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

COMPETENCY BASED CURRICULUM

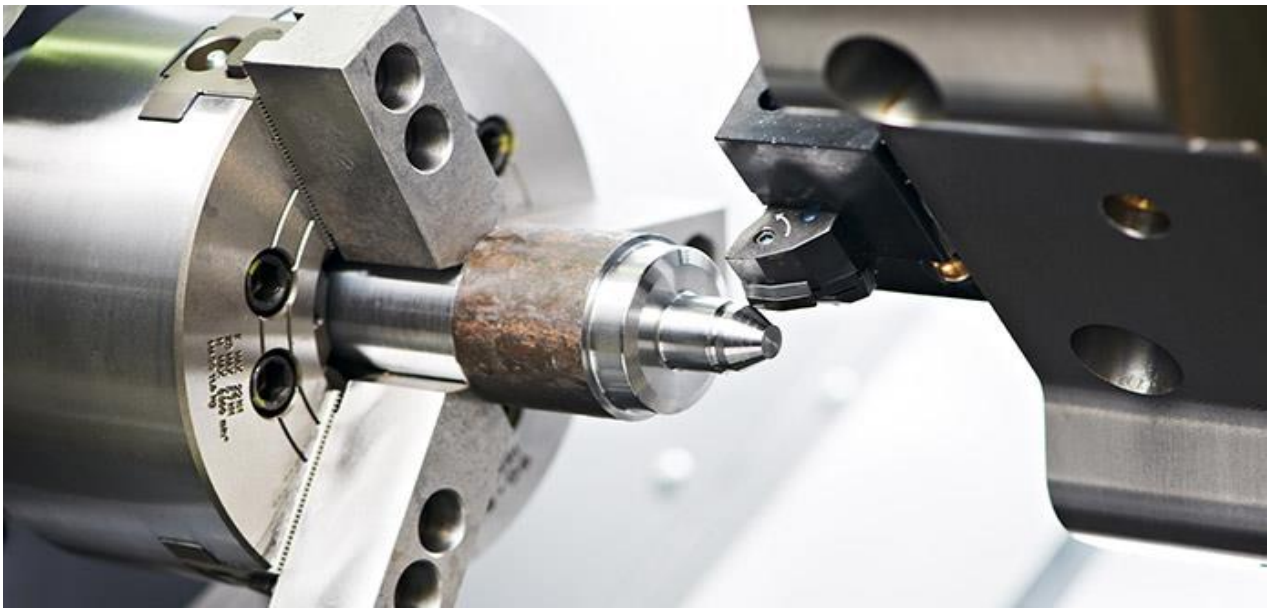
AUTOMOTIVE MANUFACTURING

(Duration: Two Years)

CRAFTSMEN TRAINING SCHEME (CTS)

(Flexi MoU)

NSQF LEVEL- 5



SECTOR – CAPITAL GOODS & MANUFACTURING

Directorate General of Training

Skill India
कौशल भारत - कुशल भारत

AUTOMOTIVE MANUFACTURING

(Engineering Trade)

(Revised in 2019)

Version: 1.1

CRAFTSMEN TRAINING SCHEME (CTS)

(Flexi MoU)

NSQF LEVEL - 5

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE

EN-81, Sector-V, Salt Lake City,
Kolkata – 700 091
www.cstaricalcutta.gov.in

CONTENTS

1. COURSE INFORMATION

Flexi- MoUis one of the pioneer programmes under DGT on the basis of the MoU in between DGT & Maruti Suzuki India Limited for propagating vocational training to allow industries to take advantage of various schemes for conducting training programme in higher employment potential courses according to needs of industries. The concept of Flexi- MoUs was introduced in June-July 2014. DGT and Maruti Suzuki India Limited have decided to sign this memorandum of understanding to provide an opportunity to the youth to acquire skills related to Automobile and Manufacturing industry through specially designed "Learn and Earn" approach consisting a mix of theoretical and On-the-Job Training (OJT) components and hence improve their employability potential& to contribute in the overall growth of Automobile and manufacturing industry by creating a pool of skilled resources.

During the two-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 practical skills are imparted in simple to complex manner & simultaneously theory subject is taught in the same fashion to apply cognitive knowledge while executing task.

The content broadly covers skills in manufacturing process of automobiles components and automobiles in today's automobile industry. The year wise course coverage is categorized as below:

FIRST YEAR - In the first year, the contents covered are safety aspects related to trade, familiarization with automobile systems and components, vehicle engine components, and basic automobile manufacturing process such as basic fitting operation (marking, filling, sawing, chiseling, drilling tapping & grinding), basic brazing/welding operation using Gas, MIG& ERW (but joint, lap joint, T-joint), basic blanking & stamping operations (sheet metal work), basic surface preparation painting work, basic vehicle assembly and basic vehicle inspection & testing process. This year also covers practical training starting with practice with tools & measuring instruments viz. Vernier calliper, micrometer, height gauge, dial gauge, slip gauge, feeler gauge, go-no go gauges etc. This is followed by on job training in practice in press shop (blanking & stamping), fabrication & weld shop, paint shop, casting, machine shop, and different assembly lines including line inspection and final testing.

SECOND YEAR - In this year, the job covers installation of vehicle interior components and assembling engine, power train components, suspension and brake assembly. This is followed by installation of Final line assembly and under body components. The final year course also covers automobile pollution, testing and measures to control vehicular pollution, function of automation in manufacturing & automation components. Trainer also learns the Quality control and inspection & testing process in an automobile company which includes on-line stage inspection to final inspection & testing of completely assembled vehicles.

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 economy/ Labour market. DGT is futuristic in preparing the prospective Indian workforce in building skills and capabilities as per the needs of the industry. In this quest, it has changed the paradigm of growth to a job oriented growth by partnering with industry to be an enabler of responsible, sustainable and inclusive growth. Towards this end, DGT signed this MoU with the Maruti Suzuki India Limited.

Maruti Suzuki India Limited shall conduct courses pan-India locations leveraging the facilities and services available at ITIs, regional training centers, training centers of training partners, vendors and dealers associated with Maruti Suzuki. Maruti Suzuki will ensure that not less than 50% of trainees are placed with Maruti Suzuki or its business partners for not less than six month duration. It will also ensure the eligible trainees take up Apprenticeship / higher education in suitable streams and shall also guide the students to become Entrepreneurs. Maruti Suzuki India Limited will strictly follow the policy guidelines for Flexi - MoU as in place from time to time. No deviation for the same would be permitted. Every Alternate Month Admission and Exam for trades run under Flexi MoU at training locations of Maruti. Theory content to be 30% and practical content to be 70%.

Broadly candidates need to demonstrate that they are able to:

- Read & interpret technical parameters/documentation, plan and organize work processes, 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 and maintenance work.
- Check the task/job for functioning, identify and rectify errors in task/job.
- Document the technical parameters related to the task undertaken.

2.2 PROGRESSION PATHWAYS

- Can take admission in diploma course in notified branches of Engineering by lateral entry.
- 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 two years:

S No.	Course Element	Notional Training Hours
1	Professional Skill (Trade Practical)	2944
2	Professional Knowledge (Trade Theory)	552
3	Workshop Calculation & Science	160
4	Engineering Drawing	160
5	Employability Skills	240
6	Revision & Project work	92
7	Examination	252
	Total	**4400**

2.4 ASSESSMENT & CERTIFICATION

I. Conducting training of selected candidates is the sole responsibility ofIndustrial Training Partner (ITP).

II. Assessment will be jointly done by ITP and DGT. Practical and formative assessment shall be conducted by ITP, and Computer Based theoretical exams shall be conducted by DGT.

