ELECTROPLATER

COMPETENCY BASED CURRICULUM
(Duration: 2 Yrs.)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 5

SECTOR – ELECTRICAL (INCLUDING NEW & RENEWABLE ENERGY)

सत्यमेव जयते

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

Directorate General of Training

Skill India
कौशल भारत-कुशल भारत

ELECTROPLATER

(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 5

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
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1. BACKGROUND

1.1 Apprenticeship Training Scheme under Apprentice Act 1961

The Apprentices Act, 1961 was enacted with the objective of regulating the programme of training of apprentices in the industry by utilizing the facilities available therein for imparting on-the-job training. The Act makes it obligatory for employers in specified industries to engage apprentices in designated trades to impart Apprenticeship Training on the job in industry to school leavers and person having National Trade Certificate(ITI pass-outs) issued by National Council for Vocational Training (NCVT) to develop skilled manpower for the industry**.** There are four categories of apprentices namely**; trade apprentice, graduate, technician and technician (vocational) apprentices.**

Qualifications and period of apprenticeship training of **trade apprentices** vary from trade to trade. The apprenticeship training for trade apprentices consists of basic training followed by practical training. At the end of the training, the apprentices are required to appear in a trade test conducted by NCVT and those successful in the trade tests are awarded the National Apprenticeship Certificate.

The period of apprenticeship training for graduate (engineers), technician (diploma holders and technician (vocational) apprentices is one year. Certificates are awarded on completion of training by the Department of Education, Ministry of Human Resource Development.

1.2 Changes in Industrial Scenario

Recently we have seen huge changes in the Indian industry. The Indian Industry registered an impressive growth during the last decade and half. The number of industries in India have increased manifold in the last fifteen years especially in services and manufacturing sectors. It has been realized that India would become a prosperous and a modern state by raising skill levels, including by engaging a larger proportion of apprentices, will be critical to success; as will stronger collaboration between industry and the trainees to ensure the supply of skilled workforce and drive development through employment. Various initiatives to build up an adequate infrastructure for rapid industrialization and improve the industrial scenario in India have been taken.

1.3 Reformation

The Apprentices Act, 1961 has been amended and brought into effect from 22nd December, 2014 to make it more responsive to industry and youth. Key amendments are as given below:

- Prescription of number of apprentices to be engaged at establishment level instead of trade-wise.
- Establishment can also engage apprentices in optional trades which are not designated, with the discretion of entry level qualification and syllabus.
- Scope has been extended also to non-engineering occupations.
- Establishments have been permitted to outsource basic training in an institute of their choice.
- The burden of compliance on industry has been reduced significantly.

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. The vocational training programmes are delivered under aegis of National Council of Vocational Training (NCVT). Craftsman Training Scheme (CTS) and Apprenticeship Training Scheme (ATS) are two pioneer programmes of NCVT for propagating vocational training.

Electroplater trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of two years (02 Blocks) 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 and science, Engineering Drawing and Employability Skills imparts requisite core skills & knowledge and life skills. After passing out the training programme, the trainee is being awarded National Apprenticeship Certificate (NAC) by NCVT having worldwide recognition.

Broadly candidates need to demonstrate that they are able to:

- Read & interpret technical parameters/document, 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 skill, knowledge, core skills & employability skills while performing jobs and solve problem during execution.
- Check the job/finishing and assembly as per drawing for functioning, identify and rectify errors in job/assembly.
- Document the technical parameters related to the task undertaken.

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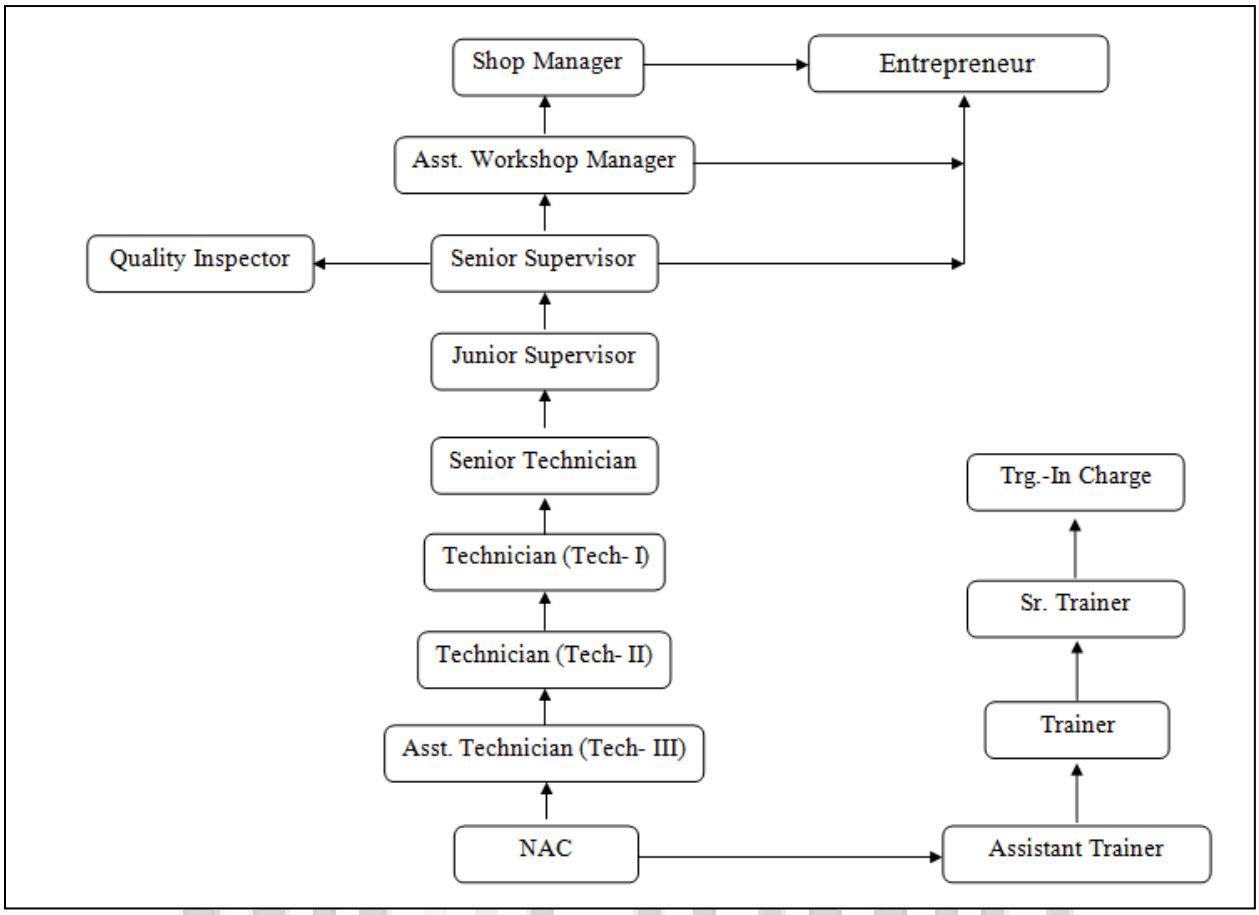
2.2 CAREER PROGRESSION PATHWAYS:

