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

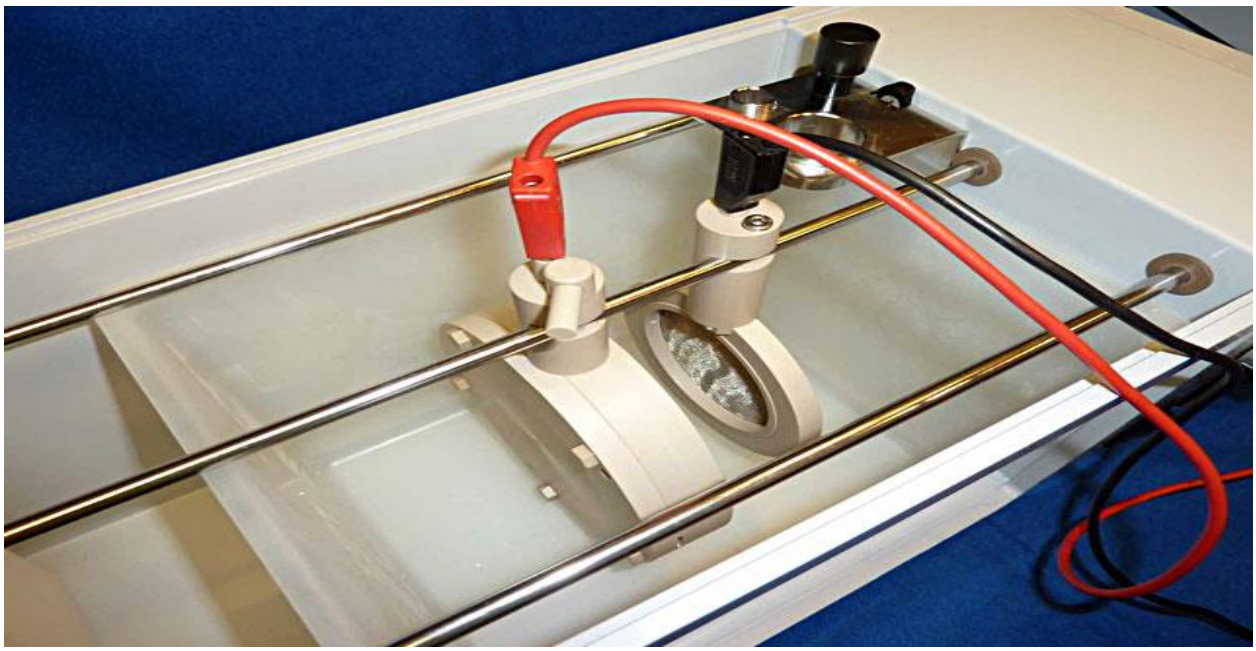
COMPETENCY BASED CURRICULUM

ELECTROPLATER

(Duration: Two Years)
Revised in July 2022

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 4



SECTOR – CHEMICALS AND PETROCHEMICALS

Directorate General of Training

ELECTROPLATER

(Engineering Trade)

(Revised in July 2022)

Version: 2.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 4

Developed By

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1. COURSE INFORMATION

During the two-year duration of Electroplater trade a candidate is trained on professional skill, professional knowledge, and Employability skill related to job role. In addition to this a candidate is entrusted to undertake project work and extracurricular activities to build up confidence. The broad components covered under Professional skill subject are as below: -

FIRST YEAR: In this year, the trainee learns about safety and environment, use of fire extinguishers and various safety measures involved in the industry. He gets the idea of trade tools &machineries, practices on filing, hacksawing, planning, drilling, marking, cutting and chipping etc. Identifies different types of conductors, cables, prepare wire joints and learns crimping and soldering. Knowledge of basic electrical laws like Kirchhoff's law, ohm's law, laws of resistances and their applications. The trainee learns installation, testing and maintenance of batteries and wiring of panels. The trainee gets the idea of basic process of electroplating.

The trainee learns to handle different solutions, treatment of hazardous chemicals, safety precautions in electroplating shop, first aid and antidotes for chemical poisoning. Preparation of articles before plating, different types of cleaning like polishing, buffing, blasting, electro-cleaning, ultrasonic cleaning and vapour degreasing etc. Skilling practice on Nickel and Bright & Hard Chromium plating by different methods, various defects generally encountered in plating, causes for these defects, their remedies and various methods to remove defective deposits.

SECOND YEAR: The trainee learns setting up of various electroplating baths. Prepares solutions and practices on Zinc, Cadmium, Tin, Brass, Silver and Gold plating on ferrous/ non-ferrous metals by different methods and passivation with various colours. He understands various defects generally encountered in electroplating, causes for these defects and their remedies. Skilling practice to remove defective deposits on different metals by immersion and electrolytic methods. The trainee practices on electroplating of small articles by Barrel plating method for the plating of Copper, Nickel, Tin, Zinc and Cadmium.