III. ITP must refer to the latest examination reform guidelines issued by DGT dated 4thOctober 2018 any changes or revisions to the same shall be applicable to flexi-MoU scheme.

IV. Maximum attempts for clearing the exam and obtaining NTC shall be in line with CTS.

V. For practical examination and formative assessment, ITP has been given flexibility to design the questions, assess the candidates and upload their marks in the scheme portal.

VI. ITP shall develop a comprehensive Question Bank (in English and Hindi) of minimum 1000 questions, grouped by chapters and difficulty level. The same shall be vetted by NIMI experts and then be handed over to DGT for conducting theory exams. DGT may add some questions to the same before conducting actual exams.

VII. Theoretical exams shall be conducted by DGT in Computer Based Test format. Upon completion of course and payment of requisite examination fee by ITP, admit cards shall be generated by scheme portal.

VIII. DGT shall arrange for conduct of computer based theory exam at designated examination centres & certify the successful trainees with e-NTC under flexi-MoU scheme with mention of ITP name in the Certificate.

IX. Students, who have successfully appeared in the final exam after completion of course, are eligible to register as apprentices.

The trainee will be tested for his skill, knowledge and attitude during the period of the course and at the end of the training program as notified by the Government of India (GoI) from time to time. The employability skills will be tested in the first year itself.

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 has to maintain an individual trainee portfolio as detailed in assessment guideline. The marks of internal assessment will be as per the template (Annexure –II).

The learning outcome and assessment criteria will be the basis for setting question papers for final assessment. The examiner during final examination will also check the individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

The minimum pass percentage for practical is 60% & minimum pass percentage of theory subjects is 33%.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking the assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the 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 and records of internal (Formative) assessments are to be preserved until forthcoming examination for audit and verification by examination body. The following marking pattern to be adopted 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 should produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and due regard for safety procedures and practices	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. • 60-70% accuracy achieved while undertaking different work with those demanded by the component/job. • A fairly good level of neatness and consistency in the finish. • Occasional support in completing the project/job.
(b) Weightage in the range of 75%-90% to be allotted during assessment	
For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and practices	• Good skill levels in the use of hand tools, machine tools and workshop equipment. • 70-80% accuracy achieved while undertaking different work with those demanded by the component/job. • A good level of neatness and consistency in the finish. • Little support in completing the project/job.
(c) Weightage in the range of more than 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% accuracy achieved while undertaking different work with those demanded by the component/job. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Mechanical Sub-Assembly Technician; Mechanical Sub-Assembly Technician assembles together the mechanical subsystems. The individual at work is responsible for assembling mechanical modules from moulded, welded or forged components to produce the final mechanical sub assembly of the product.

Assembler, Automobile; Assembler (Automobile) assembles different parts and units of automobile, installs them on frame and makes necessary connections, adjustment, settings etc. according to specifications. Assembles engine, gear box, front and rear axles etc. individually according to specifications and ensures their stipulated performance. Places body frames, side members, supporting frames etc. in special jigs and secures them tightly by fixing bolts and nuts to different parts. Assists Spot Welder to spot weld body frame. Fits front and rear axle to body and tightens with nuts and bolts. Collects various components and parts from subassembly or from nearby bins and fits them to body or chassis as appropriate. Lifts assembled engine manually or using hoisting equipment carefully, places it over engine frame of chassis and securesit in position with bolts and nuts. Fits clutch, gear box propeller shaft, etc. and makes necessary settings and adjustments. Gathers such parts like radiator, alternator, water pump, hydraulic/vacuum brakes etc. from nearby sub-assembly line and fits them to vehicle. Makes necessary adjustments, connections and alterations to fittings as directed. Checks for wheel alignment using special equipment and makes necessary adjustments to brakes. Delivers assembled vehicle to trim line for fitting of upholstery, door and window glasses, door locks and other fittings. Lubricates various moving parts of vehicle with grease or oil. May assemble only engine, gear boxes, axles, hydraulic brake system etc. in sub-assembly line and be designated accordingly.

Assembler, Stationary Petrol Engine; Assembler, Stationary Petrol Engine assembles stationary petrol engine with finished components, tunes engine and tests performance. Checks condition and cleaning of various engine parts such as crankshaft, camshaft, connecting rod, pistons, tappets, valves, valve guides, spring etc. and measures appropriate parts to assess serviceability, reconditioning or replacement as necessary. Scrapes bearings, grinds valves, files piston rings, assembles pistons with connecting rods and fits camshaft, crankshaft, fly wheel, cylinder block, piston assemblies, valves etc. according to design in order of sequence using hoisting device, stand, special tools and other implements ensuring necessary movement and clearances as specified. Sets valve timing, meshes timing wheels on cam and crankshafts and fastens cylinder head with gasket on cylinder block. Assembles and fits fuel pumps lubrication and fuel pipes, sparking plugs etc. Fits distributor according to ignition timing and makes electrical connections with battery, ignition coil, plugs cut out, etc. Fits radiator, fan pulleys, water pump, etc. Sets tappets and starts engine. Tunes engine and runs it for prescribed number of hours. May test engine horse power, solder nipples, anneal pipes etc. May suggest alterations in fittings.

Assembler, Stationary Diesel Engine; Assembler, Stationary Diesel Engine assembles stationary diesel engine from finished components, makes adjustments, sets alignments, clearances etc. and ensures stipulated performance. Places diesel engine block on jig or other fixture using hoisting equipment. Fits or assembles various parts to engine block such as crank shaft, cam shaft, main

bearing, connecting rods, timing gears pistons, fuel pump, atomiser, automatic timing mechanism, exhaust manifold suspension, etc. using spanners, wrenches, screw drivers and other special tools and devices. Collects various parts like nuts, bolts, washers etc. from nearby bins and fits or screws them to cylinder head. Checks assembled units or parts at every stage for prescribed accuracy, alignment, tolerance etc. using special tools. Records part number fitted or assembled to engine block and notes factual details or position regarding clearances, adjustments etc. made. Assembles other sub-assemblies like starter, alternator timing chain, heater assembly switch, radiator etc. Places assembled engine at central places for engine test. May conduct engine test on dynamo meter and note actual tuning conditions and make necessary adjustments. May overhaul and repair engines or other components.

Assembler, Electrical Accessories; Assembler, Electrical Accessories assembles mechanical parts of electrical equipment, such as light sockets, switches, terminal boards, and plugging devices: Fits together parts, such as socket bases, shafts, contact fingers, and springs, in specified sequence, using fixtures, screwdrivers, and air nut runners. Tests actions of moving parts and listens for unusual sounds to detect defective parts for faulty operation. Verifies completed assembly against pictorial drawings.

CNC Operator - Machining Technician; CNC Operator-Machining Technician sets up base level operations of different machine tools and same can be performed both manually and through automatic machines/robots. Machining Technician Level 3 is often called Assistant Machinist, Junior Machinist, Lathe Operator, Apprentice Machinist, Semi-Skilled Operator. This role primarily involves supporting the Machine Operator in all pre machining activities, machining of the actual part, ad hoc repair work like in auto service stations, gauging, deburring and inspection activities.