- Indicative pathways for vertical mobility.



2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two years (*Basic Training and On-Job Training*): -

Total training duration details: -

Time (in months)	**1-3**	**4-12**	**13-15**	**16-24**
Basic Training	**Block – I**	**-----**	**Block – II**	**------**
Practical Training (On - job training)	**----**	**Block – I**	**------**	**Block – II**

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A. Basic Training

For 02 yrs. Engg. Course :-(**Total 06 months:** 03 months in 1st yr. + 03 months in 2nd yr.)
For 01 yr. Engg. course :-(**Total 03 months:** 03 months in 1st yr.)

Sl. No.	Course Element	Total Notional Training Hours	
		For 02 yrs. course	**For 01 yr. course**
1	Professional Skill (Trade Practical)	550	275
2	Professional Knowledge (Trade Theory)	240	120
3	Workshop Calculation & Science	40	20
4	Engineering Drawing	60	30
5	Employability Skills	110	55
	Total (including Internal Assessment)	**1000**	**500**

B. On-Job Training:-

For 02 yrs. Engg. Course :- (**Total 18 months:** 09 months in 1st yr. + 09 months in 2nd yr.)

Notional Training Hours for On-Job Training: 3120 Hrs.

For 01 yr. Engg. course :-(**Total 12 months**)

Notional Training Hours for On-Job Training: 2080 Hrs.

C. Total training hours:-

Duration	Basic Training	On-Job Training	Total
For 02 Engg. yrs. course	1000 hrs.	3120 hrs.	4120 hrs.
For 01 yr. Engg. course	500 hrs.	2080 hrs.	2580 hrs.

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 (section-2.4.2). 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 NAC will be conducted by NCVT on completion of course 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 (section-2.4.2) 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%. The candidate pass in each subject conducted under all India trade test.

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:

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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:

Electroplater

Electroplater gives coating of gold, silver, nickel, chromium, copper etc. of required thickness to metal parts by electrolytic process. Examines strength of metallic solution and sets anode plates (positive terminal) in solution. Suspends de-greased components well dipped in side plating solution and connects cathode (negative) to it. Regulates current and allows components to remain dipped in solution for specific period depending upon type and thickness of plating required. Removes components and swills them in hot and cold water baths. Dries them in sawdust or centrifugal air dryer. Transfers components to unrigging rack or other specified place for polishing. Prepare plating solution under guidance of shop supervisor. It is designated as GILLDER if engaged in gold platting and ANODISER, aluminium and light alloys article using specific chemical solutions.

Reference NCO-2015:

i) 8122.0100 – **Electroplater**

4. NSQF LEVEL COMPLIANCE

NSQF level for Electroplater trade under ATS: **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 and
e. Responsibility.

The Broad Learning outcome of Electroplater trade under ATS 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.

5. GENERAL INFORMATION

Name of the Trade	ELECTROPLATER
NCO-2015	8122.0100
NSQF Level	Level – 5
Duration of Apprenticeship Training (Basic Training + On-Job Training)	Two years (02 Blocks each of one year duration).
Duration of Basic Training	a) Block –I : 3 months b) Block – II : 3 months **Total duration of Basic Training: 6 months**
Duration of On-Job Training	a) Block–I: 9 months b) Block–II : 9 months **Total duration of Practical Training: 18 months**
Entry Qualification	Passed in 10th class examination under 10+2 system or its equivalent.
Selection of Apprentices	The apprentices will be selected as per Apprenticeship Act amended time to time.
Instructors Qualification for Basic Training	As per ITI instructors qualifications as amended time to time for the specific trade.
Infrastructure for Basic Training	As per related trades of ITI
Examination	The internal examination/ assessment will be held on completion of each block. Final examination for all subjects will be held at the end of course and same will be conducted by NCVT.
Rebate to Ex-ITI Trainees	01 year
CTS trades eligible for Electroplater Apprenticeship	Electroplater

Note:

- *Industry may impart training as per above time schedule for different block, however this is not fixed. The industry may adjust the duration of training considering the fact that all the components under the syllabus must be covered. However the flexibility should be given keeping in view that no safety aspects is compromised.*
- *For imparting Basic Training the industry to tie-up with ITIs having such specific trade and affiliated to NCVT.*

6. LEARNING OUTCOME

6.1GENERIC LEARNING OUTCOME

The following are minimum broad Common Occupational Skills/ Generic Learning Outcome after completion of the Electroplater course of 02 years duration under ATS.