In this year, the trainee learns about electroless method of plating for Copper, Nickel, Tin, Silver and Gold. General defects, their causes and remedies in electroless plating. Electroplating on Aluminium with zincate dipping process. The trainee practices on plating of Copper, Nickel, Chromium, Silver and Gold plating on non-conductive surfaces like ABS plastic. He prepares PCBs with Copper, Nickel, Tin, Silver & Gold and practices chemical etching for Copper & Brass. Skilling practice on Anodizing, methods of various colouring techniques, conversion coating, chemical milling on aluminium, phosphating, power coating, metalizing and passivation process. Conducts various tests viz., adhesion, porosity, thickness, corrosion resistance etc. and carries out preventive and breakdown maintenance of electroplating shop machineries.

2. TRAINING SYSTEM

2.1 GENERAL

The Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers a range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under the aegis of Directorate General of Training (DGT). Craftsman Training Scheme (CTS) with variants and Apprenticeship Training Scheme (ATS) are two pioneer schemes of DGT for strengthening vocational training.

Electroplater trade under Craftsman Training Scheme is delivered nationwide through network of ITIs. The course is of two-year duration. It mainly consists of Domain area and Core area. The Domain area (Trade Theory & Practical) imparts professional skills and knowledge, while Core area (Employability Skills) imparts requisite core skill, knowledge and life skills. After passing out the training program, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

Trainee broadly needs to demonstrate that they are able to:

- Read and interpret technical parameters/ documents, 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 & employability skills while performing jobs.
- Document the technical parameters related to the task undertaken.

2.2 PROGRESSION PATHWAYS

- Can join industry as Technician and will progress further as Senior Technician, Supervisor and can rise up to the level of Manager.
- Can become Entrepreneur in the related field.
- Can join Apprenticeship programme in different types of industries leading to a National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.
- Can join Advanced Diploma (Vocational) courses under DGT as applicable.

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	
		1st Year	2nd Year
1	Professional Skill (Trade Practical)	840	840
2	Professional Knowledge (Trade Theory)	240	300
3	Employability Skills	120	60
	Total	**1200**	**1200**

Every year 150 hours of mandatory OJT (On the Job Training) at nearby industry, wherever not available then group project is mandatory.

4	On the Job Training (OJT)/ Group Project	150	150

Trainees of one-year or two-year trade can also opt for optional courses of up to 240 hours in each year for 10th/ 12th class certificate along with ITI certification, or, add on short term courses.

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through formative assessment and at the end of the training programme through summative assessment as notified by the DGT from time to time.

a) The **Continuous Assessment** (Internal) 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 formative assessment template provided on www.bharatskills.gov.in.

b) The final assessment will be in the form of summative assessment. The All India Trade Test for awarding NTC will be conducted by Controller of examinations, DGT as per the guidelines. The pattern and marking structure is being notified by DGT from time to time. **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

For the purposes of determining the overall result, weightage of 100% is applied for six months and one year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percent for Trade Practical and Formative assessment is 60% & for all other 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 some of 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
- Computer based multiple choice question examination
- Practical Examination

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming examination for audit and verification by examining body. The following marking pattern to be adopted for formative assessment:

Performance Level	Evidence
(a) Marks 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	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment.

craftsmanship with occasional guidance, and due regard for safety procedures and practices	• 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) Marks 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) Marks 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

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 policing. May prepare plating solution under guidance of shop supervisor. Is designated as Gillder if engaged in gold platting and Anodiser if colours aluminium and light alloys article using specific chemical solutions.

Surface Treatment Technician; is responsible for conducting electroplating, powder coating and Anodizing operations as per the product and the customer requirement to ensure that the surface of the metallic body becomes resistant to chemicals, moisture and other wear and tear.

Galvanizer; applies coating of zinc on ferrous articles by dipping them in molten zinc. Checks and controls quantity, quality and temperature of acid (hydrochloric acid), flux (zinc chloride) and zinc baths. Preheat articles if necessary and dips or passes them either manually or mechanically through, acid, water, flux and zinc baths successively at controlled speed. Skims dirt from baths and continues operation with necessary adjustment of solution, temperature etc., ensuring regular and uniform coating. May similarly apply tin coating using palm oil as flux and be designated as Tin Plater or Tinning Machine Operator. May regulate temperature by gauges and by colour of melting metals.

