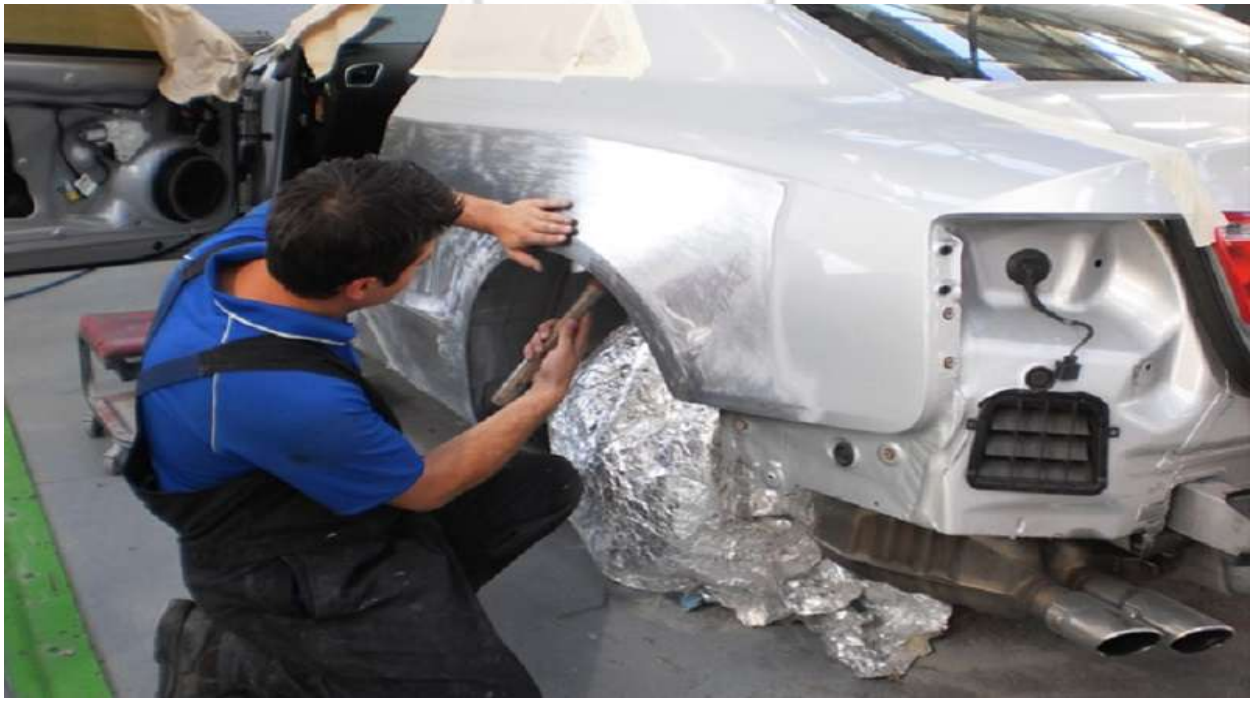
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

COMPETENCY BASED CURRICULUM

MECHANIC AUTO BODY REPAIR

(Duration: One Year)

CRAFTSMEN TRAINING SCHEME (CTS)
NSQF LEVEL- 4



SECTOR – AUTOMOTIVE

MECHANIC AUTO BODY REPAIR

(Revised in 2018)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL - 4

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
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ACKNOWLEDGEMENT

The DGT sincerely acknowledges contributions of the Industries, State Directorates, Trade Experts, Domain Experts and all others who contributed in revising the curriculum. Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

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1. COURSE INFORMATION

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

Semester – I

After the completion of this semester the trainee will be able to Check & perform Measuring & marking by using various Measuring & Marking tools. Plan & perform basic fastening & fitting operation by using correct hand tools, Machine tools & equipments. He will Trace and Test all Electrical & Electronic components & circuits and assemble circuit to ensure functionality of system. Repair Auto body panels by using Arc & Gas welding and Assess damage to Vehicle and identify repair and replacement needs. The trainee will also service, Repair and Maintenance of Air compressor and Air Lines.

Semester – II

After the completion of this semester the trainee will be able operate welding and cutting equipment including plasma arc cutter. He will analyze minor body damage and perform repair following sequential procedures involved in metal damage repair and Evaluate and repair damage plastic part. The trainee will also be able to perform glasses, body parts and door fitting and repairing process and will demonstrate knowledge of the procedures for diagnosing structural collision damage and measuring systems to identify location and extent of damage. The trainee will be able to use advanced body repair techniques like how to use frame straightening equipment and re-alignment procedures along with various anchoring methods and ensuring the structural integrity of the vehicle and occupant safety.

2. TRAINING SYSTEM

2.1 GENERAL

Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers range of vocational training courses catering to the need of different sectors of Labour market. The vocational training programmes are running under aegis of National Council of Vocational Training (NCVT). Craftsman Training Scheme (CTS) and Apprenticeship Training Scheme (ATS) are two pioneer programmes under NCVT for propagating vocational training.

Mechanic Auto Body Repair trade under CTS is one of the popular courses delivered nationwide through a network of ITIs. The course is of one-year (02 semester) duration. It mainly consists of Domain area and Core area. In the Domain area (Trade Theory & Practical) impart professional skills and knowledge, while Core area (Workshop calculation science, Engineering Drawing and Employability Skills) impart requisite core skill, knowledge and life skills. After passing out of the training programme, the trainee is awarded National Trade Certificate (NTC) by NCVT which is recognized worldwide..

Candidates need broadly to demonstrate that they are able to:

- Read & interpret technical parameters/documentation, plan work, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional knowledge, core skills & employability skills while performing the job.
- Check the job/assembly as per drawing for functioning, identify and rectify errors in job/assembly.
- Document the technical parameters related to the task undertaken.

2.2 CAREER PROGRESSION PATHWAYS:

- Can join Apprenticeship programme in different types of industries leading to National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.

2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of one year (02 semesters):

S No.	Course Element	Notional Training Hours
1	Professional Skill (Trade Practical)	1075
2	Professional Knowledge (Trade Theory)	258
3	Workshop Calculation & Science	86
4	Engineering Drawing	129
5	Employability Skills	110
6	Library & Extracurricular activities	62
7	Project work	80
8	Revision & Examination	280
	Total	**2080**

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course and at the end of the training programme as notified by Govt of India from time to time. The Employability skills will be tested in first two semesters only.

a) The **Internal assessment** during the period of training will be done by **Formative assessment method** by testing for assessment criteria listed against learning outcomes. The training institute have to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the template (Annexure – II).

b) The final assessment will be in the form of summative assessment method. The All India Trade Test for awarding NTC will be conducted by NCVT at the end of each semester as per guideline of Govt of India. The pattern and marking structure is being notified by govt of India from time to time. **The learning outcome and assessment criteria will be basis for setting question papers for final assessment. The examiner during final examination will also check** individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

The minimum pass percent for Practical is 60% & minimum pass percent for Theory subjects 40%. For the purposes of determining the overall result, 50% weightage is applied to the result of each semester examination.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while

undertaking assessment. Due consideration should be given while assessing for team work, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitivity to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work

Evidences of internal assessments are to be preserved until forthcoming semester examination for audit and verification by examination body. The following marking pattern to be adopted while assessing:

Performance Level	Evidence
(a) Weightage in the range of 60 -75% to be allotted during assessment	
For performance in this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment • Below 70% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A fairly good level of neatness and consistency in the finish • Occasional support in completing the project/job.
(b) Weightage in the range of above75% - 90% to be allotted during assessment	
For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.	• Good skill levels in the use of hand tools, machine tools and workshop equipment • 70-80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A good level of neatness and consistency in the finish • Little support in completing the project/job

(c) Weightage in the range of above 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment • Above 80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Brief description of Job roles:

Dent Remover/Auto Body Repair Technician/Denter Dent Remover; Panel Beater 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.