Block I & II:-

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, 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 OUTCOME

Block – I

1. Implement various safety measures on the shop floor, demonstrate the usage of first aid, operate the fire extinguishers, read the signs and posters of 5S, plan the house keeping.
2. Demonstrate the use of trade hand tools and machineries, draw its specifications, and maintain the hand tools, solder the wire joints and carry out brazing.
3. Identify electrical wiring accessories, wire up circuits in wooden/PVC/Metallic boards and troubleshoot the electrical items used in plating.
4. Plan the usage, handling and storage of hazardous chemicals. Layout the vat / barrel diagram showing connections for copper and nickel plating and other electroplating equipments.
5. Label, store and use the chemicals, cyanides and work with the poisonous gases safely; treat the plating-effluents, softening of hard water by different methods.
6. Clean the surface of articles by different methods, scouring, scrubbing, alkaline cleaning, etching, degreasing, pickling, dipping, vapor degreasing methods.
7. Polish and buff the articles of Iron and steel, cast Iron, aluminium, brass, bronze etc., carry out the burnishing and lapping; barrel polishing of Iron and steel articles; scouring and finishing of silver and gold, ultrasonic cleaning, anodic and cathodic cleaning.
8. Carry out plating copper on different metals by using acid bath, cyanides bath, pyrosulphate solutions etc.
9. Carry out plating nickel on different metals by using nickel-sulphate, nickel –sulphamate baths, electroless nickel plating , black electroless nickel plating, nickel plating by barrel method
10. Maintain copper bath and nickel bath solution, carry out the hull cell tests, test the pH value of solutions and measure the parameters- Filtration, temperature & density etc.
11. Treat the solution for nickel plating and carry out the effluent treatment of plating solutions.
12. Test the quality of copper and nickel plated work with respect to thickness, corrosion, adhesion and pores.
13. Inspect for the common defects in copper and nickel bath, explain causes and provide remedies.
14. Carry out Lacquering by different methods
15. Carry out the volumetric analysis of plating solutions, gravimetric analysis.
16. Carry out plating on PCB's; heat treatment, conversion coating, masking and stripping process

Block – II

17. Prepare the work and chrome solutions, carry out the chrome bright plating on nickel base, hard chrome plating for dies, printing plates, black chrome plating and barrel chrome plating

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18. Carry out the chrome passivation, chrome bright plating on nickel base, hard chrome plating for dies and printing plates, black chrome plating, identify the defects, causes and rectify the defects.
19. Prepare cadmium solutions, carry out cadmium plating on various metals, maintain the plating solutions, carry out the post plating treatment-chrome acid dip, identify defects, causes and rectify the defects.
20. Carry out plating silver on articles made of copper, nickel, and steel.
21. Prepare gold solutions, carry out gold plating, maintain gold, practice in masking
22. Prepare brass solution, prepare the work, identify and rectify the defects in brass plating.
23. Carry out barrel zinc plating, practice stripping.
24. Prepare tin solution, set up tin plating bath, carry out tin and tin alloy plating
25. Prepare solution for chrome anodizing, sulphuric acid anodizing and oxalic acid anodizing
26. Practice metal colouring, bronzing, practice brass etching
27. Practice conversion coating on materials such as aluminium, zinc, copper, steel, magnesium alloys, carry out the hot dipping process & electroplating (granadising). Plate PCBs, do the heat treatment, and strip different plating and conversion coating
28. Inspect the plated articled visually, determine the thickness of plating, conduct the adhesion test, corrosion test, calculate the current & time, solution composition etc., Carry out pores strength test, salt spray test and BNF test.
29. Install machinery for electroplating shops, select equipments, and design the layout of plant tools and machineries.

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

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING OUTCOME	
LEARNING 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, explain different mathematical calculation & science in the field of study including basic electrical and	2.1 Explain concept of basic science related to the field such as Material science, Mass, weight, density, speed, velocity, heat & temperature, force, motion, pressure, heat treatment, centre of gravity, friction.
apply in day to day	2.2 Measure dimensions as per drawing

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]*	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, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Sectional views, Estimation of material, Electrical & electronic symbol]*	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, vernier callipers, dial gauge, bevel protector and height 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 the 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	6.1 Explain the concept of energy conservation, global warming, pollution and utilize the available recourses optimally & remain sensitive to avoid environment pollution.

available resources.	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 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 OUTCOME	
Block-I & II (Section:10)	
*Assessment Criteria i.e. the standard of performance, for each specific learning outcome mentioned under **block – I & block – II**(section: 10) must ensure that the trainee achieves well developed skill with clear choice of procedure in familiar context. Assessment criteria should broadly cover the aspect of **Planning** (Identify, ascertain, estimate etc.); **Execution** (perform, illustration, demonstration etc. by applying 1) a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information 2) Knowledge of facts, principles, processes, and general concepts, in a field of work or study 3)Desired Mathematical Skills and some skill of collecting and organizing information, communication) and **Checking / Testing** to ensure functionality during the assessment of each outcome. The assessments parameters must also ascertain that the candidate is responsible for own work and learning and some responsibility for other's work and learning.*	