Fitter General; Fitter General sizes metal parts to close tolerances and fits and assembles them using hand tools for production or repairs of machines, or other metal products. Studies drawings to understand specification of different parts, fittings or assembles to be made and their functions. Cuts and shapes required parts dimensions and specifications by processes of sawing, clipping, filing, grinding, drilling holes, screw cutting, scrapping etc., Assembles parts by riveting, screwing, pinning etc. So as to make complete unit according to drawing. Dismantles or removes worn out, broken or defective parts using hand tools and replaces them by repaired or new ones. Tests completed article to ensure correct performance. May do simple turning, planning and shaping of parts on machines and perform welding, brazing, annealing, hardening, tempering and, like operations. May specialize in particular type of machine or product and be designated accordingly. May suggest alterations

In summary the Automotive Manufacturing Technician will be part of the team of manufacturing technicians of four wheelers in a vehicle manufacturing plant or in other manufacturing industry and performing jobs viz. Fitting, Welding, Sheet metal Forming, CNC machine operating, Painting, and Assembling electrical and mechanical components using appropriate hand & power tools to produce a vehicle.

Reference NCO-2015:

a) 8211.0101 - Mechanical Sub-Assembly Technician

b) 8211.1200 - Assembler, Automobile
c) 8211.0500 - Assembler, Stationary Petrol Engine
d) 8211.0600 - Assembler, Stationary Diesel Engine
e) 8212.0400 - Assembler, Electrical Accessories
f) 7223.5002 - CNC Operator –Machining Technician
g) 7233.0100 – Fitter General

4. GENERAL INFORMATION

Name of the Trade	**Automotive Manufacturing (Flexi MoU)**
NCO - 2015	8211.0101, 8211.1200, 8211.0500, 8211.0600, 8212.0400,7223.5002
NSQF Level	Level-5
Duration of Craftsmen Training	Two years
Entry Qualification	Passed 10th Class Examination or its equivalent
Unit Strength (No. Of Student)	20
Space Norms	192 Sq. m.
Power Norms	17 KW
Instructors Qualification for	
1. Automotive Manufacturing Trade	B.Voc/ Degree in Automobile / Mechanical Engg. (with specialization in Automobile) from AICTE/ UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 3 years Diploma in Automobile/ Mechanical (specialization in automobile) from AICTE recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/NAC in the Trade of "Automotive Manufacturing" with 3 years' experience in the relevant field. **Essential Qualification:** Relevant National Craft Instructor Certificate (NCIC) in any of the variants under DGT. ***NOTE: - Out of two Instructors required for the unit of 2 (1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However, both of them must possess NCIC in any of its variants.***
2. Workshop Calculation & Science	B.Voc/Degree in Engineering from AICTE/ UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 3 years Diploma in Engineering from AICTE /recognized board

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

List of Tools and Equipment	As per Annexure – I

Distribution of training on Hourly basis: (Indicative only)

Year	Total Hours/Week	Trade Practical	Trade Theory	Workshop Cal. &Sc.	Engineering Drawing	Employability Skills
1st	48 Hours	32 Hours	8 Hours	2 Hours	2 Hours	4 Hours
2nd	48 Hours	32 Hours	10 Hours	2 Hours	2 Hours	2 Hours

5. NSQF LEVEL COMPLIANCE

NSQF level for **Automotive Manufacturing** trade CTS (Flexi MoU): **Level-5.**

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
e. Responsibility

The broad learning outcome of **Automotive Manufacturing** trade under CTS (Flexi MoU) mostly matches with the Level descriptor at Level- 5.

The NSQF Level-5 descriptor is given below:

Level	Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility
Level 5	Job that requires well developed skill, with clear choice of procedures in familiar context.	Knowledge of facts, principles, processes and general concepts, in a field of Work or study.	A range of cognitive and practical skills required to accomplish tasks and solve problem by selecting and applying basic methods, tools, materials and information.	Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication.	Responsibility for own work and learning and some responsibility for other's works and learning.

6. LEARNING 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 OUTCOMES

1. Recognize & comply general safe working practices, environment regulation and housekeeping.
2. Explain & perform 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, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]*
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, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Sectional views, Estimation of material, Electrical & electronic symbol]*
4. Select and ascertain measuring instrument 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 organize the work related to the occupation.

6.2 SPECIFIC LEARNING OUTCOMES

FIRST YEAR

9. Recognize & comply Health, Safety & Environment practices in a vehicle manufacturing plant.
10. Identify & explain about automobile industry in India, different types of vehicles, vehicle Id. Nos. of different components of vehicles, and perform on job training in various shops & conveyor systems.
11. Explain, perform & maintain hand & power tools and equipment used in a workshop & vehicle manufacturing plant and develop skills to assemble components using fasteners on conveyor line.

12. Recognize vehicle body parts & components, their functions and assembles components on actual manufacturing lines.
13. Explain elements of vehicle manufacturing process and perform to make components in Blanking & Stamping shop, Casting and Machine shop.
14. Plan & organize to perform arc, gas and Electric resistance (ER) welding and conduct inspection of weld joints to find welding defects.
15. Plan & organize to perform surface preparation & painting, check dry film thickness (DFT) using Elcometer and analyse painting defects.
16. Plan & prepare for assembling vehicle components and perform components assembly work in different assembly processes.

SECOND YEAR

17. Plan & organize work and assemble vehicle interior components viz. electrical harness, internal wiring, dash board, instruments, switches, seats, fire wall, ducts, headliner, weather strip, shock absorbers etc. on different type of conveyor system lines.
18. Explain and perform installation of power train, suspension and brake system components using appropriate hand & power tools.
19. Plan & organize to perform work and assemble Final line assembly components on vehicle viz. Rear pillar trim, trunk lid latch, radiator, hoses, seat belt, steering shaft, air conditioning system, parking brake, glove box, , garnish, battery cable, silencer, front grille, moulding, console box, head & back lights, turn signals, front & rear glass, etc. using appropriate hand & power tools.
20. Select proper tools and Explain & perform installation of electrical and electronics components in vehicle. Check functionality after installation and recognize the function of automation in vehicle assemble and material handling
21. Recognise the harmful effect of pollution in general & pollution generated by automobiles. Explain & assemble the components designed to control pollution in vehicle, like ECM and Catalytic convertor. Conduct Emission test as per standard procedure.
22. Explain & perform different types of quality control & inspection tests on assembly line and tester line and conduct final inspection & testing.

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING OUTCOMES	
LEARNING OUTCOMES	**ASSESSMENT CRITERIA**
1. Recognize & comply with general 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 of 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 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 and 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. Explain & perform different mathematical calculation &	2.1 Explain concept of basic science related to the field such as Material science, Mass, weight, density, speed,

science in the field of study including basic electrical and apply in day-to-day work.*[Different mathematical calculation & science-Work, Power &Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]*	velocity, heat & temperature, force, motion, pressure, heat treatment, center of gravity, friction.
	2.2 Measure dimensions as per drawing.
	2.3 Use scale/ tapes to measure for fitting to specification.
	2.4 Comply with 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, scales, Different Projections, Machined components & different thread forms, 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 machining/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 ascertain measuring instrument and measure dimension of components and record data.	4.1 Select appropriate measuring instruments such as micrometers, verniercallipers, dial gauge, bevel protector and height gauge, feeler gauge (as per tool list).
	4.2 Ascertain the functionality & correctness of the instrument.
	4.3 Measure dimension of the components & record data to analyse with the 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	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.

productivity & quality.	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, and pollution and utilize the available resources 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 familiarize with the Policies/Programmes, procedure and the available scheme.
	7.3 Prepare project report to become an entrepreneur for submission to financial institutions.
8. Plan and organize 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 Assign roles and responsibilities of the co-trainees for execution of the task effectively and monitor the same.