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

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

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

Reference NCO-2015: 7213.0301, 7212.0100, 7212.0400

4. GENERAL INFORMATION

Name of the Trade	MECHANIC AUTO BODY REPAIR
NCO - 2015	7213.0301, 7212.0100, 7212.0400
NSQF Level	Level – 4
Duration of Craftsmen Training	One year (Two semesters each of six months duration).
Entry Qualification	Passed 10th class under 10+2 System of education
Unit Strength (No. Of Student)	16 (Max. supernumeraries seats: 5)
Space Norms	210 Sq. mtr.
Power Norms	4 KW
Instructors Qualification for	
1. Mechanic Auto Body Repair Trade	a) Degree in Automobile/ Mechanical Engg. (with specialization in Automobile) from recognized college/University with one year experience in the automobile Body/repair 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/repair industry and should posses valid LMV driving license **OR** NTC/NAC in the Trade of "Mechanic Auto Body Repair" with 3 years post qualification experience in the relevant field and should posses valid LMV driving license **Desirable: -** Preference will be given to a candidate with CIC (Craft Instructor Certificate) in Mechanic Auto Body Repair trade. ***Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications.***
2. Workshop Calculation & Science	Degree in Engineering with one year experience. OR Diploma in Engineering with two years experience. Desirable: Craft Instructor Certificate in RoD & A course under NCVT.

3. Engineering Drawing	Degree in Engineering with one year experience. OR Diploma in Engineering with two years experience. OR NTC/ NAC in the Draughtsman (Mechanical) with three years experience. **Desirable:** Craft Instructor Certificate in RoD & A course under NCVT.
4. Employability Skill	MBA OR 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 DGT institutes. AND Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above. **OR** **Existing Social Studies Instructors duly trained in Employability Skills from DGT institutes**
List of Tools and Equipment	As per Annexure – I

Distribution of training on Hourly basis: (Indicative only)

Total hours /week	Trade practical	Trade theory	Work shop Cal. &Sc.	Engg. Drawing	Employability skills	Extra-curricular activity
40 Hours	25 Hours	6 Hours	2 Hours	3 Hours	2 Hours	2 Hours

5. NSQF LEVEL COMPLIANCE

NSQF level for **Mechanic Auto Body Repair** trade under CTS: **Level 4**

As per notification issued by Govt. of India dated- 27.12.2013 on National Skill Qualification Framework total 10 (Ten) Levels are defined.

Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are:

a. Process
b. professional knowledge
c. professional skill
d. Core skill and
e. Responsibility

The Broad Learning outcome of **Mechanic Auto Body Repair** trade under CTS mostly matches with the Level descriptor at Level- 4.

The NSQF level-4 descriptor is given below:

LEVEL	Process required	Professional knowledge	Professional skill	Core skill	Responsibility
Level 4	work in familiar, predictable, routine, situation of clear choice	factual knowledge of field of knowledge or study	recall and demonstrate practical skill, routine and repetitive in narrow range of application, using appropriate rule and tool, using quality concepts	language to communicate written or oral, with required clarity, skill to basic Arithmetic and algebraic principles, basic understanding of social political and natural environment	Responsibility for own work and learning.

6. LEARNING/ ASSESSABLE OUTCOME

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

6.1 GENERIC LEARNING OUTCOME

1. Recognize & comply safe working practices, environment regulation and housekeeping.

2. Understand and explain different mathematical calculation & science in the field of study including basic electrical. *[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, elasticity]*

3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, Different Projections, Assembly drawing, Sectional views, Estimation of material]*

4. Select and measure dimension of components and record data.

5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.

6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.

7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.

8. Plan and execute the work related to the occupation.

6.2 SPECIFIC LEARNING OUTCOME

Semester – I

9. Check & perform Measuring & marking by using various Measuring & Marking tools(Vernier Calliper, Micrometer, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.)
10. Plan & perform basic fastening & fitting operation by using correct hand tools, Machine tools & equipments.
11. Trace and Test all Electrical & Electronic components & circuits and assemble circuit to ensure functionality of system.
12. Join components by using Arc & Gas welding.

13. Check and Interpret Vehicle Specification data and VIN, Select & operate various Service Station Equipments.
14. Assess damage to Vehicle and identify repair and replacement needs
15. Service, Repair and Maintenance of Air compressor and Air Lines.

Semester – II

16. Demonstrate the proper operation and methods of welding and cutting equipment including plasma arc cutting processes
17. Analyze minor body damage and perform repair following sequential procedures involved in metal damage repair.
18. Evaluate and repair damage plastic part.
19. Demonstrate glasses, body parts and door fitting and repairing process
20. Demonstrate knowledge of the procedures for diagnosing structural collision damage and measuring systems to identify location and extent of damage.
21. Demonstrate how to use frame straightening equipment and re-alignment procedures along with various anchoring methods and ensuring the structural integrity of the vehicle and occupant safety

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING/ ASSESSABLE OUTCOME	
LEARNING/ ASSESSABLE OUTCOMES	**ASSESSMENT CRITERIA**
1. Recognize & comply safe working practices, environment regulation and housekeeping.	1. 1. Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements.
	1. 2. Recognize and report all unsafe situations according to site policy.
	1. 3. Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
	1. 4. Identify, handle and store / dispose off dangerous/unsalvageable goods and substances according to site policy and procedures following safety regulations and requirements.
	1. 5. Identify and observe site policies and procedures in regard to illness or accident.
	1. 6. Identify safety alarms accurately.
	1. 7. Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.
	1. 8. Identify and observe site evacuation procedures according to site policy.
	1. 9. Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
	1. 10. Identify basic first aid and use them under different circumstances.
	1. 11. Identify different fire extinguisher and use the same as per requirement.
	1. 12. Identify environmental pollution & contribute to avoidance of same.
	1. 13. Take opportunities to use energy and materials in an environmentally friendly manner
	1. 14. Avoid waste and dispose waste as per procedure
	1. 15. Recognize different components of 5S and apply the same in the working environment.
2. Understand and explain different mathematical calculation & science in the field	2.1 Explain concept of basic science related to the field such as Material science, Mass, weight, density, heat & temperature, heat treatment.

of study including basic electrical. *[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry, Mensuration, Trigonometry, Heat & Temperature, elasticity]*	2.2 Measure dimensions as per drawing
	2.3 Use scale/ tapes to measure for fitting to specification.
	2.4 Comply given tolerance.
	2.5 Prepare list of appropriate materials by interpreting detail drawings and determine quantities of such materials.
	2.6 Ensure dimensional accuracy of assembly by using different instruments/gauges.
	2.7 Explain basic electricity, insulation & earthing.
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, Different Projections, Assembly drawing, Sectional views, Estimation of material]*	3. 1. Read & interpret the information on drawings and apply in executing practical work.
	3. 2. Read & analyse the specification to ascertain the material requirement, tools, and assembly /maintenance parameters.
	3. 3. Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
4. Select and measure dimension of components and record data.	4.1 Select appropriate measuring scale/tape/gauges.
	4.2 Measure dimension of the components/assembly & compare with given drawing/measurement.
5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	5.1 Explain the concept of productivity and quality tools and apply during execution of job.
	5.2 Understand the basic concept of labour welfare legislation and adhere to responsibilities and remain sensitive towards such laws.
	5.3 Knows benefits guaranteed under various acts
6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	6.1 Explain the concept of energy conservation, global warming, pollution and utilize the available recourses optimally & remain sensitive to avoid environment pollution.

	6.2 Dispose waste following standard procedure.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	7. 1. Explain personnel finance and entrepreneurship.
	7. 2. Explain role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
	7. 3. Prepare Project report to become an entrepreneur for submission to financial institutions.
8. Plan and execute the work related to the occupation.	8. 1. Use documents, drawings and recognize hazards in the work site.
	8. 2. Plan workplace/ assembly location with due consideration to operational stipulation
	8. 3. Communicate effectively with others and plan project tasks
	8. 4. Execute the task effectively.