BASIC TRAINING (Block – I)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	1. Implementation of various safety measures in the shop floor. 2. Visit to different sections of the Institute. **3.** Demonstration of elementary first aid. Artificial Respiration. 4. Practice on use of fire extinguishers. **5. Occupational Safety & Health.** **6. Importance of housekeeping & good shop floor practices.** 7. Health, Safety and Environment guidelines, legislations & regulations as applicable. 8. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Basic safety introduction, Personal protective Equipment(PPE):- 9. Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. 10. Preventive measures for electrical accidents & steps to be taken in such accidents. **11.** Use of Fire extinguishers.	**Occupational Safety & Health** Basic safety introduction, Personal protection:- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Use of Fire extinguishers. Visit & observation of sections. Various safety measures involved in the Industry. Elementary first Aid. Concept of Standard **Soft Skills**: its importance and Job area after completion of training. Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept & its application. Response to emergencies eg; power failure, fire, and system failure.
2	12. Familiarization with signs and symbols of Electrical accessories.	Fundamental of electricity: Electron theory- free electron, Fundamental terms- Current, Voltage definitions, AC, DC, Phase, Neutral, Earth. Units & effects of electric current.
3	13. Skinning the cables. 14. Demonstration & practice in soldering & brazing, practice in measuring instruments used in electroplating like micrometer, vernier, plug gauges, ring gauges, depth micrometer, hole measuring micrometers. Ammeter, Voltmeter, Thermometer, Thermocouple, Energy meter,	Solders, flux and soldering technique. Resistors types of resistors & properties of resistors. Introduction of National Electrical Code. Explanation, Definition and properties of conductors, insulators and semi-conductors. Types of wires & cables, standard wire gauge. Specification of wires & Cables-insulation &

	Temperature recorders.	voltage grades- Low , medium & high voltage
4	15. Verification of Ohm's Law, Measuring unknown resistance. 16. Verification of laws of series and parallel circuits.	Ohm's Law - Simple electrical circuits and problems. Reading of simple Electrical Layout. Resistors -Law of Resistance. Series and parallel circuits & related calculation. Alternating Current - Comparison and Advantages D.C and A.C. Related terms Frequency, Instantaneous value, R.M.S. value Average value, Peak factor, form factor, sine wave, phase and phase difference. Inductive and Capacitive reactance, Impedance (Z), power factor (p.f). Active and Reactive power. Single Phase and three-phase system etc. Power consumption in series and parallel, P.F. etc. Concept three-phase Star and Delta connection. Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load.
5	17. Demonstration of trade hand tools. 18. Use, care & maintenance of various hand tools. 19. Practice on installation and overhauling common electrical accessories as per simple Electrical circuit / Layout. 20. Make test board.	Identification of Trade-Hand tools-Specifications Common Electrical Accessories, their specifications in line with NEC 2011-Explanation of switches lamp holders, plugs and sockets. Developments of domestic circuits, Alarm & switches, with individual switches, Two way switch .Security surveillance, Fire alarm, MCB, ELCB, MCCB. Series –parallel testing board & use.
6	21. Identification of parts of battery. 22. Practice on Battery Charging. 23. Preparation of battery charging. 24. Testing of cells, Installation of batteries, Charging of batteries by different methods. 25. Routine care & maintenance of Batteries. 26. Practice on Earthing - different methods of earthing.	Chemical effect of electric current-Principle of electrolysis. Faraday's Law of electrolysis Lead acid cell-description, methods of charging-Precautions to be taken & testing equipment, Different types of lead acid cells. Sealed Maintenance free Batteries, Solar battery. Load & back up time calculation. Earthing-

	27. Measurement of Earth resistance by earth tester. 28. Testing of Earth Leakage by ELCB and relay.	Principle of different methods of earthing & selection. i.e. Pipe, Plate, etc Importance of Earthing. Improving of earth resistance Earth Leakage circuit breaker (ELCB).
7	29. Demonstration of safety aids in electroplating, identification, labeling and storage of chemicals, practice on use of chemicals, cyanides and other poisonous gases. 30. Use of jigs and fixtures and their importance, different materials to be used to make fixtures for different plating. 31. Method of racking for electroplating and anodizing, effluent treatment of plating effluents, softening of hard water by different methods. 32. Practice on use of electroplating equipments.	Safety precautions to be considered in plating shop, Introduction to electroplating, electroplating techniques, definitions of the terms used in electroplating, calculation of surface areas and volumes, specific gravity, properties of metals and non-metals, alloys-their composition and uses; effluent treatment of plating effluents, BOD and COD of effluents.
8 -9	33. Practice on - Mechanical cleanings like Sand blasting, Abrasive blasting, scouring, scrubbing, Barrel de-burring and cleaning for different materials like steel, copper, aluminium, brass, silver, gold. 34. Chemical cleaning – Solvent cleaning, Ultrasonic cleaning, Vapour degreasing, alkaline cleaning, pickling, Anodic-Cathodic cleaning, Etching Barrel polishing etc.	Fundamental particles- electron, proton & neutrons, elements, compounds and mixtures, examples; formulas and symbols; chemical reactions, types of chemical reactions, acids, bases and salts with examples, acidity of a solution, alkalinity of a solution, solutions, solute, solvent, saturated solutions, unsaturated solutions, dilute and concentrated solutions, supersaturated solutions, pollution-types, causes and effects, Ionic dissociation-principles of electrolytic dissociation, Faraday's laws-electrochemical series, current density; purity of chemicals, care and maintenance of plating solutions.
10	35. Emery dressing, grease mopping, polishing and buffing of articles of Iron and steel, cast Iron, aluminium, brass, bronze etc, Burnishing and lapping; barrel polishing Iron and steel articles; scouring and finishing of silver and gold, ultrasonic cleaning, anodic and cathodic cleaning	Abrasives, emery wheels, polishing machines, burnishing-hand and lathe burnishing; tools for polishing – mops and buffs, polishing composition, bobbing grease, wheel composition, types of wheels, grinding and polishing techniques, grinding and polishing techniques, polishing of different metals such as Iron and steel, cast iron, copper, brass, Aluminium, scouring and finishing of gold and silver, barrelling purpose and methods, barreling machines and techniques.