SPECIFIC LEARNING OUTCOMES	
LEARNING OUTCOMES	**ASSESSMENT CRITERIA**
FIRST YEAR	
9. Recognize & comply Health, Safety & Environment practices in a vehicle manufacturing plant.	9.1 Practice and understand precautions to be followed while working in assembly line.
	9.2 Safe use of equipment generally used in assembly line with operating standard.
	9.3 Understand class of fire and be able to operate fire extinguishers.
	9.4 Practical use and understanding of PPEs.
10. Identify & explain about automobile industry in India, different types of vehicles, vehicle Id. Nos. of different components of vehicles, and perform on job training in various shops & conveyor systems.	10.1 Identification of different types of vehicle.
	10.2 Identification of Vehicle Identification Number, Chassis No. &Engine no.
	10.3 Identification of different types of vehicle and engine components.
	10.4 Plant and personal safety demonstration.
	10.5 Familiarization with different components in the vehicle
	10.6 On the job training in various production shops to get acquainted to the vehicle manufacturing process
	10.7 Hands on training on conveyor line and sub assembly.
11 Explain, perform & maintain hand & power tools and equipment used in a workshop & vehicle manufacturing plant and develop skills to assemble components using fasteners on conveyor line.	11.1 Working with tools used in vehicle assembly.
	11.2 Use of Vernier Calliper,Micrometer and height gauge
	11.3 Working with Electric &pneumatic powered tools.
	11.4 Working with hand drill, hammers, punches and chisel.
	11.5 Working with files, drill, reamer and tap.
	11.6 Using wrench, screwdriver and pliers.
	11.7 Use of Allen key.
	11.8 Understanding of types and sizes of fasteners and picking of defined number of fasteners.
	11.9 Gap setting and checking with feeler Gauge.
	11.10 Operating of spot welding guns and other welding machines.
	11.11 Practice on different types of Conveyor
12 Recognize vehicle body parts & components, their functions and assemble	12.1 On the job training on the actual manufacturing lines and identifying various components their function assembly and fitment procedure.

	components on actual manufacturing lines.		
13	Explain elements of vehicle manufacturing process and perform to make components in Blanking &Stamping shop, Casting and Machine shop.	13.1	Blanking and stamping shops.
		13.2	Casting shop.
		13.3	Machine shop.
		13.4	Engine assembly shop.
		13.5	Conveyors.
		13.6	Spot welding guns.
		13.7	Pneumatic tools.
		13.8	Electric tools.
		13.9	Sealant application gun.
		13.10	Special tools and equipment.
14	Plan & organize to perform arc, gas and Electric resistance (ER) welding and conduct inspection of weld joints to find welding defects.	14.1	Basic understanding of automotive welding process.
		14.2	Carry out welding training and understanding of different types of welding
		14.3	Inspect welding joints using visual, DP & MP tests
15	Plan & organize to perform surface preparation & painting, check dry film thickness (DFT) using Elcometer and analyse painting defects.	15.1	Paint MS sheet panels following the correct painting procedure i.e. Surface preparation, primer, intermediate coat & final coat.
		15.2	Inspect the painted panel note down the defects
		15.3	Take painted surface DFT at various locations using Elcometer.
16	Plan & prepare for assembling vehicle components and perform components assembly work in different assembly processes.	16.1	Basic understanding of automotive Assembly process in plant.
		16.2	Hands On training on different Assembly processes in workshop
SECOND YEAR			
17	Plan & organize work and assemble vehicle interior components viz. electrical harness, internal wiring, dash board, instruments, switches, seats, fire wall, ducts, headliner, weather strip, shock absorbers etc. on	Installation of following components in the vehicle.	
		17.1	Harness & controls and other electrical items viz. Junction box, Switches, Relays, Dash board instruments and complete all internal wiring.
		17.2	Pedal Assembly.
		17.3	Insulator or Fire wall
		17.4	Air duct, heater duct, heater.
		17.5	Head liner.

different type of conveyor system lines.	17.6 Weather-strip, 17.7 Horn 17.8 Stop switch 17.9 Front/ rear shock absorber, shift cable 17.10 Washer tank 17.11 Front/ rear seat belt 17.12 Installation of components in the vehicle along with familiarization of tools conveyor system and automation.
18. Explain and perform installation of power train, suspension and brake system components using appropriate hand & power tools.	Installation of following components in the vehicle 18.1 Brake tube 18.2 Filler neck. 18.3 Fuel pipe, fuel tank, canister. 18.4 Rear axle, stabilizer bar 18.5 Knuckle, tie rod 18.6 Exhaust System 18.7 Tire 18.8 Front/rear seat 18.9 Front/ rear bumper 18.10 Familiarization of tools, conveyor systems and automation
19. Plan & organize to perform work and assemble Final line assembly components on vehicle viz. Rear pillar trim, trunk lid latch, radiator, hoses, seat belt, steering shaft, air conditioning system, parking brake, glove box, , garnish, battery cable, silencer, front grille, moulding, console box, head & back lights, turn signals, front & rear glass, etc. using appropriate hand & power tools.	Installation of following components in the vehicle 19.1 Rear pillar trim, trunk lid latch. 19.2 Console bracket, carpet, trunk room trim. 19.3 License plate lamp, radiator, hose 19.4 Seat belt, centre pillar trim 19.5 Heat hose, steering shaft 19.6 Air-conditioner components, A/c gas 19.7 Parking brake, garnish 19.8 Glove box, battery tray, seat belt, anchor cover, garnish 19.9 Rear combination lamp, sun visor 19.10 Air cleaner, front/rear seat 19.11 Battery cable, silencer 19.12 Front grille, drip moulding 19.13 Front turn signal lamp, console box

	19.14	Front/rear glass, roof moulding
	19.15	Combination meter
	19.16	Familiarization of tools, conveyor systems and automation
20 Select proper tools and Explain & perform installation of electrical and electronics components in vehicle. Check functionality after installation and recognize the function of automation in vehicle assemble and material handling.	20.1	Installation of electrical components in vehicleassembly line.
	20.2	Installation of electronic components invehicle assembly line.
	20.3	Function of automation equipment in vehicle assembly line.
	20.4	Function of automation equipment in material handling.
	20.5	Function of automation equipment in testing.
21 Recognise the harmful effect of pollution in general & pollution generated by automobiles. Explain & assemble the components designed to control pollution in vehicle, like ECM and Catalytic convertor. Conduct Emission test as per standard procedure.	21.1	Installation of components in the vehiclealong with familiarisation of tools, conveyor systems and automation.
	21.2	Electronic control systems.
	21.3	Catalytic convertors.
	21.4	Measurement techniques and hands on training on measurement.
	21.5	Emission standards & Test procedures.
22 Explain & perform different types of quality control & inspection tests on assembly line and tester line and conduct final inspection & testing.	22.1	Vehicle testing on plant tester line.
	22.2	Wheel alignment.
	22.3	Toe in adjustment.
	22.4	Head lamp beam adjustment.
	22.5	Drum test.
	22.6	Brake test.
	22.7	Emission test.
	22.8	Shower test.
	22.9	Road test.
	22.10	Final Inspection.
	22.11	ID plate punching.