SPECIFIC LEARNING/ ASSESSABLE OUTCOMES	
LEARNING/ ASSESSABLE OUTCOMES	**ASSESSMENT CRITERIA**
SEMESTER-I	
9. Check & perform Measuring & marking by using various Measuring & Marking tools (Vernier Caliper, Micrometer, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.)	9. 1. Plan the working principles of measuring instruments and special tools required for auto workshop.
	9. 2. Select, care and use of measuring instrument.
	9. 3. Set up the measured value with workshop manual and quality concepts and proper safety.
	9. 4. Carry out decision on whether to replace or not.
10. Plan & perform basic fastening & fitting operation by using correct hand tools, Machine tools & equipments.	10.1 Describe the purpose, use of auto hand tools.
	10.2 List the safety rules for hand tools.
	10.3 Select the correct tool for the job.
	10.4 Set up the tacked pieces in specific position.
	10.5 Joint components by Brazing, Soldering, Riveting as per given drawing.
	10.6 Produce components by different operation (Drilling, Reaming, Taping, Dieting)
11. Trace and Test all Electrical & Electronic components & circuits and assemble circuit to ensure functionality of system. Charge and test batteries used in vehicle.	11.1 Plan and prepare as per procedure and safety methods of soldering the cable ends using an electric soldering iron.
	11.2 Use crimping tool to make a circuit joint.
	11.3 Explain the connection of an ammeter, voltmeter, and ohmmeter in a circuit trouble shooting.
	11.4 State open & short circuit, series and parallel circuits.
	11.5 Verify DC series & parallel circuits and its characteristics.
	11.6 Check out the open and short circuits in the lighting circuits.
	11.7 Verify ohm's law and measure resistance using rheostat.
	11.8 Check the voltage drop in the auto electrical system by using multimeter.
	11.9 Trace the auto electrical components by using vehicle wiring circuits.
	11.10 Check the condition of the solenoid switch in the starting system.

	11.11 Determine the forward to reverse resistance ratio of diodes and identify good / bad diodes.
	11.12 Perform battery charging and check
12. Check & Interpret Vehicle Specification data and VIN. Select & operate various Service Station Equipments	12. 1. Identify of different type of vehicle.
	12. 2. Identify the different vehicle specification data and information
	12. 3. Demonstrate the garage, service station different equipment
13. Assess damage to Vehicle and identify repair and replacement needs.	13. 1. Prepare accident report.
	13. 2. Ascertain the damage and plan repair sequence.
	13. 3. Identify the vehicle parts and finalize the repair procedure to be followed.
14. Identify various vehicle parts and Service, Repair and Maintenance of Air compressor and Air Lines.	14.1 Ascertain basic working principles and safety aspect of Air Compressor.
	14.2. Plan and perform removal of accessories fitted to the Air Compressor.
	14.3. Dismantle the cylinder block parts.
	14.4. Perform inspection to ascertain the serviceability of the dismantled parts.
	14.5. Repair/replace defective parts.
	14.6. Comply with safety rules when performing the above operations.
	14.7. Assemble and check functionality of the components.
	14.8. Service FRL unit and check air leaks on the Air compressor and installed pipelines.
SEMESTER-II	
15. Demonstrate the proper operation and methods of welding and cutting equipment including plasma arc cutting processes	15. 1. Plan and mark on surface for plasma cutting.
	15. 2. Select the torch/nozzle size, current and working pressure of gas as per requirement.
	15. 3. Set the marked plate properly on cutting table.
	15. 4. Set the plasma cutting machine and perform the cutting operation by adapting proper techniques and safety aspects
	15. 5. Clean and inspect the cut surface for quality of cutting.
16. Analyze minor body damage and perform repair	16. 1. Perform minor repair using a hammer and dolly straighten damage on a door.

following sequential procedures involved in metal damage repair.	16. 2. Pull out minor damage in the fender Using dent puller.
	16. 3. Remove dents in steel Panels Using a spot weld dent puller.
	16. 4. Select proper abrasive and carryout paint strip by single action sander.
	16. 5. Apply body filler and carryout sanding for quality body repair finish.
17. Evaluate and repair damage plastic part.	17. 1. Identify common automotive plastics used in the industry.
	17. 2. Repair minor cuts and cracks using chemical adhesive.
	17. 3. Reshape a plastic part by heat application.
18. Demonstrate glasses, body parts, door fitting and repairing process	18. 1. Remove hood from a vehicle as per standard procedure.
	18. 2. Adjust hood and perform hood latch adjustments.
	18. 3. Replace bumper.
	18. 4. Remove Fender, reinstall fender and adjust it properly, adjust Trunk lid and service trunk bed and align the panel
	18. 5. Remove windshield and service rubber gasket.
	18. 6. Apply adhesive to windshield glass using a sealer gun
	18. 7. Align windshield into position and Install.
	18. 8. Adjust Door glass, install door trim panel, service tailgate glass, station wagon tailgate, rear view mirror service, roof panel
19. Demonstrate knowledge of the procedures for diagnosing structural collision damage and measuring systems to identify location and extent of damage	19. 1. Use trame gauge for upper body dimensioning.
	19. 2. Measure and ascertain damage at the front body and body side panel, rear body Damage Using Gauge Measuring Systems.
	19. 3. Determine the extent of impact damage using universal measuring system and computerized measuring system
20. Demonstrate how to use frame straightening equipment and re-alignment procedures along	20. 1. Analyze Length damage, Width damage and Height damage.
	20. 2. Repair the vehicle for front-end damage, rear damage, side damage, sag damage, twist damage, diamond

with various anchoring methods and ensuring the structural integrity of the vehicle and occupant safety.	damage, straightening strut, tower damage.
	20. 3. Relieve stress with heat, stress concentrators, and Frame Straightening Equipment by anchoring the vehicle using pulling clamps and chains.

8. SYLLABUS

SYLLABUS FOR MECHANIC AUTO BODY REPAIR			
First Semester - Six Months			
Week No.	**Ref. Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
1	Recognize & comply safe working practices, environment regulation and housekeeping	1. Familiarisation with institute, Job opportunities in the automobile sector.(5 hrs) 2. Machinery used in Trade.(10 hrs) 3. Types of work done by the students in the shop floor.(10hrs)	**Admission & introduction to the trade:** Introduction to the Course duration, course content, study of the syllabus. General rule pertaining to the Institute, facilities available- Hostel, Recreation, Medical and Library working hours and time table
2	-do-	4. Practical related to Safety and Health.(5 hrs) 5. Importance of maintenance and cleanliness of Workshop. (2 hrs) 6. Interaction with health center and fire service station to provide demo on First aid and Fire safety. (3 hrs) 7. Use of fire extinguishers. (5 hrs) 8. Demonstration on safe handling and Periodic testing of lifting equipment. (5 hrs) 9. Safety disposal of Used engine oil. Energy saving Tips/Audit of ITI electricity Usage. (5 hrs)	**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. Hazard identification, spatter hazard etc and countermeasure to

			eliminate them & importance of usage of PPEs.
3-4	Check & perform Measuring & marking by using various Measuring & Marking tools(Vernier Calliper, Micrometer, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.)	10. Practice using all marking aids, like steel rule with spring calipers, dividers, scriber, punches, Chisel etc .(15 hrs) 11. Layout a work piece- for line, circle, arcs and circles .(10 hrs) 12. Practice to measure a wheel base of a vehicle with measuring tape .(5 hrs) 13. Practice to remove wheel lug nuts with use of an air impact wrench. (10 hrs) 14. Practice on General workshop tools & power tools and equipments (10 hrs)	**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, scriber, punches-prick punch, center punch, pin punch, hollow punch, number and letter punch. Chisel-flat, cross-cut. Hammer-ball pein, lump, mallet. , Different type of -body hammers, pick hammers, , Bumping hammers, finishing hammers, dolly block, and body spoon, body picks, body pullers and pull rods, suction cup, scratch awl, Screw drivers-blade screwdriver, Phillips screw driver, Ratchet screwdriver. Allen key, bench vice & C-clamps, Spanners- ring spanner, open end spanner & the combination spanner, universal adjustable open end spanner. Sockets & accessories, Pliers - Combination pliers, multi grip, long nose, flat-nose, Nippers or pincer pliers, Metal cutting shears-Tin snips, sheet metal cutting pliers, (Aviation snips), panel cutters, trim and upholstery tools, Door handle tool (clip pullers), Metal files-reveal file, surform file, sanding board, sanding block, spreaders and squeegees.
5-7	Plan & perform	15. Practice on General workshop tools	**Power Tools:-**