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11	36. Practice in setting up of equipments for copper plating. 37. Preparation of copper plating solutions - acid bath and cyanides bath solutions; copper plating on various articles; Electroless copper, testing of copper solutions.	Vats, details of rectifiers, position of rectifiers, tubes and rods for Vats, resistance board, heating, light, ventilation, effluents discharge, current efficiency, anodes and cathode efficiency, safety precautions.
12	38. Practice in setting up of equipments for nickel plating, 39. Preparation of nickel plating solutions, nickel-sulphate plating, nickel plating on Mild steel, copper, brass, aluminium articles, electroless nickel plating, black electroless nickel plating, nickel plating by barrel method.	Importance of cleaning, pickling and dipping methods with different solutions, scratch brushing methods, stripping methods and techniques.
13	40. Testing of pH value of solutions. 41. Test and identifying plating defects by various methods i.e., visual test, thickness test, corrosion test, adhesion test, pores test, Hardness test, Surface roughness test etc. 42. Practice in Stripping of copper and Nickel coating on different base materials and methods. 43. Practice in volumetric analysis of plating solutions, gravimetric analysis, maintenance of plating solutions, carbon treatment.	Copper plating- properties, copper solutions, troubles of copper solutions, factors to be considered in plating, copper plating, defects and causes, application; Nickel plating, electroless nickel plating, troubleshooting application ,process control of plating solutions.
	Internal Assessment/Examination 03days	

NOTE: -

More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.

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BASIC TRAINING (Block – II)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	44. Practice in setting up of equipments for chrome plating. 45. Practice preparation of the work and chrome solutions, chrome bright plating on nickel base, hard chrome plating for dies, printing plates, Black chrome plating, barrel chrome plating, Stripping of chrome plating from different base metals.	Properties of chromium, types of chrome solutions, lead anodes, physical factors like density, temperature etc., equipments, significant of bright and hard chrome plating on different metals, advantages and disadvantages, operating conditions, black chrome plating, barrel chrome plating, Chrome plating on stainless steel, post plating treatment, Chrome plating, defects, causes and remedies.
2-3	46. chrome passivation chrome bright plating on nickel base, hard chrome plating for dies, printing plates, Black chrome plating, barrel chrome plating, chrome passivation, preparation of cadmium solutions bright cadmium plating, maintenance of the plating solutions, post plating treatment-chrome acid dip.	Preparation of cadmium solutions, cadmium plating on various metals, Blue passivation, Dichromate passivation, Limitation of temperature after Dichromate passivation, Nitric Acid dip. Quality tests and inspection of Cadmium plating like visual, Thickness, Corrosion resistance, Surface finish etc defects, causes and remedies.
4	47. Practice in setting up of equipments for silver plating Preparation of articles made of copper, nickel, steel for silver plating.	Properties of silver, significant of Silver plating on different metals, advantages and disadvantages. Preparation of Silver solutions, Silver plating on various metals, maintenance of the plating solutions, post plating treatment Silver passivation (Silchrome). Quality tests and inspection like visual, Thickness, Corrosion resistance, Surface finish etc. defects, causes and remedies.
5	48. Practice in preparation of gold solutions, gold plating. 49. maintenance of gold, practice in masking.	Properties of Gold, significant of Gold plating on different metals, advantages and disadvantages. Preparation of Gold solutions, Gold plating on various metals, maintenance of the plating solutions, post plating treatment like lacquering etc. Quality tests and inspection of Gold plating like visual, Thickness, Surface finish etc. Defects, causes and remedies.
6	50. Practice in preparing brass solution, preparation of work, brass plating for rubber adhesion, barrel plating	Properties of Brass, significant of Brass plating on different metals, advantages and disadvantages. Preparation of Brass solutions, Brass plating on various metals, maintenance of the plating solutions, post plating treatment

		like lacquering etc. Quality tests and inspection of Brass plating like visual, Thickness, Surface finish etc. Defects, causes and remedies. Stripping of Brass plating from different base metals.
7 - 8	51. Practice in preparing zinc solution, preparation of work, various zinc plating, barrel zinc plating, practice in stripping, stopping off, passivation of electrodeposits	Properties of zinc, Significant of Zinc plating on different metals, advantages and disadvantages. Preparation of Zinc solutions, Zinc plating on various metals, maintenance of the plating solutions, post plating treatment like Blue passivation, Dichromate passivation, Nitric acid dip etc. Quality tests and inspection.
9	52. Practice in preparing tin solution, setting up of tin plating bath, tin and tin alloy plating, Practice in conversion coating on different materials such as aluminium, zinc, copper, steel, magnesium alloys	Properties of Tin, preparation of Tin solutions, setting up of tin plating bath, tin and tin alloy plating. Tin plating on various metals, maintenance of the plating solutions, Quality tests and inspection of Tin plating like visual, Thickness, Solder-ability, Surface finish etc. Defects, causes and remedies in Tin plating. Stripping of Tin plating from different base metals.
10	53. Practice in preparing solution for chrome anodizing, sulphuric acid anodizing, oxalic acid anodizing, Practice in metal colouring, Alodine (Alochrome) aluminium and alloys, chromating of magnesium alloys, practice in brass etching, Blackening on steel, brass and copper.	Aluminium anodizing, chromic acid, sulphuric acid, oxalic acid anodizing ,its application, metal colouring, plating on non-metals, conversion coating, chemical etching, lacquering, plastic and other non-metallic plating, phosphating (Zinc and Manganese) on ferrous metal.
11	54. Practice in visual testing of plated articles, determination of thickness of plating, adhesion test, corrosion test, Practice in testing and identifying pores strength, salt spray test, BNF test.	Inspection of plated surfaces, visual test, BNF test, salt spray test, corrosion test.
12	55. Installation of machinery for electroplating shops, selection of equipments, layout with details of plant tools and machineries.	Electroplating shop layout, factors to be considered- tools, machines, raw materials, waste disposal, selection of vats and anodes
13	Industrial visit/Project work	
	Internal Assessment/Examination 03days	

NOTE: -

- *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

9. SYLLABUS - CORE SKILLS

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

Block – I		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration: - 30 hrs.)**
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** - Viewing of engineering drawing sheets. Method of Folding of printed Drawing Sheet as per BIS SP:46-2003 **Drawing Instruments** : their Standard and uses - Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.
2.	**Fractions & Simplification**: Fractions, Decimal fraction, Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems Simplification using BODMAS.	**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
3.	**Square Root** : Square and Square Root, method of finding out square roots, Simple problem using calculator	**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.
4.	**Ratio &Proportion:** Simple calculation on related problems.	**Lettering and Numbering** as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case.