8. SYLLABUS

SYLLABUS – AUTOMOTIVE MANUFACTURING			
FIRST YEAR			
Week No.	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
1	Recognize & comply safe working practices, environment regulation and housekeeping.	**Workshop Safety (32hrs)** 1. Importance of trade training, List of tools &Machinery used in the trade. 2. Safety attitude development of the trainee by educating them to use Personal Protective Equipment (PPE). 3. First Aid Method and basic training. 4. Safe disposal of waste materials like cotton waste, metal chips/burrs etc. 5. Hazard identification and avoidance. 6. Safety signs for Danger, Warning, caution & personal safety message. 7. Preventive measures for electrical accidents & steps to be taken in such accidents. 8. Use of Fire extinguishers. 9. Practice and understand precautions to be followed while working in fitting jobs. 10. Safe use of tools and equipment used in the trade.	**Workshop Safety (6hrs)** 1. All necessary guidance to be provided to the new comers to become familiar with the working of Industrial Training Institute system including stores procedures. 2. Soft Skills, its importance and Job area after completion of training. 3. Importance of safety and general precautions observed in the in the industry/shop floor. 4. Introduction of First aid. Operation of electrical mains and electrical safety. Introduction of PPEs. 5. Response to emergencies e.g.; power failure, fire, and system failure. 6. Importance of housekeeping & good shop floor practices. Introduction to 5S concept & its application. 7. Occupational Safety & Health**:** Health, Safety and Environment guidelines, legislations & regulations as applicable. 8. Basic understanding on Hotwork, confined space work and material handling equipment.
2	Recognize &comply Health, Safety & Environment	**Health and safety in Manufacturing Environment (32hrs)**	**Health and safety in Manufacturing Environment (6hrs)** 1. Precautions to be followed while

	practices in a vehicle manufacturing plant.	1. Practice and understand precautions to be followed while working inassembly line 2. Safe use of equipment generally used in assembly line with operating standard. 3. Understand class of fire and be able to operate fire extinguishers. 4. Practical use and understanding of PPEs.	working in assembly Line 2. Safe use of equipment generally used in assembly line 3. Maintaining health and safety for workers in assembly line 4. Emergency and evacuation procedures to be 5. followed in the assembly line 6. First-Aid, nature and causes of injury and utilization offirst-aid. 7. Safety: - its importance, classification, personal, general, workshop and machine safety. 8. Safety signs and norms. 9. Fires: - types, causes, classes 10. Use of personal protective Equipment (PPE), standardization
3-14	Identify & explain about automobile industry in India, different types of vehicles, vehicle Id. Nos. of different components of vehicles, and perform on job training in various shops & conveyor systems.	**Basics of Automobile and Manufacturing Process (384hrs)** 1. Identification of different types of 2. vehicle 3. Identification of Vehicle Identification Number, Chassis No. & Engine no 4. Identification of different types of vehicle and engine components. 5. Plant and personal safety demonstration. 6. Familiarization with different components in the vehicle 7. On the job training in various production shops to get acquainted to the vehicle manufacturing process 8. Hands on training on conveyor line and sub assembly	**Basics of Automobile and Manufacturing Process (72hrs)** 1. Knowledge about automobile industry 2. Basic automotive terms and familiarisation to various types of vehicles 3. Basics of Vehicle manufacturing process 4. Basics of Blanking process 5. Basics of Stamping process 6. Basics of Welding process 7. Basics of Painting process 8. Basics of Assembly process 9. Basics of Vehicle Inspection and testing process 10. Introduction to Tools and equipment used in vehicle manufacturing 11. Conveyors types 12. Spot Welding guns 13. Stamping presses 14. Pneumatic tools 15. Electric tools 16. Sealant application guns 17. Special tools and equipment
15-17	Explain, perform &	**Tools and Workshop Equipment**	**Tools and Workshop Equipment**

	maintain hand & power tools and equipment used in a workshop & vehicle manufacturing plant and develop skills to assemble components using fasteners on conveyor line.	**(96hrs)** 1. Practice working with tools used in vehicle assembly 2. Practice working with pneumatic tools, Use of Vernier calliper, Micrometer and height gauge 3. Working with hand drill, hammer punches and chisel 4. Practical with drill reamer and tap 5. Practical with wrench screwdriver and pliers 6. Use of Allen key 7. Understanding of types and sizes of fasteners and picking of defined number of fasteners 8. Gap setting and checking with feeler Gauge 9. Operating of spot welding guns and other welding machines 10. Practice on different types of Conveyor	**(18hrs)** Common tools and material used in assembly Process 1. Types and sizes of spanners and screw drivers and Allen keys Taps wrenches and dies 2. Gauges 3. Files 4. Drilling machines and drills 5. Cutting machines 6. Pneumatic guns 7. Measuring instruments 8. Special purpose tools 9. Fasteners 10. General equipment in weld shop 11. Grinding, boring machines and screw jack 12. Hydraulic presses 13. Special purpose machines 14. Conveyor types
		Vehicle body assembly	**Vehicle body assembly**
18-20	Recognize vehicle body parts & components, their functions and assemble components on actual manufacturing lines.	**Structure of Vehicle Body 96hrs)** 1. On the job training on the actual manufacturing lines and identifying various components their function assembly and fitment procedure	**Structure of Vehicle Body (18hrs)** 1. Structure of car vehicle body 2. Component installation in power train and its explanation 3. Engine classification, mountings, transmission, driveshaft, propeller shaft, Differential, Clutch and Various joints 4. Suspension components 5. Construction of various components in power train
21-27	Explain elements of vehicle manufacturing process and perform to make components in Blanking & Stamping shop,	**On the job training (224hrs)** Hands On training in 1. Blankingand stamping shops 2. Casting shop 3. Machine shop 4. Engine assembly shop	**Elements of Vehicle manufacturing process (42hrs)** 1. Casting 2. Forging 3. Forming 4. Machining 5. Fitting 6. Blanking process

	Casting and Machine shop.		7. Stamping press tools and dies
28-31	Plan & organize to perform arc and Electric resistance (ER) welding and conduct inspection of weld joints to find welding defects	**Welding (128hrs)** 1. Basics of automotive welding process 2. Carry out welding training and understanding of different types of welding 3. Inspect welding joints using visual, DP & MP tests.	**Welding (24hrs)** 1. Weld equipment and parameters 2. Types of welding 3. Welding defects 4. Welding inspection
32-34	Plan & organize to perform surface preparation & painting, check dry film thickness (DFT) using Elcometer and analyse painting defects.	**Painting (96hrs)** 1. Paint MS sheet panels following the correct painting procedure i.e. Surface preparation, primer, intermediate coat & final coat. 2. Inspect the painted panel note down the defects 3. Take painted surface DFT at various locations using Elcometer.	**Painting (18hrs)** 1. Basic knowledge of automotive paining process 2. Terminology for painting 3. Sealant application guns 4. Paint equipment and parameters 5. Painting defects 6. Paint inspection & thickness measurement
35-46	Plan & prepare for assembling vehicle components and perform components assembly work in different assembly processes.	**Assembly (384hrs)** 1. Basic understanding of automotive Assembly process in plant 2. Hands On training on different Assembly processes in workshop	**Assembly (72hrs)** 1. Various assembly processes 2. Pneumatic tools and electrical tools 3. Torque wrenches 4. Types of assembly conveyors 5. Filling and testing equipment 6. Vehicle Inspection and testing 7. Tester line equipment 8. Testing parameters and its
47	**Project work** a) Make a chart showing different types of vehicles / automobiles. b) Make chart explaining power transmission in a vehicle. c) Prepare models of different types of chassis or frames of vehicles. d) Prepare working model of battery charging system. e) Prepare a working model of lead-acid battery. f) Prepare a model of Steering system. g) Make charts of how catalytic convertor works or how a muffler works.		
48-51	**Revision**		
52	**Examination**		