	basic fastening & fitting operation by using correct hand tools, Machine tools & equipments.	& power tools and equipments. (10hrs) 16. Practice on visual Identification of materials used in workshop.(10 hrs) 17. Trouble shooting for Air drills- Tool will not run, Tool locked up, spindle will not run, tool will not shutoff, Trouble shooting for Air hammers- tool will not run, chisel stack in nozzle.(10 hrs) 18. Trouble shooting for Air ratchet- Motor runs, spindle does not turn or turns erratically, motor will not run, Trouble shooting for Air Wrenches- Tools run slowly & not at all.(10 hrs) 19. Tool will not run, exhaust air flows freely, socket will not stay on, tool shows premature shank wear, Tool will not shut off.(10 hrs) 20. Trouble shooting for hydraulic tools for- Spongy effect, Tool will not extend.(10hrs) 21. Tool will not retract tool leaks under pressure..(10 hrs) 22. Handle kickback, works properly onetime but not the next.(5 hrs)	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. air impact wrench, air ratchet, air drill, spot weld remover air drill, spot weld cutter-drill type & Hole saw type, air chisel, air blowgun, Spray guns, wrenches- Torque wrenches, pipe wrenches, car jet washers Pipe flaring & cutting tool. Vacuum cleaner, power washers, Heat gun, Hydraulically powered shop equipment- Hand or bottle jacks, Transmission jack, service jack, Frame rack, Maintenance of hydraulic tools, hydraulic lifts. Engine crane.
8	Check & perform Measuring & marking by using various Measuring & Marking tools*(Vernier Calliper, Micrometer, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.)*	23. Measuring practice on engine components with aid of instrument studied.(25 hrs)	**Systems of measurement:** 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.

9	Plan & perform basic fastening & fitting operation by using correct hand tools, Machine tools & equipments.	24. Practice on General cleaning, checking and use of nut , bolts, & studs etc.(15 hrs) 25. Removal of stud/bolt from blind hole.(10 hrs)	**Fasteners-** Study of different types of screws, nuts, studs & bolts, locking devices, Such as lock nuts, cotter, split pins, keys, circlips, lock rings, lock washers and locating where they are used. Washers & chemical compounds can be used to help secure these fasteners. Selection of materials for gaskets and packing, Description of Riveting tools
10	-do-	26. Practice on cutting tools like Hacksaw, file, chisel, OFF-hand grinding with sander, bench and pedestal grinders, safety precautions while grinding.(15 hrs) 27. Practice on Hacksawing and filing to given dimensions..(10 hrs)	**Cutting tools** :- Study of different type of cutting tools like Hacksaw, File- Definition, parts of a file, specification, Grade, shape, different type of cut and uses., chisel, OFF-hand grinding with sander, bench and pedestal grinders, safety precautions while grinding. **Limits, Fits & Tolerances**:- Definition of limits, fits & tolerances with examples used in auto components.
11-12	-do-	28. Practice on Marking and Drilling clear and Blind Holes, Sharpening of Twist Drill.(10hrs) 29. Safety precautions to be observed while using a drilling machine. (10 hrs) 30. Practice on Tapping a Clear and Blind Hole, Selection of tape drill Size, use of Lubrication.(10 hrs) 31. Use of tap extractor, Cutting Threads on a Bolt/ Stud.(10hrs) 32. Practice Adjusting two piece Die and Reaming a hole/ Bush to suit the given pin/ shaft, scraping a given machined surface.(10 hrs)	**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.

13	-do- Join components by using Arc & Gas welding.	33. Practice on making Rectangular Tray. Pipe bending, Fitting nipples unions in pipes.(15 hrs) 34. Soldering and Brazing of Pipes. (10 hrs)	**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.
14	Trace and Test all Electrical & Electronic components & circuits and assemble circuit to ensure functionality of system.	35. Practice in joining wires using soldering Iron.(10 hrs) 36. Construction of simple electrical circuits, Measuring of current, voltage and resistance.(7.5 hrs) 37. Using digital multimeter, practice continuity test for fuses, jumper wires, fusible links, circuit breakers.(7.5 hrs)	**Basic electricity,** Electricity principles, Ground connections, Ohm's law, Voltage, Current, Resistance, Power, Energy. Voltmeter, ammeter, Ohmmeter Mulitmeter, Conductors & insulators, Wires, Shielding, Length vs. resistance, Resistor ratings
15-16	-do- Trace Hydraulic and Pneumatic circuits.	38. Diagnose series, parallel, series-parallel circuits using Ohm's law. (5 hrs) 39. Check electrical circuit with a test lamp.(10 hrs) 40. Perform voltage drop test in circuits using multimeter, measure current flow using multimeter /ammeter. (10 hrs) 41. Use of service manual wiring diagram for troubleshooting. (10 hrs) 42. Identification of Hydraulic and pneumatic components used in vehicle.(15 hrs).	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. **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. Pneumatic Symbols,
17	Check & Interpret Vehicle Specification data and VIN Select & operate various Service Station Equipments.	43. Identification of different type of Vehicle. (5 hrs) 44. Demonstration of vehicle specification data; (5 hrs) 45. Identification of vehicle information Number (VIN). (5 hrs) 46. Demonstration of Garage, Service station equipments.(5 hrs) 47. Vehicle hoists – Two post and four post hoist, Engine hoists, Jacks**,** Stands. (5 hrs)	Auto Industry - History, leading manufacturers, development in automobile industry, trends, new product. Brief about Ministry of Road transport & Highways, The Automotive Research Association of India (ARAI), National Automotive Testing and R&D Infrastructure Project (NATRIP), & Automobile Association. 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.**
18-20	Assess damage to Vehicle and identify repair and replacement needs	48. Practice on preparation of accident report. (15 hrs) 49. Preparation of Body shop repair sequence procedures. Washing of vehicle. (5 hrs) 50. Identification of different type body, chassis, Drive lines.(05 hrs) 51. Identify the location of parts and panels. (5 hrs) 52. Identify the parts of unibody design vehicle. (5 hrs) 53. Identify the front body structural components of a transverse-mounted engine of FWD vehicle. Identify the rear body structural components of a unibody sedan. (5 hrs) 54. Identify the under body front and rear section structural components of	**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.. **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

		a unibody sedan. (5 hrs) 55. Identity the front, rear body structural components of mid-engine vehicle. (5 hrs) 56. Identify the parts of a full frame of pickup truck and Sports utility vehicle (SUV) (10 hrs) 57. Practice on use of computer-based service information, service manuals, collision repair guides, refinishing guides, vehicle dimension manual, color matching guides, parts interchange guides(15 hrs)	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. 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
21-22	Service, Repair and Maintenance of Air compressor and Air Lines.	58. Identify the parts of a piston type stationary compressor, Overhauling of Air compressor, Overhauling of service (FRL) unit, Drain the air	**Compressor Air system :** Basic requirement for compressed air systems, Type of Compressor- Description and construction of Diaphragm

		receiver and the moisture separator/regulator or air transformer. (10 hrs) 59. Check the level of the oil in the crankcase, clean air filters, Clean or blow off fins on cylinders, heads, intercoolers, After coolers. (10 hrs) 60. 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. (15 hrs) 61. Check and align a loose motor pulley or compressor. (5 hrs) 62. Check for air leaks on the compressor outfit and air piping system. (10 hrs)	compressor, piton type compressor-single stage and two stage, rotary screw air compressor, Performance of air compressor- Description of Horse power, delivery volume, displacement, Free air delivery, compressor volumetric efficiency, tank size, Air and Fluid Control Equipment – In take air filter, Distribution system, regulator, lubricator, different type air purification method, Compressor Accessories –Hose type, hose size, maintenance of hose, connectors, adapters and couplings, Air System Maintenance. Study the typical piping arrangement found in a body shop, colour coding of airline, water line and fuel line.
23-25	**Revision**		
26	**Examination**		