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5.	**Percentage:** Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	**Free Hand sketch:** Hand tools and measuring instruments used in Electroplater trade
6.	**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 steel, Non-Ferrous metals, Non-Ferrous Alloys.	**Free hand drawing :** - Lines, polygons, ellipse, etc. - geometrical figures and blocks with dimension . - Transferring measurement from the given object to the free hand sketches.

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Block – II		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration: - 30 hrs.)**
1	**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
2	**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.	**Construction of Scales and diagonal scale** **Three phase Induction motor** Free hand sketching of Slip-ring and Squirrel cage Induction motor. Typical wiring diagram for drum controller operation of A.C. wound rotor motor.
4	**Algebra:** Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	Drawing the schematic diagram of Autotransformer starter, DOL starter and Star Delta Starter. Drawing the schematic diagram of A.C. motor speed control by SCR /AC Drive.
5	**Mensuration :** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle. Volume of solids – cube, cuboid, cylinder and Sphere. Surface area of solids – cube, cuboid, cylinder and Sphere. **Trigonometry:** Trigonometric ratios, measurement of angles. Trigonometric tables. Finding height and distance by trigonometry.	**Distribution of Power** Types of insulator used in over head line. (Half sectional views) Different type of distribution systems and methods of connections. Layout diagram of a substation. Single line diagram of substation feeders.

9.2 EMPLOYABILITY SKILLS

(DURATION: - 110 HRS.)

Block – I (Duration – 55 hrs.)	
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 know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.
2. I.T. Literacy	Duration : 20 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 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
Block – II **Duration – 55 hrs.**	
4. Entrepreneurship Skills	Duration : 15 Hrs. Marks : 06
Concept of	Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue

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Entrepreneurship	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, 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. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
Institutions 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 familiarizes 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 improves or slows down.
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 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 & 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.

10. DETAILS OF COMPETENCIES (ON-JOBTRAINING)

BROAD LEARNING TO BE COVERED IN INDUSTRY FOR ELECTROPLATERTRADE:

1. Safety and best practices /Basic Industrial Culture (5S, KAIZEN, etc.)
2. Record keeping and documentation
3. Handle the materials for electroplating, including hazardous ones.
4. Prepare job for electroplating, set up the bath, set the current and time of operation.
5. Electroplating of different metals as per requirement and check accuracy.
6. Test the electroplated surface for laid out specifications.
7. Carryout maintenance of different machines including electrical power supply and transformer.

Note: Actual training will depend on the existing facilities available in the establishments.

The **competencies/ specific outcomes** on completion of On-Job Training are detailed below: -

Block – I

1. Implement various safety measures on the shop floor, demonstrate the usage of first aid, operate the fire extinguishers, read the signs and posters of 5S, plan the house keeping.
2. Demonstrate the use of trade hand tools and machineries, draw its specifications, and maintain the hand tools, solder the wire joints and carry out brazing.
3. Identify electrical wiring accessories, wire up circuits in wooden/PVC/Metallic boards and troubleshoot the electrical items used in plating.
4. Plan the usage, handling and storage of hazardous chemicals. Layout the vat / barrel diagram showing connections for copper and nickel plating and other electroplating equipments.
5. Label, store and use the chemicals, cyanides and work with the poisonous gases safely; treat the plating-effluents, softening of hard water by different methods.
6. Clean the surface of articles by different methods, scouring, scrubbing, alkaline cleaning, etching, degreasing, pickling, dipping, vapor degreasing methods.
7. Polish and buff the articles of Iron and steel, cast Iron, aluminium, brass, bronze etc., carry out the burnishing and lapping; barrel polishing of Iron and steel articles; scouring and finishing of silver and gold, ultrasonic cleaning, anodic and cathodic cleaning.
8. Carry out plating copper on different metals by using acid bath, cyanides bath, pyrosulphate solutions etc.
9. Carry out plating nickel on different metals by using nickel-sulphate, nickel –sulphamate baths, electroless nickel plating , black electroless nickel plating, nickel plating by barrel method.

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10. Maintain copper bath and nickel bath solution, carry out the hull cell tests, test the pH value of solutions and measure the parameters- Filtration, temperature & density etc.
11. Treat the solution for nickel plating and carry out the effluent treatment of plating solutions.
12. Test the quality ofcopper and nickel plated work with respect to thickness, corrosion, adhesion and pores.
13. Inspect for the common defects in copper and nickel bath, explain causes and provide remedies.
14. Carry out Lacquering by different methods
15. Carry out the volumetric analysis of plating solutions, gravimetric analysis.
16. Carry out plating on PCB's; heat treatment, conversion coating, masking and stripping process

Block – II

17. Prepare the work and chrome solutions, carry out the chrome bright plating on nickel base, hard chrome plating for dies, printing plates, black chrome plating and barrel chrome plating
18. Carry out the chrome passivation, chrome bright plating on nickel base, hard chrome plating for dies and printing plates, black chrome plating, identify the defects, causes and rectify the defects.
19. Prepare cadmium solutions, carry out cadmium plating on various metals, maintain the plating solutions, carry out the post plating treatment-chrome acid dip, identify defects, causes and rectify the defects.
20. Carry out platingsilver on articles made of copper, nickel, and steel.
21. Prepare gold solutions, carry out gold plating, maintain gold, practice in masking
22. Prepare brass solution, prepare the work, identify and rectify the defects in brass plating.
23. Carry out barrel zinc plating, practice stripping.
24. Prepare tin solution, set up tin plating bath, carry out tin and tin alloy plating
25. Prepare solution for chrome anodizing, sulphuric acid anodizing and oxalic acid anodizing
26. Practice metal colouring, bronzing, practice brass etching
27. Practice conversion coating on materials such as aluminium, zinc, copper, steel, magnesium alloys, carry out the hot dipping process & electroplating (granadising). Plate PCBs, do the heat treatment, and strip different plating and conversion coating
28. Inspect the plated articled visually, determine the thickness of plating, conduct the adhesion test, corrosion test, calculate the current & time, solution composition etc., Carry out pores strength test, salt spray test and BNF test.
29. Install machinery for electroplating shops, select equipments, and design the layout of plant tools and machineries.