SYLLABUS – AUTOMOTIVE MANUFACTURING			
SECOND YEAR			
Week No.	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
53-60	Plan & organize work and assemble vehicle interior components viz. electrical harness, internal wiring, dash board, instruments, switches, seats, fire wall, ducts, headliner, weather strip, shock absorbers etc. on different type of conveyor system lines.	**Vehicle interior assembly (256 hrs)** Installation of following components in the vehicle; 1. Harness & controls and other electrical items viz. Junction box, Switches, Relays, Dash board instruments and complete all internal wiring. 2. Pedal Assembly, 3. Insulator or Fire wall 4. Air duct, heater duct, heater, 5. Head liner 6. Weather-strip, 7. Horn, 8. Stop switch 9. Front/ rear shock absorber, shift cable 10. Washer tank 11. Front/ rear seat belt 12. Installation of components in the vehicle along with familiarization of tools conveyor system and automation	**Vehicle interior assembly (48 hrs)** Understanding the function and construction of the following components and system 1. Harness & controls and other electrical items viz. Junction box, Switches, Relays, Dash board instruments and complete all internal wiring. 2. Pedal Assembly, 3. Insulator or Fire wall 4. Air duct, heater duct, heater, 5. Head liner 6. Weather-strip, 7. Horn, 8. Stop switch 9. Front/ rear shock absorber, shift cable 10. Washer tank 11. Front/ rear seat belt 12. Installation of components in the vehicle along with familiarization of tools conveyor system and automation
61-70	Explain and perform installation of power train, suspension and brake system components using appropriate hand & power tools.	**Power train, suspension and Brake Assembly (320 hrs)** Installation of following components in the vehicle; 1. Brake tube 2. filler neck 3. Fuel pipe, fuel tank, canister 4. Rear axle, stabilizer bar 5. Knuckle, tie rod 6. Exhaust System 7. Tire, 8. front/rear seat 9. Front/ rear bumper	**Power train, suspension and Brake Assembly (60 hrs)** Understanding the function and construction of the following components and system 1. Brake tube 2. filler neck 3. Fuel pipe, fuel tank, canister 4. Rear axle, stabilizer bar 5. Knuckle, tie rod 6. Exhaust System 7. Tire, 8. front/rear seat

		10. Familiarization of tools, conveyor systems and automation	9. Front/ rear bumper 10. Installation of components in the vehicle along with familiarization of tools, conveyor systems and automation
71-80	Plan & organize to perform work and assemble Final line assembly components on vehicle viz. Rear pillar trim, trunk lid latch, radiator, hoses, seat belt, steering shaft, air conditioning system, parking brake, glove box, , garnish, battery cable, silencer, front grille, moulding, console box, head & back lights, turn signals, front & rear glass, etc. using appropriate hand & power tools.	**Final line assembly (320 hrs)** Installation of following components in the vehicle; 1. Rear pillar trim, trunk lid latch 2. Console bracket, carpet, trunk room trim 3. License plate lamp, radiator, hose 4. Seat belt, centre pillar trim 5. Heat hose, steering shaft 6. Air-conditioner components, A/c gas 7. Parking brake, garnish 8. Glove box, battery tray, seat belt, anchor cover, garnish 9. Rear combination lamp, sun visor 10. Air cleaner, front/rear seat 11. Battery cable, silencer 12. Front grille, drip moulding 13. Front turn signal lamp, console box 14. Front/rear glass, roof moulding 15. Combination meter 16. Familiarization of tools, conveyor systems and automation	**Final line assembly (60 hrs)** Understanding the function and construction of the following components and system 1. Rear pillar trim, trunk lid latch 2. Console bracket, carpet, trunk room trim 3. License plate lamp, radiator, hose 4. Seat belt, centre pillar trim 5. Heat hose, steering shaft 6. Air-conditioner components, A/c gas 7. Parking brake, garnish 8. Glove box, battery tray, seat belt, anchor cover, garnish 9. Rear combination lamp, sun visor 10. Air cleaner, front/rear seat 11. Battery cable, silencer 12. Front grille, drip moulding 13. Front turn signal lamp, console box 14. Front/rear glass, roof moulding 15. Combination meter 16. Installation of components in the vehicle along with familiarization of tools, conveyor systems and automation
81-88	Select proper tools and Explain & perform installation of electrical and electronics components in vehicle.Check functionality after installation and	**Automotive Electrical and Electronics (256 hrs)** 1. Installation of electrical components invehicle assembly line 2. Installation of electronic components in vehicle assembly line 3. Function of automation	**Automotive Electrical and Electronics (48 hrs)** 1. Basics of Electrical and Electronic Engineering 2. Current voltage and resistance 3. Ohm's Law 4. Types of Electrical Materials 5. Direct Current and Alternating current

	recognize the function of automation in vehicle assemble and material handling.	equipment in vehicle assembly line. 4. Function of automation equipment in material handling 5. Function of automation equipment in testing	6. Function of current 7. Heat generation action 8. Chemical Action 9. Magnetic Action 10. Parallel and Series connections 11. Function and working principal of electrical components in vehicle assembly line 12. Alternator 13. Distributor 14. Wiper Motor 15. Wiring Harness and Connectors 16. Function and working principle of electronic components in vehicle assembly line 17. Electronic Control Module 18. Sensors and actuators 19. Air Bags 20. ABS & EBD 21. Electronic power steering 22. Function of automation equipment in vehicle assembly line 23. Function of automation equipment in material handling 24. Function of automation equipment in testing
89-92	Recognise the harmful effect of pollution in general & pollution generated by automobiles. Explain & assemble the components designed to control pollution in vehicle, like ECM and Catalytic convertor. Conduct Emission test as per standard procedure.	**Automotive Pollution & Control & Emission Measurements (128 hrs)** 1. Installation of components In the vehiclealong with familiarisationof tools, conveyor systems and automation 2. Electronic control systems 3. Catalytic convertors 4. Measurement techniques and hands on training on measurement 5. Emission standards & Test procedures	**Automotive Pollution & Control & Emission Measurements (24 hrs)** 1. Understanding the function and construction of the following components and system 2. Importance of pollution and emission control in automobile Vehicular emission 3. Factors influencing motor vehicle emission 4. Electronic control systems 5. Catalytic convertors 6. Evaporative emission control 7. Influence of engine variables on emissions

			8. Pollutant formation in SI & CI Engines 9. Control of Emissions from SI & CI Engines 10. Measurement techniques 11. Emission standards & Test procedures
93-98	Explain & perform different types of quality control & inspection process on assembly line and tester line and conduct final inspection& testing.	**Quality Control and Inspection (192 hrs)** 1. Vehicle testing on plant tester line 2. Wheel alignment 3. Toe in adjustment 4. Head lamp beam adjustment 5. Drum test 6. Brake test 7. Emission test 8. Shower test 9. Road test 10. Final Inspection 11. ID plate punching	**Quality Control and Inspection (36 hrs)** 1. Different types of quality control processes used in automotive manufacturing shop 2. Statistical Process Control (SPC) 3. Functions of various departments in quality control procedures 4. Product development department 5. Production department 6. Quality Department 7. Marketing Department 8. Inspection Process 9. Final Audit Tests 10. Vehicle Identification Number (VIN)
99	**In-plant training/ Project work** h) Make electrical circuit diagrams with load calculations. i) Make electronic circuit diagrams to show how different transistors work. j) Prepare model of side indicator lights or parking lights. k) Prepare charts showing interior components of a vehicle. l) Test emission of diesel and petrol vehicles and prepare reports. m) Make charts of how catalytic convertor works or how a muffler works.		
100-103	**Revision**		
104	**Examination**		

9. SYLLABUS - CORE SKILLS

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

FIRST YEAR		
S No.	**Workshop Calculation (40 hrs)and Science (40 Hrs) Total 80 Hrs**	**Engineering Drawing (80 Hours)**
1.	**Unit**: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	Engineering Drawing: Introduction and its importance - Relationship to other technical drawing types - Conventions - Viewing of engineering drawing sheets. - Method of Folding of printed Drawing Sheet as per BIS SP:46-2003
2.	**Fractions**: Fractions, Decimal fraction, L.C.M., H.C.F., Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems using Scientific Calculator.	Drawing Instruments : their Standard and uses - Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, and Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.
3.	**Square Root**: Square and Square Root, method of finding out square roots, Simple problem using calculator.	Lines : - Definition, types and applications in Drawing as per BIS SP:46-2003 - Classification of lines (Hidden, centre, construction, Extension, Dimension, Section) - Drawing lines of given length (Straight, curved) - Drawing of parallel lines, perpendicular line - Methods of Division of line segment
4.	**Ratio &Proportion**: Simple calculation on related problems.	Drawing of Geometrical Figures: Definition, nomenclature and practice of - Angle: Measurement and its types, method of bisecting.

		- Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.
5.	**Percentage**: Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	Lettering and Numbering as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case.
6.	**Algebra**: Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	Dimensioning: - Definition, types and methods of dimensioning (functional, non-functional and auxiliary) - Types of arrowhead - Leader Line with text
7.	**Mensuration :**Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi-circle, Volume of solids – cube, cuboids, cylinder and Sphere. Surface area of solids – cube, cuboids, cylinder and Sphere.	Free hand drawing of - Lines, polygons, ellipse, etc. - geometrical figures and blocks with dimension - Transferring measurement from the given object to the free hand sketches.
8.	**Trigonometry:** Trigonometrically ratios, measurement of angles. Trigonometric tables	Sizes and Layout of Drawing Sheets - Basic principle of Sheet Size - Designation of sizes - Selection of sizes - Title Block, its position and content - Borders and Frames (Orientation marks and graduations) - Grid Reference - Item Reference on Drawing Sheet (Item List)
9.	**Material Science** : properties -Physical & Mechanical, Types –Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals, introduction of Iron, Cast Iron, Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless	Method of presentation of Engineering Drawing - Pictorial View - Orthogonal View - Isometric view

	steel, Non-Ferrous metals, Non-Ferrous Alloys.	
10.	**Mass, Weight and Density**: Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals.	Symbolic Representation (as per BIS SP:46-2003) of : - Fastener (Rivets, Bolts and Nuts) - Bars and profile sections - Weld, brazed and soldered joints. - Electrical and electronics element - Piping joints and fittings
11.	**Speed and Velocity**: Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation, equations of motions, simple related problems.	Construction of Scales and diagonal scale
12.	**Work, Power and Energy**: Work, unit of work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy.	Practice of Lettering and Title Block
13.	**Heat & Temperature**: Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, scale of temperature, relation between different scale of temperature, Thermometer, pyrometer, transmission of heat, conduction, convection, radiation.	Dimensioning practice: - Position of dimensioning (unidirectional, aligned, oblique as per BIS SP:46-2003) - Symbols preceding the value of dimension and dimensional tolerance. - Text of dimension of repeated features, equidistance elements, circumferential objects.
14.	**Basic Electricity**: Introduction, use of electricity, how electricity is produced, Types of current_ AC, DC, their comparison, voltage, resistance, and their units. Conductor, insulator, Types of connections – series, parallel, electric power, Horse power, energy, unit of electrical energy.	Construction of Geometrical Drawing Figures: - Different Polygons and their values of included angles. Inscribed and Circumscribed polygons. - Conic Sections (Ellipse& Parabola)
15.	**Levers and Simple Machines:** levers and its types.	Drawing of Solid figures (Cube, Cuboids, Cone, Prism, Pyramid, Frustum of Cone and

	Simple Machines, Effort and Load, Mechanical Advantage, Velocity Ratio, Efficiency of machine, Relationship between Efficiency, velocity ratio and Mechanical Advantage.	Pyramid.) with dimensions.
16.	----------	Free Hand sketch of hand tools and measuring tools used in respective trades.
17.	----------	Projections: - Concept of axes plane and quadrant. - Orthographic projections - Method of first angle and third angle projections (definition and difference) - Symbol of 1st angle and 3rd angle projection as per IS specification.
18.	----------	Drawing of Orthographic projection from isometric/3D view of blocks
19.	----------	Orthographic Drawing of simple fastener (Rivet, Bolts, Nuts & Screw)
20.	----------	Drawing details of two simple mating blocks and assembled view.

SECOND YEAR		
S No.	**Workshop Calculation (40 hrs) and Science (40 Hrs) Total 80 hrs**	**Engineering Drawing (80 Hours)**
1.	GEOMETRY: Geometrical construction & theorem: division of line segment, parallel lines, similar angles, perpendicular lines, isosceles triangle and right angled triangle.	- Revision of first year topics.
2.	Area of cut-out regular surfaces: circle and segment and sector of circle.	- Machined components; concept of fillet & chamfer; surface finish symbols.
3.	Area of irregular surfaces. Application related to shop problems.	- Screw thread, their standard forms as per BIS, external and internal thread, conventions on the features for drawing as per BIS.
4.	Volume of cut-out solids: hollow cylinders, frustum of cone, block section. Volume of simple machine blocks.	- Free hand Sketches for bolts, nuts, screws and other screwed members.
5.	Material weight and cost problems related to trade.	- Free hand Sketching of foundation bolts and types of washers.
6.	Finding the value of unknown sides and angles of a triangle by Trigonometrical method.	- Standard rivet forms as per BIS (Six types).
7.	Finding height and distance by trigonometry.	- Riveted joints-Butt & Lap (Drawing one for each type).
8.	Application of trigonometry in shop problems. (viz. taper angle calculation).	- Orthogonal views of keys of different types.
9.	**Graph:** - Read images, graphs, diagrams, bar chart, pie chart. - Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.	- Free hand Sketches for simple pipe, unions with simple pipe line drawings.
10.	Simple problem on Statistics: - Frequency distribution table - Calculation of Mean value. - Examples on mass scale productions. - Cumulative frequency - Arithmetic mean	- Concept of preparation of assembly drawing and detailing. Preparation of simple assemblies & their details of trade related tools/job/exercises with the dimensions from the given sample or models.

11.	- Forces definition. - Compressive, tensile, shear forces and simple problems. - Stress, strain, ultimate strength, factor of safety. - Basic study of stress-strain curve for MS.	- Free hand sketch of trade related components / parts (viz., single tool post for the lathe, etc.)
12.	- Temperature measuring instruments. Specific heats of solids & liquids.	- Study of assembled views of Vee-blocks with clamps.
13.	- Thermal Conductivity, Heat loss and heat gain.	- Study of assembled views of shaft and pulley.
14.	- Average Velocity, Acceleration & Retardation. - Related problems.	- Study of assembled views of bush bearing.
15.	- Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force.	- Study of assembled views of a simple coupling.
16.	- Acceptance of lot by sampling method (within specified limit size) with simple examples (not more than 20 samples).	- Free hand Sketching of different gear wheels and nomenclature.
17.	- Friction- co-efficient of friction, application and effects of friction in Workshop practice. - **Center of gravity** and its practical application.	- Free hand Details and assembly of simple bench vice.
18.	- Magnetic substances- natural and artificial magnets. - Method of magnetization. Use of magnets.	- Reading of drawing. Simple exercises related to missing lines, dimensions. How to make queries.
19.	- Electrical insulating materials. - Basic concept of earthing.	- Simple exercises relating missing symbols. - Missing views
20.	- Transmission of power by belt, pulleys & gear drive. - Calculation of Transmission of power by belt pulley and gear drive.	- Simple exercises related to missing section.
21.	- Heat treatment and advantages.	- Free hand sketching of different types of bearings and its conventional representation.