Note: - *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of welded items like boiler drum, ship building, heavy welded structures etc., may be shown to the trainees to give a feel of Industry and their future assignment.*

SYLLABUS FOR MECHANIC AUTO BODY REPAIR			
Second Semester – Six Months			
Week No.	**Ref. Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
27-31	Demonstrate the proper operation and methods of welding and cutting equipment including plasma arc cutting processes	63. Identify the parts of an oxyacetylene welding and cutting outfit. (10 hrs) 64. Practice on Oxyacetylene welding process, Practice on Soldering and brazing. (10 hrs). 65. Practice on torch flame adjustment. (5 hrs) 66. Identify the different parts on MIG welding machine, Selection of weld specification as per manual, selection of MIG wire size. (5 hrs) 67. Compare the welding methods used in vehicle production, practice on surface preparation and setting of welding parameter, use of clamping and MIG welding of sample panel, practice on plug weld hole for body panel replacement. (10 hrs) 68. Practice on Spraying anti spatter compound into a MIG nozzle will help protect the tip and prevent the wire from sticking in the gun, Practice on Flat, Horizontal, vertical and overhead welding position. (10 hrs) 69. Practice on continuous, plug, stitch, MIG spot, lap, tack welding techniques, Identify the different parts on SPOT welding machine. (20 hrs) 70. Practice on resistance spot welding process on different	**Welding:** Introduction to joining of metals, Welding characteristics, weld terminology, weld symbols, Common Auto body welding techniques- MIG, TIG, Soft brazing, Factory weld specification, Typical Auto body MIG wire sizes, Typical Auto body shielding gases, Heat affected Zone (HAZ), Auto body MIG welding -Principles & characteristics, MIG welding equipments, Welding lens, MIG operation methods, MIG welding equipment, MIG welding current, MIG Arc voltage, MIG Tip to base metal distance, MIG gun angle and welding direction, MIG shield gas flow volume, MIG welding speed, MIG wire speed, MIG gun nozzle adjustment, Heat buildup penetration, clamping tools for welding, Welding position. welding Technique- Tack weld, Continuous weld, plug weld, spot weld, lap weld, stitch weld, intermittent weld, Base welding method-Butt welds lap & flange welding, plug weld, stitch weld, MIG welding of Galvanized metals & Aluminum, Welding Aluminum, MIG weld defects, Testing the MIG weld. FCAW (Flux cored Arc welding) , TIG Welding, Resistance spot welding, Resistance spot welding components, Spot welder adjustments, Operating a squeeze-type resistance spot welder, Other spot welding functions, stud spot welds for dent removal, Oxyacetylene welding,

		thickness materials. (15 hrs) 71. Practice tip dressing, tip change, chisel test nugget test for spot welding to ensure the spot weld quality. (20 hrs) 72. Practice on plasma cutting operation. (20 hrs)	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.
32-35	Analyze minor body damage and perform repair following sequential procedures involved in metal damage repair.	73. Practice on minor repair of damaged car. (15 hrs) 74. Practice on using a hammer and dolly straighten damage on a door. (10 hrs) 75. Using long spoon to pry out a fender to allow for hammer straightening. (10 hrs) 76. Using Pry picks remove small dents in hard-to-reach areas. (15 hrs) 77. Practice on Using dent puller to pull out minor damage along a lip in the fender. (10 hrs) 78. Using a spot weld dent puller remove dents in steel Panels. (10 hrs) 79. Perform Paint Stripping using single action sander, Abrasive selection. (10 hrs) 80. Carry out maintenance of single action sander. (10 hrs) 81. Perform Body Filler application & Sanding to ensure body repair quality. (10 hrs)	**Sheet metal repair.** Automotive sheet metal, basic steps for correcting minor sheet metal damage, Low carbon steel, high strength steels (HSS)- Type of HSS- High tensile strength steel (HTSS), Type of loading- Tensile, compress, shear, cleavage, peel, Properties of sheet metal- Yield strength, Compressive strength, shear strength, torosional 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 reliving,

			stretched metal, Principle of shrinking , shrinking steel panel with heat, Kinking, shrinking a gouge, filing the repair area, working Aluminum panels, working Aluminum with hammer and dolly, straightening aluminum with hammer, filling and grinding aluminum, straightening aluminum by heat shrinkage, Paint less dent removal method. Introduction to Paint: 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 Requirement of body filler, components of body filler (filler & hardner), mixing ratio of filler and hardner, tools used for mixing and application - Spatula, Board, application process, drying of body filler using conventional proceedure and infrared drier, scuffing, sanding of body filler, defects in body filler application, final finnishing of body panel
36	Evaluate and repair damage plastic part.	82. Identify the thermoplastics, thermosetting plastics. (5 hrs) 83. Identify common automotive plastics used in the industry. (5 hrs) 84. Practice on using chemical adhesive bonding techniques to repair of minor cuts and cracks. (5 hrs) 85. Practice on using heat to reshape plastics, (10 hrs)	Repairing Plastics Introduction to plastics, Types of Plastics-Thermoplastics, thermosetting plastics, safety points observed while working with plastic repair, common automotive plastics identification, plastic repair, chemical adhesive bonding techniques- repair of minor cuts and cracks, repair of tears, and punctures, using the right adhesive, Flexible part repair- Plastic welding, Hot air plastic welding,

			High speed plastic welds, plastic welder setup shutdown, and servicing, Airless plastic welding, ultrasonic plastic welding, plastic welding procedures, general plastic welding, techniques, Plastic tack welding, plastic welding procedures, airless melt-flow plastic welding, plastic stitch- tamp welding, single-sided plastic welds, two sided plastic welds, repairing vinyl, using heat to reshape plastics, ultrasonic stud welding, reinforced plastic repairs.
37-38	Demonstrate glasses, body parts and door fitting and repairing process	86. Practice on Hood removal as per procedure(5 hrs). 87. Practice on Hood adjustment, Hood-to-hinge adjustment, hood height adjustment, hood latch mechanism, hood latch adjustments, and Bumper replacements. (15 hrs) 88. Practice on Fender removal, installing fenders, fender adjustments, grille service, Trunk lid adjustments, panel alignment, Truck bed service. (30 hrs)	Hood, Bumper, Fender, Lid, And Trim Service Part removal Sequence, Hood service- Hood removal, Hood adjustment, Hood-to-hinge adjustment, hood height adjustment, hood latch mechanism, hood latch adjustments, Bumper replacements, Fender service- Fender removal, installing fenders, fender adjustments, grille service, Trunk lid adjustments, panel alignment, Truck bed service, sound- Deadening pads, custom body panels, installing body trim and moldings, removing adhesive held moldings, installing adhesive body sine moldings.
39-40	-do-	89. Practice on removing windshield, Practice on windshield rubber gasket service. (5 hrs) 90. Practice to align windshield into position during Installation(5 hrs) 91. Practice on using a sealer gun to apply adhesive to windshield glass. (10 hrs) 92. Identify the basic parts of a door assembly(5 hrs) 93. Practice on door removal. Practice on repair of modern	Door, roof, and glass Service Vehicle Glass Technology- Introduction, type of glass- laminated, plate glass, tempered glass, glass service- removing windshield molding, windshield rubber gasket service, Glass adhesive-full cut-out method, glass adhesive, partial cutout method, windshield wiper service, rear and quarter window service, service doors-door construction, manual & power regulators, checking door operation, door removal, door weather strip service, Door inner trim panel Door window regulator