Note:

- Industry must ensure that above mentioned competencies are achieved by the trainees during their on job training.
- In addition to above competencies/ outcomes industry may impart additional training relevant to the specific industry.

ANNEXURE – I

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

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LIST OF TOOLS AND EQUIPMENT for Basic Training (For 20 Apprentices)

A. TRAINEES TOOL KIT (For each additional unit trainees tool kit Sl. 1-18 is required additionally)

Sl. no.	Name of the Tool &Equipments	Specification	Quantity
1.	Steel Tape	15 m length	21 nos.
2.	Plier Insulated	150 mm	21 nos.
3.	Plier Side Cutting,	150 mm	21 nos.
4.	Screw Driver,	100 mm	21 nos.
5.	Screw Driver,	150 mm	21 nos.
6.	Electrician Connector, screw driver insulated handle thin stem,	100 mm	21 nos.
7.	Heavy Duty Screw Driver ,	200 mm	21 nos.
8.	Electrician Screw Driver thin stem insulated handle,	250 mm	21 nos.
9.	Punch Centre ,	150 mm X 9 mm	21 nos.
10.	Knife Double Bladed Electrician		21 nos.
11.	Neon Tester		21 nos.
12.	Steel Rule	300 mm	21 nos.
13.	Hammer, with handle	cross peen	21 nos.
14.	Hammer, With handle	ball peen	21 nos.
15.	Gimlet	6 mm.	21 nos.
16.	Bradawl		21 nos.
17.	Scriber	(Knurled centre position)	21 nos.
18.	Pincer	150 mm	21 nos.
19.	Digital multimeter		21 nos.
B : INSTRUMENTS & GENERAL SHOP OUTFIT			
1.	C- clamp	100mm, 150mm, 200mm	2 Nos. each
2.	Adjustable spanner	150mm, 300mm	2 Nos. each
3.	Blow lamp	0.5 ltr	1
4.	Melting pot		1
5.	Ladel		1

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6.	Chisel cold firmer	25mm x 200 mm	2
7.	Chisel	25mm & 6 mm	2 Nos. each
8.	Hand drill machine		2
9.	Portable electric drill machine,	12 mm capacity	1
10.	Pillar Electric Drill machine,	12 mm capacity	1
11.	Allen key set		2 sets
12.	Oil can	0.12 ltr	1
13.	Grease gun		1
14.	Out side Micrometer		2
15.	Motorised Bench grinder		1
16.	Rawl plug tool & bit		2 sets
17.	Pulley puller		2
18.	Bearing puller		2
19.	Pipe vice		2
20.	Thermo meter	0-100 deg C	1
21.	Scissors blade	150mm	2
22.	Crimping tool		2 sets
23.	Wire stripper	20 Cm	2
24.	Chisel cold flat	12mm	2
25.	Mallet hard wood	0.5Kg	2
26.	Mallet hard wood	1 Kg	2
27.	Hammer extractor type	0.4 Kg	2
28.	Hacksaw frame	200mm & 300mm adjustable	2 each
29.	Try square	150 mm blade	2
30.	Outside & inside divider caliper		2 each
31.	Pliers flat nose	150mm	4
32.	Pliers round nose	100 mm	4
33.	Tweezers	100mm	4
34.	Snip straight & bent	150mm	2 each
35.	Double ended spanner set metric		2 sets
36.	HSS drill bit set	2-12mm	4 sets
37.	Plane, smoothing cutters	50mm	2
38.	Gauge, wire imperial		2
39.	File, flat	200mm 2nd cut	8
40.	File half round	200 mm 2nd cut	4
41.	File round	200mm 2nd cut	4
42.	File flat	150mm rough	4

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43.	File flat	250mm bastard	4
44.	File flat	250mm smooth	4
45.	File Rasp half round	200 mm bastard	4
46.	Soldering iron	25 W, 65 W	2 each
47.	Copper bit soldering iron	0.25 kg	2
48.	Desoldering gun		4
49.	Hand vice	50mm jaw	4
50.	Bench vice	100mm jaw	6
51.	Pipe cutter to cut pipes	upto 5cm dia	2
52.	Stock & die set	for 20mm to 50 mm GI pipe	1
53.	Stock & dies conduit		1
54.	Ohm meter; series & shunt type		2 each
55.	Multimeter (analog),	0-1000 M ohm, 2.5 to 500V	2
56.	Digital Multimeter		4
57.	AC voltmeter	MI 0-500V	2
58.	Milli Voltmeter centre zero	100-0-100 mV	1
59.	DC milli Ammeter	0-500 mA	1
60.	Ammeter	MC 0-5A, 0-25A	1 each
61.	AC Ammeter	MI 0-5A, 0-25A	1 each
62.	Kilowatt meter	0-1-3 KW	1
63.	AC Energy meter	single phase 5A, 3 ph 15 A	1 each
64.	Power factor meter	single phase	1
65.	Frequency meter		1
66.	Flux meter		1
67.	DC power supply	0-30V, 2 Amp	2
68.	Rheostats	0-1 ohm 5A, 0-10 ohm 5A, 0-25 ohm 1A, 0-300 ohm 1A	1 each
69.	Digital Tachometer		1
70.	Growler		1
71.	Tong tester / clamp meter 0-100 A AC		1
72.	Meggar	500V	1
73.	Oscilloscope	dual trace, 30 MHz	1
74.	Function Generator		1
75.	Hygrometer		1
76.	Lux meter		1
77.	Hydro meter		1
78.	Current transformer	415 V, 50 Hz , CT Ratio 10/5A,	1