22.	Concept of pressure – units of pressure, atmospheric pressure, absolute pressure, gauge pressure – gauges used for measuring pressure.	- Solution of DGT test. - Simple exercises related to trade related symbols. - Basic electrical and electronic symbols
23.	----------	- Study of drawing & Estimation of materials.
24.	----------	- Solution of DGT test papers.

9.2 EMPLOYABILITY SKILLS

Duration: One Year (Total 138 Hours)	
1. English Literacy	**Duration: 30 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 essential parts, letters of application reference to previous communication.
2. IT Literacy	**Duration: 30 hrs.** **Marks : 09**
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
Computer Operating System	Basics of Operating System, WINDOWS, the user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc., Use of Common applications.
Word Processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets.
Computer Networking and Internet	Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and

	use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cybercrimes.
3. Communication Skills	**Duration: 22 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 effectivelistening, 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
4. Entrepreneurship Skills	**Duration: 18 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 andrelation to the economy, Source of business ideas, Entrepreneurial opportunities, and the process of setting up a business.
Project Preparation & Marketing Analysis	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & 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/Programmed, procedure andthe available scheme.
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.
5. Productivity	**Duration: 15 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: 20 hrs.** **Marks : 06**
Safety & Health	Introduction to Occupational Safety and Health, importance of safety and health at workplace.
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibro-acousticHazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, 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 and 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. Labor Welfare Legislation	**Duration: 10 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, Workmen' Compensation Act.
8. Quality Tools	**Duration: 15 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 & Equipment		
Automotive Manufacturing (Flexi MoU) (For batch of 30 candidates)		
S No.	**TOOLS, EQUIPMENT, MACHINERIES AND VEHICLES**	**QTY**
1.	CNC Vertical head machine	1 no.
2.	CNC Horizontal head machine	1 no.
3.	CNC Milling tools different size	5 nos.
4.	CNC Boring tools	5 nos.
5.	Bench vice	30 no.
6.	Drilling machine	2 nos.
7.	Double ended spanner set 6-32mm	05set
8.	Ring spanner set 6-32mm	05 set
9.	Tubular spanners 8,10,12,14,16,17mm	5 nos.
10.	Socket spanners 6-32 mm with T bar and ratchet	05 set
11.	Allen keys 4-12mm in steps of 2mm	05 set
12.	Screw driver (flat) 20cm x 9mm blade	05 no.
13.	Screw driver (flat) 30cm x 9 mm blade	05 no.
14.	Screw driver (Philips type) 100 -300mm set of 5 pieces	05 set
15.	Hammer ball peen 0.75 kg	5 nos.
16.	Mallet hammer	5 nos.
17.	Hammer rubber	5 nos.
18.	Nose pliers straight 15 cm	5 nos.
19.	Combination pliers 15 cm	5 nos.
20.	Circlip plier external & contracting 6”	5 nos.
21.	Circlip pliers external & contracting 7”	5 nos.
22.	Feeler gauge 20 blades metric	5 nos.
23.	Adjustable spanner 20 cm	5 nos.
24.	Spark plug spanner 12,14,17mm	5 nos.
25.	File different shapes and size of 15cm	05 set

26.	Drill bits 3mm to 16mm	02 set
27.	Tap set M6 to M12	02 set
28.	Pneumatic Gun / Pneumatic drill	5 nos.
29.	Battery gun / Battery drill	5 nos.
30.	Socket set	5 nos.
31.	Screw Bit set	5 nos.
32.	Torque wrench 0-50 NM	01 no.
33.	Digital Multi meter	01 no.
34.	Tappet adjuster	01 no.
35.	Air compressor 200 liters capacity	01 no.
36.	Impact screw driver for flat and Philips type	01 set
37.	Pneumatic tyre inflator	01 no.
38.	Measuring Jars (Different capacity)	01 Set
39.	4 Pole lift	2 nos.
40.	Slat conveyor for assembly training	1 no.
41.	Desktop computers for Basic training	10 nos.
42.	Engine (Petrol MPFI) for dismantling and assembly	2 nos.
43.	Engine (Diesel DDIS) for dismantling and assembly	2 nos.
44.	Transmission for assembly and disassembly training	2 nos.
45.	4- Wheeler vehicle	2 nos.
46.	Cut section of main parts and systems for training • Oil filter and Cooler • Motor Assembly Starter • Generator Assembly • Diesel Injector • Injector fuel • Turbo Charger assembly • A/C Compressor • High Pressure pump • Strut Assy. Front • Cut section Engine • Pump Assembly Fuel • Column Assembly with EPS • Brake Booster • Absorber Assy. Rear • CNG Regulator	1 no. each
47.	Manufacturing line with all modern manufacturing techniques and equipment to facilitate Hands on training for the students • Blanking line • Stamping presses • Weld shop fully equipped with welding equipment	

	• Paint shop with all equipment and process • Assembly shop slat and overhead conveyors • Vehicle Testing line (head light, brake, drum and emission tester)	
48.	Welding Simulator	1 no.
49.	Painting Simulator	1 no.
50.	Simulator for Fitting and assembly of fasteners	30 nos.

Tools & Equipment for Employability Skills		
S 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	30 no.
2	UPS - 500VA	10 no.
3	Scanner cum Printer	1 no.
4	Computer Tables	30 no.
5	Computer Chairs	30 no.
6	LCD Projector – One in each class room	One in each class room
7	White Board 1200mm x 900mm	One in each class room

ANNEXURE - II

MSIL - Maruti Suzuki Training Academy

Trainee Internal Assessment Report

Name :		**Batch No:**	
Card ID No :		**Dept:**	
Attendance % :			

Quarters	Month	Attend %	Month	Attend %	Month	Attend %	Quarterly Average Attend. %
Qtr-1							
Qtr-2							
Qtr-3							
Qtr-4							

General Assessment **Assessment Period :**

S.No	ATTRIBUTES		Score Qtr-1	Score Qtr-2	Score Qtr-3	Score Qtr-4	Score Sum of 4-Qtrs
1	**Safety**	Knowledge, follow safety precautions and rules					
2	**Sense of Responsibility**	Does he obey Sup/Line i/c instructions					
		Does he attend shift start meetings regularly					
		Does he take supervisors feedback properly					
		Whether he takes planned leaves					
		Does he participates in new drives					
		Does he take care in handling tools					
		Is Punctual					
		Positive, Behaviour, response, learning					
		Maintain 5S at his work station					
		Co-operation - Consider team work, willingness to work with and for others					
		Able to identify and report irregularities at his work place					
3	**Method**	Follow WIS/MOS					
		Able to check faults of previous station					
		Understands tools/equipment functions and its different parts					
		Able to perform the job independently					
4	**Speed**	Able to match line "TACT" time					
		Willingness to learn/flexibility for alternate job					
		Work completion/target achievement					
5	**Quality**	Able to contain defects					
		Awareness about GCA/PDI					
		Skill acquired during "On job training"					
		Total Score					
		Max. Marks					

(Fill score in relevant box) **Excellent : 4, Very Good : 3, Good : 2, Fair : 1, Need Improvement : 0**

Remarks (Supervisor): (Mention achievement/Critical incidents)

Remarks (Shift Incharge/Dept, Manager):

Remarks (MSTA Training Coordinator):