		power window regulator, door lock & latch, Door & Door glass adjustments, servicing welded door hinges, bolted door hinge adjustment. (10 hrs) 94. Practice on Door glass adjustment, door trim panel installation tailgate glass service, station wagon tailgate adjustment, rear view mirror service, roof panel service. (15 hrs)	service, door lock & latch service, Door reinforcements, panel adhesive technology, Replacing bonded door skins, replacing SMC(Sheet molded compound) Door skins, Door & Door glass adjustments, servicing welded door hinges, bolted door hinge adjustment, Door glass service- Door glass adjustment, door trim panel installation tailgate glass service, station wagon tailgate adjustment, Glass element repairs, rear view mirror service, roof panel service, fastened roof panel service, convertible top service, Sun roof service.
41	-do-	95. Identify the different parts of Passenger Compartment, practice on seat service. (5 hrs) 96. Front seat service, Rear bench seat service, seat cover service, carpeting service, dash panel service, console service. (5 hrs) 97. Instrument cluster service, Headliner service, locating air and water leaks(5 hrs) 98. Checking drain hoses, wind noise, repairing leaks, Rattle elimination, Fixing rattle. (10 hrs)	Passenger compartment Service Major parts of Passenger Compartment - dash assembly, instrument cluster, seat assemblies, interior trim, steering column assembly, headliner assembly, carpeting, weather stripping, Interior trim-pillar trim panels, dash panel, door trim panels, Glass trim panels, sill plates, interior trim service- procedure, roll bars, seat service- Front seat service, Rear bench seat service, seat cover service, carpeting service, dash panel service, console service, Instrument cluster service, Headliner service, locating air and water leaks- checking drain hoses, wind noise.
42-44	Demonstrate knowledge of the procedures for diagnosing structural collision damage and measuring systems to identify location and extent of damage	99. Practice on use of trame gauge, upper body dimensioning. (25 hrs) 100. Measurement of the front body, measurement of the body side panel, measurement of the rear body Damage Using Gauge Measuring Systems, Strut Centerline Gauge. (15 hrs) 101. Identify the condition of collision, influence of impact on a body-over-frame vehicle,	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

		visually determine the extent of impact damage. (15 hrs) 102. Inspecting for damage from passengers & luggage, Universal Measuring Systems, Computerized Measuring Systems. (20 hrs)	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.
45-47	Demonstrate how to use frame straightening equipment and re-alignment procedures along with various anchoring methods and ensuring the structural integrity of the vehicle and occupant safety	103. Practice on analyzing damage- Length damage, Width damage, Height damage. (25 hrs) 104. Practice on repair method for front-end damage, rear damage, side damage, sag damage, twist damage, diamond damage, straightening strut, tower damage, stress relieving, straightening strut tower damage, stress relieving with heat, stress concentrators, Frame Straightening Equipment, anchoring the vehicle using pulling clamps and chains. (50 hrs)	Unibody/frame alignment Realignment basics-vehicle anchoring and pulling, pulling direction, single-pull method, multiple-pull Method, visualizing front-end Collisions, rear-end collisions, side collision, rollover damage, angled impacts, unibody/Frame Straightening Equipment, in-floor straightening equipment-anchor-pot system and the modular rail frame system. portable body and frame pullers, rack (floor) straightening systems, bench straightening systems, anchoring the vehicle using pulling clamps and chains, other straightening accessories- restraint bar , door aligner, engine holder, portable hydraulic rams, strut plate, straightening and realigning techniques-sequence for a total

			structure realignment procedure , unibody/frame realignment safety, measuring when pulling, computerized measuring systems, procedure for planning the pull, making pulls-single-pull setup, multiple-pull setups, executing a pulling sequence, purpose of over pulling.
48-49	**In-plant training / Project work**		
50-51	**Revision**		
52	**Examination**		

9. SYLLABUS - CORE SKILLS

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

First Semester **Duration: Six Month**		
S No.	**Workshop Calculation and Science**	**Engineering Drawing**
1.	Units, Derived and fundamental, types of system FPS, CGS, MKS and their conversion. Metric weights and measurements, units conversion factors	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.	Fractions- Addition and subtraction, Fractions and whole numbers, Combined addition and subtraction, Multiplication and division of fractions. Operations in problems involving fractions.	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.
3.	Order of performing (BODMAS) Mathematical operators , Integers - Rules for dealing with integers, Addition, subtraction, Multiplication and division.	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.
4.	Ratio and proportion. Percentages, Examples of ratios in Automotive technology	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
5.	profit and loss, Discount .	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.

6.	simple interest and compound interest	Orthographic Projection - Definition - Planes of Projection - Four quadrants - Reference Line, First angle projection - Third angle projection.
7.	depreciation calculation	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
8.	Time and work problem , Time and distance, clocks and calendar,	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.
9.	Brief description of manufacturing process of steel, and aluminum	-
10.	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.	-
11.	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).	-
12.	**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.	-
13.	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.	-
14.	Different Type of cutting fluids and their properties. Calculation of cutting speed, feed and drilling time.	-

15.	**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.	-
16.	**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.	-

Second Semester **Duration: Six Month**		
S No.	**Workshop Calculation and Science**	**Engineering Drawing**
1.	**Factorization and quadratics:** multiply expressions in brackets by a number, symbol or by another expression in a bracket; by extraction of a common factor by grouping eg ax - ay + bx - by ; quadratic expressions eg a + 2ab + b ; roots of an equation eg quadratic equations with real roots by factorisation, and by the use of formula	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.
2.	**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,	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.
3.	**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.	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 Slotsr
4.	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.	Layout of an automobile chassis. Drawing the layout of body shop. Free hand sketching of major outer body panels, viewed from outside.

5.	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,	Free hand sketching of symbols are used in service information
6.	**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 ;	Free hand sketching of block diagram compressor and its parts.
7.	**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	Block diagram of spot weld dent pullers and its parts.
8.	**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.	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.
9.	**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)	Drawing the exploded view of Hood, bumper, fender assembly.

10.		Drawing the exploded view of door, roof and wind shied assembly.
11.		Drawing of exploded view of a dash assembly
12.		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

9.2 EMPLOYABILITY SKILLS

CORE SKILL – EMPLOYABILITY SKILL	
First Semester	
1. English Literacy	**Duration : 20 hrs** **Marks : 09**
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
Functional Grammar	Transformation of sentences, voice change, change of tense, spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
Speaking/ Spoken English	Speaking with preparation on self, on family, on friends/ classmates, on known people, picture reading, gain confidence through role-playing and discussions on current happenings, job description, asking about someone's job, habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing on messages and filling in message forms, greeting and introductions, office hospitality, resumes or curriculum vitae's essential parts, letters of application reference to previous communication.
2. IT Literacy	**Duration : 20 hrs** **Marks : 09**
Basics of Computer	Introduction, computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down computer.
Computer Operating System	Basics of Operating System, WINDOWS, User interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc., Use of common applications.
Word Processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing documents, Use of shortcuts, Creating and Editing Text, Formatting the text, Insertion & creation of tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets.
Computer Networking and Internet	Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web browser, Website, Web

	page and Search Engines. Accessing the Internet using web browser, Downloading and printing web pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.
3. Communication Skills	**Duration : 15 hrs** **Marks : 07**
Introduction to Communication Skills	Communication and its importance Principles of Effective communication Types of communication - verbal, non-verbal, written, email, talking on phone. Non-verbal communication- characteristics, components-Para-language Body language Barriers to communication and dealing with barriers. Handling nervousness/discomfort.
Listening Skills	Listening-hearing and listening, effective listening, barriers to effective listening, guidelines for effective listening. Triple- A Listening - Attitude, Attention & Adjustment. Active listening skills.
Motivational Training	Characteristics essential to achieving success. The power of positive attitude. Self-awareness Importance of commitment. Ethics and values Ways to motivate oneself. Personal goal setting and employability planning.
Facing Interviews	Manners, etiquettes, dress code for an interview. Do's & Don'ts for an interview.
Behavioral Skills	Problem solving, confidence building, attitude.
Second Semester	
4. Entrepreneurship Skills	**Duration : 15 hrs** **Marks : 06**
Concept of Entrepreneurship	Entrepreneur - Entrepreneurship - Enterprises: Conceptual issue Entrepreneurship vs. management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, and the process of setting up a business.
Project Preparation &	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept

Marketing Analysis	& application of PLC, Sales & distribution management. Difference between small scale & large scale business, Market survey, Method of marketing, Publicity and advertisement, Marketing mix.
Institution's Support	Preparation of project. Role of various schemes and institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non-financing support agencies to familiarize with the Policies/ Programmes, procedure & the available scheme.
Investment Procurement	Project formation, feasibility, Legal formalities i.e., Shop Act, Estimation & costing, Investment procedure - Loan procurement - Banking processes.
5. Productivity	**Duration : 10 hrs** **Marks : 05**
Benefits	Personal/ Workman - Incentive, Production linked Bonus, Improvement in living standard.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation - How it improves or slows down productivity.
Comparison with Developed Countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, Safe cash handling, Personal risk and insurance.
6. Occupational Safety, Health and Environment Education	**Duration : 15 hrs** **Marks : 06**
Safety & Health	Introduction to occupational safety and health importance of safety and health at workplace.
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygiene, Occupational Diseases/ Disorders & its prevention.
Accident & Safety	Basic principles for protective equipment. Accident prevention techniques - control of accidents and safety measures.
First-Aid	Care of injured & sick at the workplaces, First-Aid &Transportation of sick person.
Basic Provisions	Idea of basic provision legislation of India. Safety, health, welfare under legislative of India.