79.	Potential Transformer	415/110 V	1
80.	Wood Saw	250 mm	1
81.	Tenan Saw		1
82.	Guarded Test Lamp		1
C : GENERAL MACHINERY INSTALLATIONS			
1.	Canvas apron		21
2.	Respirators		21
3.	Rubber gloves		21
4.	Rubber Gum boots		21
5.	First aid box		21
6.	Goggles		21
7.	Rubber/Leather Apron		21
8.	Hand vice	50mm jaw)	9
9.	File flat	200mm,2nd cut	13
10.	File flat	200mm smooth	13
11.	Cutting plier insulated	200mm	21
12.	Brush hand scratch		21
13.	Brush circular brass		21
14.	File 2nd cut half round	150mm	21
15.	File round	2nd cut 200mm	21
16.	File round	200 mm smooth	21
17.	Weigh Balance m/c , Electronic	5kg capacity.	1
18.	Hydrometer with syringe		4
19.	Thermometer	(0 to 100)	5
20.	Glue pot	(5kg capacity)	2
21.	Oil can	500ml	2

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22.	Exhaust fan	1 phase	2
23.	Work bench		4
24.	Voltmeter	0-30V DC Digital	4
25.	Ammeter	MC 0-300 A Digital	4
26.	Ammeter	MC 0-2000mA	4
27.	Adjustable resistance board with ammeter & voltmeter		4
28.	PVC Polypropylene (PP) Vat/ Tank with SS stand for nickel , copper, brass, silver, tin, zinc, cadmium	,(L-2ft B-1.5ft ht-1.5ft) anodizing etc	1
29.	Perforated barrel	(10 kg capacity)	2
30.	Cleaning tank made out of hard Polypropylene	L-2ft b-1.5ft ht-1.5ft (PP)	5
31.	Dust & spray proof polishing machine 1phase	250V/5A	1
32.	Dust & spray proof polishing Machine 3phase	440v/15A	1
33.	Nickel comparator test set Digital pH meter	Table top type	1
34.	Buffing machine with spindle and roller bearing motorised heavy duty , 3 phase 440V 15 Amps. Bench Grinder and portable angle grinder hand type 1 phase 3 phase 440V 15 Amps. Bench Grinder and portable angle grinder hand type 1 phase		1
35.	Electroplating rectifiers, 3 phase 380/440V 50 c/s AC supply 16 Volts DC with an output of 500Amps 300A Dc voltages adjustable from 3.5 0 to 16 20V with voltage control 63 steps of load complete with required meter panel sand change over switch 3 phase 380/440V 50 c/s AC supply 16 Volts DC with an output of 500Amps 300A Dc voltages adjustable from 3.5 0 to 16 20Vwith voltage control 63 steps of load complete with required meter panel sand change over switch		1

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36.	AC to DC Motor Generator set for electroplating shop.		1
37.	Induction Motor:	3 ph, 5HP, 440V	1
38.	Plain steel lined VAT		5
39.	Rubber lined VAT		5
40.	Fire extinguishers	(chemical)	4
41.	Heating coil (copper, lead titanium /suitable material for long life)	1kw length 10/12''	5
42.	Work tables (wooden)	10ft by 8ft 5ft by 2ft	2
43.	Safety charts	(chemical / electrical)	10
44.	Mechanical Air agitation unit		1
45.	Centrifugal Dryer		1
46.	Cartridge solution filter		1
47.	Plastic siphon	12mm dia	2
48.	Hull cell unit (complete set for chemical analysis)		2
49.	BNF jet test apparatus Salt spray testing chamber for quality testing of plated surface		1
50.	Chromium plating tank made out of Antimonial lead lining with reinforced glass lining. ,	L-2ft,b-1.5ft,ht-1.5ft	5
D. Furniture			
1.	Instructor's table		1
2.	Instructor's chair		2
3.	Metal Rack	100cm x 150cm x 45cm	4
4.	Lockers with 16 drawers standard size		1
5.	Almirah	2.5 m x 1.20 m x 0.5 m	1
6.	Black board/white board		1

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INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: ELECTROPLATER

LIST OF TOOLS& EQUIPMENTS FOR -20APPRENTICES

1) **Space Norms** : 45 Sq. m.(For Engineering Drawing)

2) Infrastructure:

A : TRAINEES TOOL KIT:-			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1.	Draughtsman drawing instrument box		20+1 set
2.	Set square celluloid	45^0 (250 X 1.5 mm)	20+1 set
3.	Set square celluloid	30^0-60^0 (250 X 1.5 mm)	20+1 set
4.	Mini drafter		20+1 set
5.	Drawing board	(700mm x500 mm) IS: 1444	20+1 set
B : Furniture Required			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1	Drawing Board		20
2	Models : Solid & cut section		as required
3	Drawing Table for trainees		as required
4	Stool for trainees		as required
5	Cupboard (big)		01
6	White Board	(size: 8ft. x 4ft.)	01
7	Trainer's Table		01
8	Trainer's Chair		01

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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:			

Sl. No	**Maximum Marks (Total 100 Marks)**		**15**	**5**	**10**	**5**	**10**	**10**	**5**	**10**	**15**	**15**	**Total internal assessment Marks**	**Result (Y/N)**
	Candidate Name	**Father's/Mother's Name**	Safety consciousness	Workplace hygiene	Attendance/ Punctuality	Ability to follow Manuals/ Written instructions	Application of Knowledge	Skills to handle tools & equipment	Economical use of materials	Speed in doing work	Quality in workmanship	VIVA		
1														
2														