Ecosystem	Introduction to Environment. Relationship between society and environment, Ecosystem and factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
Energy Conservation	Conservation of energy, re-use and recycle.
Global Warming	Global warming, climate change and Ozone layer depletion.
Ground Water	Hydrological cycle, Ground and surface water, Conservation and Harvesting of water.
Environment	Right attitude towards environment, Maintenance of in-house environment.
7. Labour Welfare Legislation	**Duration : 05 hrs** **Marks : 03**
Welfare Acts	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's Compensation Act.
8. Quality Tools	**Duration : 10 hrs** **Marks : 05**
Quality Consciousness	Meaning of quality, Quality characteristic.
Quality Circles	Definition, Advantage of small group activity, Objectives of quality circle, Roles and function of quality circles in organization, Operation of quality circle. Approaches to starting quality circles, Steps for continuation quality circles.
Quality Management System	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
House Keeping	Purpose of House-keeping, Practice of good housekeeping.
Quality Tools	Basic quality tools with a few examples.

ANNEXURE-I

LIST OF TOOLS AND EQUIPMENT			
MECHANIC AUTO BODY REPAIR (For batch of 16 candidates)			
A. TRAINEES TOOL KIT (For each additional unit trainees tool kit Sl. 1-25 is required additionally)			
S No.	**Name of the Tool &Equipments**	**Specification**	**Quantity (Nos.)**
1.	Allen Key set of 12 pieces	(2 mm to 14 mm)	6
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. INSTRUMENTS AND GENERAL SHOP OUTFIT - For 2 (1+1) units no additional items are required			
TOOLS & EQUIPMENT			
26.	Adjustable spanner	(pipe wrench 350 mm)	2
27.	Air blow gun with standard accessories		1
28.	Air impact wrench with standard accessories		4
29.	Air ratchet with standard accessories		4
30.	Allen Key set of 12 pieces	(2mm to 14mm)	2
31.	Ammeter 300A/ 60A DC with external shunt		5
32.	Angle plate adjustable	250x150x175	1
33.	Angle plate	size 200x100x200mm	2
34.	Anvil 50 Kgs with Stand		1
35.	Battery – charger		2
36.	Blow Lamp 1 litre		2
37.	Caliper inside 15 cm Spring		4
38.	Calipers outside 15 cm spring		4
39.	Car Jet washer with standard accessories		1
40.	Chain Pulley Block-3 ton capacity with tripod stand		1
41.	Chisel 10 cm flat		4
42.	Chisels cross cut	200 mm X 6mm	4
43.	Circlip pliers Expanding and contracting type	15cm and 20cm each	4
44.	Clamps C	100mm	4
45.	Clamps C	150mm	4
46.	Clamps C	200mm	4
47.	Cleaning tray	45x30 cm.	4
48.	Collapsible panel stands		2
49.	Copper bit soldering iron	0.25 Kg	4
50.	Crow bar	910 x25mm	2
51.	Cylinder bore gauge capacity	20 to 160 mm	2
52.	DC Ohmmeter 0 to 300 Ohms, mid scales		2

	at 20 Ohms		
53.	Depth micrometer	0-25mm	4
54.	Dial gauge type 1 Gr. A (complete with clamping devices and stand)		4
55.	Different type of Bumping hammers		1 set
56.	Different type of -body hammers		1 set
57.	Different type of body picks		1 set
58.	Different type of body spoon		1 set
59.	Different type of dolly block		1 set
60.	Different type of finishing hammers		1 set
61.	Different type of pick hammers		1 set
62.	Digital thermometer		2
63.	Dividers 15 cm Spring		4
64.	Door handle tool (clip pullers)		1
65.	Drift Punch Copper	15 cm	4
66.	Drill point angle gauge		1
67.	Drill twist 1.5 mm to 15 mm (various sizes) by 0.5 mm		4
68.	Electric Soldering Iron	230 V 60 watts 230 V 25 watts	2 each
69.	Electric testing screw driver		2
70.	Engineer's square 15 cm. Blade		4
71.	Feeler gauge 20 blades (metric)		2
72.	File flat 20 cm bastard		4
73.	File, half round 20 cm second cut		4
74.	File, Square 20 cm second cut		4
75.	File, Square 30 cm round		4
76.	File, triangular 15 cm second cut		4
77.	Files assorted sizes and types including safe edge file (20 Nos)		2 set
78.	Flat File 25 cm second cut		4
79.	Flat File 35 cm bastard		4
80.	Garage rack		2
81.	Granite surface plate	1600 x 1000 with stand and cover	1
82.	Grease Gun		2

83.	Grip Wrench	200mm	2
84.	Growler		1
85.	Hacksaw frame adjustable	20-30 cm	10
86.	Hammer Ball Peen	0.75 Kg	2
87.	Hammer Chipping	0.25 Kg	5
88.	Hammer copper	1 Kg with handle	4
89.	Hammer Mallet		4
90.	Hammer Plastic		4
91.	Hand operated crimping tool	(i) for crimping up to 4mm and (ii) for crimping up to 10mm	2
92.	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
93.	Hand Shear Universal	250mm	2
94.	Hand vice	37 mm	2
95.	Hollow Punch set of seven pieces	6mm to 15mm	2 sets each
96.	Insulated Screw driver	20 cm x 9mm blade	4
97.	Insulated Screw driver	30 cm x 9mm blade	4
98.	Interchangeable driver set		1 set
99.	Lead light		2
100.	Left cut snips	250mm	4
101.	Lifting jack screw type	3 ton capacity	4
102.	Magneto spanner set with 8 spanners		1 set
103.	Magnifying glass	75mm	2
104.	Marking out table	90X60X90 cm.	1
105.	Multimeter digital		5
106.	Oil can 0.5/0.25 liter capacity		2
107.	Oil Stone	15 cm x 5 cm x 2.5 cm	1
108.	Outside micrometer	0 to 25 mm	4
109.	Outside micrometer	25 to 50 mm	4
110.	Outside micrometer	50 to 75 mm	1
111.	Outside micrometer	75 to 100 mm	1
112.	Panel assembly hold/support arms		2

113.	Panel cutter (two-way nibbler)		1
114.	Philips Screw Driver set of 5 pieces	100 mm to 300 mm	2 sets
115.	Pipe cutting tool		2
116.	Pipe flaring tool		2
117.	plastic feeler gauges		2
118.	Pliers combination	20 cm.	2
119.	Pliers flat nose	15 cm	2
120.	Pliers round nose	15 cm	2
121.	Pliers side cutting	15 cm	2
122.	Portable electric drill Machine		1
123.	Prick Punch	15 cm	4
124.	Punch Letter 4mm (Number)		2 set
125.	Right cut snips	250 mm	4
126.	Rivet sets snap and Dolly combined	3mm, 4mm, 6mm	4
127.	Scraper flat	25 cm	2
128.	Scraper half round	25 cm	4
129.	Scraper Triangular	25 cm	4
130.	Scriber	15 cm	4
131.	Scriber with scribing black universal		2
132.	Set of stock and dies - Metric		2 sets
133.	Shear Tin Man's	450 mm x 600mm	4
134.	Sheet metal cutting pliers-left , right hand and straight -jaw		1 set
135.	Sheet Metal Gauge		2
136.	Sher Tinmans	300 mm	4
137.	Soldering Copper Hatchet type	500gms	4
138.	Solid Parallels in pairs (Different size) in Metric		2
139.	Spanner Clyburn	15 cm	1
140.	Spanner D.E. set of 12 pieces	6 mm to 3 2mm	4
141.	Spanner T. flocks for screwing up and up-screwing inaccessible		2
142.	Spanner, adjustable	15 cm	2
143.	Spanner, ring set of 12 metric sizes	6 to 32 mm	2

144.	Spanners socket with speed handle, T-bar, ratchet.		2
145.	Spark lighter		2
146.	Spark plug spanner	14mm x 18mm x Size	2
147.	Spirit level	2 V 250, 05 meter	2
148.	Steel measuring tape	10 meter in a case	4
149.	Steel rule 15 cm inch and metric		4
150.	Steel rule 30 cm inch and metric		4
151.	Steel wire Brush	50mmx150mm	4
152.	Straight edge gauge	2 ft.	2
153.	Straight edge gauge	4 ft.	2
154.	Stud extractor set of 3		2 sets
155.	Stud remover with socket handle		1
156.	Suction cup		2
157.	Surface gauge with dial test indicator plunger type i.e. 0.01 mm		2
158.	Taps and Dies complete sets	5 types	1 set
159.	Taps and wrenches - Metric		2 sets
160.	Telescope gauge		4
161.	Thread pitch gauge metric, BSW		1
162.	Torque wrenches	5-35 Nm, 12-68 Nm & 50-225 Nm	1 each
163.	Trammel	30 cm	2
164.	Trim and upholstery tools		1 set
165.	Tyre pressure gauge with holding nipple		2
166.	Universal puller for removing pulleys, bearings		1
167.	V' Block 75 x 38 mm pair with Clamps		2
168.	Vacuum gauge to read	0 to 760 mm of Hg.	2
169.	vernier caliper	0-300 mm with least count 0.02mm	4
170.	Vice grip pliers		2
171.	Voltmeter	50V/DC	5
172.	Wire Gauge (metric)		5
173.	Work bench	250 x 120 x 60 cm with 4 vices 12cm Jaw	4

C. GENERAL INSTALLATION/ MACHINERIES			
174.	Angle grinder (10-12 cm) - for cutting and grinding		2
175.	Arbor press hand operated	2 ton capacity	1
176.	Belt sander (Narrow surface)		2
177.	Bench lever shears	250 mm Blade x 3mm Capacity	1
178.	Body measurement tools- Gunsight, trammel gauge, 2 m straight edge & Measuring tape		2 each
179.	Body repair hand tools - Various hammers, dollies, spoons, files, line chisel, hacksaw, clamps, & sanding blocks		2 each
180.	Body shell - Light Motor vehicle of different Manufactures		4
181.	Bonded auto glass removal & replacement tools		2
182.	Caulking / panel seam sealer / panel adhesive application gun		2
183.	Chassis alignment equipment (incorporating measurement system)		1
184.	Compressed air line -10m (on retractable reel, with high flow connectors) with FRL unit		2
185.	Die Grinding kit		2
186.	Disc sander	18 cm	2
187.	Discrete Component Trainer / Basic Electronics Trainer		1
188.	Drilling machine bench to drill up to 12mm dia along with accessories		1
189.	Dual Magnetization Yoke	AC / HWDC, 230 VAC, 50Hz	1 set
190.	Dust extraction connections (Vacuum)		2
191.	Electronic heat shrinking equipment (carbon rod, induction or copper		1
192.	Gas Welding Table	1220mm x760mm	1
193.	Grinding machine (general purpose) D.E. pedestal with 300 mm dia wheels rough and smooth		1
194.	Hydraulic jack HI-LIFT type -	3 ton capacity, 5 ton	1each

		capacity	
195.	Infrared drying lamp unit		1
196.	Liquid penetrant Inspection kit		1 set
197.	MIG welding machine complete set 400Amps		2
198.	Motor Vehicle suitable for Body shop repair -Light Motor vehicle of different Manufactures		2
199.	Oxy-acetylene welding equipment with complete accessories (Low & high)		2
200.	PipeBending Machine (Hydraulic type)	12mm to 30mm	1
201.	Plasma cutter		1
202.	Pneumatic rivet gun		2
203.	Power hacksaw kit		2
204.	Random /dual action orbital sander	12-15 cm	2
205.	Spot weld cutter- Drill type, Hole saw type		1
206.	Spot weld removal kit / drill along with accessories		2
207.	Spot welder (single and double sided)		2
208.	Tin smiths bench folder	600 x 1.6mm	1
209.	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
210.	Weld through primer application equipment		2
211.	Welding plant Oxy-Acetylene complete (high pressure)		2
212.	Welding Transformer	200 to 400 Amps	2
213.	Weld-on pin/ ring panel puller kit		2
D. CONSUMABLE			
214.	Chalk, Prussian blue.		As required
215.	Chemical compound for fasteners		As required
216.	Diesel		As required
217.	Different type gasket material		As required
218.	Drill Twist (assorted)		As required

219.	Emery paper -	36-60 grit , 80-120	As required
220.	Hacksaw blade (consumable)		As required
221.	Holders, lamp teakwood boards, plug sockets,		As required
222.	Safety glasses		As required
223.	Steel wire Brush	50mmx150mm	As required
224.	Gloves for Welding (Leather and Asbestos)		As required
WORKSHOP FURNITURE			
225.	Book shelf (glass panel)	6V2' x 3' x I V 2'	As required
226.	Computer Chair		1+1
227.	Computer Table		1+1
228.	Desktop computer and related MS office software		1+1
229.	Discussion Table	8' x 4' x 2½ '	2
230.	Fire Extinguishers. first- aid box		As required
231.	Instructional Material - NIMI Books/Ref.books		As required
232.	Internet connection with all accessories		As required
233.	Laser printer		1
234.	LCD projector/ LED /LCD TV	42"	1
235.	Multimedia DVD for Automotive		As required
236.	application/subjects		
237.	Online UPS 2KVA		1
238.	Stools		21
239.	Storage Rack	6½ ' x 3' x W2	As required
240.	Storage shelf	6% ' x 3' x 1%'	As required.
241.	Suitable class room furniture		As required
242.	Suitable Work Tables with vices		As required
243.	Tool Cabinet -	6% ' x 3' x 1%'	2
244.	Trainees locker	6% ' x 3' x 1%'	2 Nos. to accommodate 20 Lockers

TOOLS & EQUIPMENTS FOR EMPLOYABILITY SKILLS		
Sl. No.	**Name of the Equipment**	**Quantity**
1.	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 Nos.
2.	UPS - 500VA	10 Nos.
3.	Scanner cum Printer	1 No.
4.	Computer Tables	10 Nos.
5.	Computer Chairs	20 Nos.
6.	LCD Projector	1 No.
7.	White Board 1200mm x 900mm	1 No.
Note: - Above Tools & Equipments not required, if Computer LAB is available in the institute.		

ANNEXURE-II

FORMAT FOR INTERNAL ASSESSMENT

Name & Address of the Assessor:		**Year of Enrollment:**
Name & Address of ITI (Govt./Pvt.):		**Date of Assessment:**
Name & Address of the Industry:		**Assessment location: Industry/ ITI**
Trade Name:	**Semester:**	**Duration of the Trade/course:**
Learning Outcome:		

S No.	**Candidate Name**	**Father's/Mother's Name**	Safety Consciousness (15)	Workplace Hygiene (5)	Attendance/ Punctuality (10)	Ability to Follow Manuals/ Written Instructions (5)	Application of Knowledge (10)	Skills to Handle Tools & Equipment (10)	Economical Use of Materials (5)	Speed in Doing Work (10)	Quality in Workmanship (15)	VIVA (15)	**Total Internal Assessment Marks**	**Result (Y/N)**
Maximum Marks (Total 100 Marks)			**15**	**5**	**10**	**5**	**10**	**10**	**5**	**10**	**15**	**15**		
1														
2														