Reference NCO-2015:

a) 8122.0100 – Electroplater
b) 8122.0101 – Surface Treatment Technician
c) 8122.3500 – Galvanizer

Reference NOS: --

CP/N9401
MIN/N3102
MIN/N3101
MIN/N3103
CP/N9402
MIN/N3101

MIN/N3102
MIN/N3105
CP/N9403
CP/N9404
CP/N9405
CP/N9406
CP/N9407
CP/N9408
CP/N9409
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CP/N9424
CP/N9425
CP/N9426
CP/N9427
CP/N9428
CP/N9429
CP/N9430

4. GENERAL INFORMATION

Name of the Trade	**ELECTROPLATER**
Trade Code	DGT/1065
NCO – 2015	8122.0100, 8122.0101, 8122.3500
NOS Covered	CP/N9401, MIN/N3102, MIN/N3101, MIN/N3103, CP/N9402,MIN/N3101, MIN/N3102, MIN/N3105, CP/N9403,

	CP/N9404, CP/N9405, CP/N9406, CP/N9407, CP/N9408, CP/N9409, CP/N9410, CP/N9411, CP/N9412, CP/N9413, CP/N9414, CP/N9415, CP/N9416, CP/N9417, CP/N9418, CP/N9419, CP/N9420, CP/N9421, CP/N9422, CP/N9423, CP/N9424, CP/N9425, CP/N9426, CP/N9427, CP/N9428, CP/N9429, CP/N9430
NSQF Level	Level – 4
Duration of Craftsmen Training	Two Years (2400 hours + 300 hours OJT/Group Project)
Entry Qualification	Passed 10th class examination with Science and Mathematics or with vocational subject in same sector or its equivalent.
Minimum Age	14 years as on first day of academic session.
Eligibility for PwD	LD, LC, DW, AA, DEAF, HH
Unit Strength	20 (There is no separate provision of supernumerary seats)
Space Norms	60 Sq. m
Power Norms	16 KW
Instructors Qualification for	
1. Electroplater Trade	B.Voc/ Degree in Chemical engineering from AICTE/ UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Chemical 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 passed in the Trade of "Electroplater" with three years experience in the relevant field. **<u>Essential Qualification</u>:** Relevant regular/ RPL variants of National Craft Instructor Certificate (NCIC) 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** 03 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:** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade **OR** Regular / RPL variants 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** 03 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 Mechanical group (Gr-I) trades categorized under Engg. Drawing'/ D'man Mechanical / D'man Civil' with three years' experience. **Essential Qualification:** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade **OR** Regular / RPL variants of 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. (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.
5. Minimum age for Instructor	21 years
Tools and Equipment	As per Annexure-I

5. LEARNING OUTCOME

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

5.1 LEARNING OUTCOMES

FIRST YEAR:

1. Prepare profile with an appropriate accuracy as per drawing following safety precautions. CP/N9401
2. Prepare electrical wire joints, carry out soldering and crimping. MIN/N3102
3. Verify characteristics of electrical and magnetic circuits. MIN/N3101, MIN/N3103
4. Carry out Installation, testing and maintenance of batteries with due care and safety. CP/N9402
5. Perform wiring, installation of electrical accessories and earthing of electrical equipment. MIN/N3101, MIN/N3102, MIN/N3105
6. Construct small electronic circuits as per drawing using basic electronic components. CP/N9403
7. Explain principles and basic process of plating one metal onto another by electrolysis. Use laboratory apparatus and estimate pH, mass, normality, conductivity, specific gravity etc. CP/N9404
8. Handle different solutions with due care & safety and undertake metal treatment processes and effluent treatment of hazardous chemicals in electroplating workshop. Prepare chemical solutions and undertake cooling, heating, filtering, agitating and other treatments for solutions. Carry out analysis of chemical baths with Hull cell process. CP/N9405
9. Plan and perform all the various aspects of the plating process including surface preparation, mechanical cleaning like polishing, buffing, blasting etc. and chemical cleaning like electro cleaning, ultrasonic cleaning, vapour degreasing, pickling, rinsing, masking etc. CP/N9406
10. Plan and perform Copper plating using different methods, examine various defects in Copper plating, causes and their remedies. Remove defective copper deposit by different methods. CP/N9407
11. Plan and perform Nickel plating using different methods, examine various defects in Nickel plating, causes and their remedies. Remove defective nickel deposit by different methods. CP/N9408
12. Plan and perform Bright and Hard Chromium plating by different methods on ferrous and non-ferrous metals, examine various defects in Chromium plating, causes and their remedies. Remove defective chromium deposit by different methods. CP/N9409
13. Read and apply engineering drawing for different application in the field of work. CP/N9410

14. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. CP/N9411

SECOND YEAR:

15. Plan and perform Zinc plating by different methods, examine various defects in Zinc plating, causes and their remedies. Remove defective zinc by different methods. CP/N9412
16. Plan and perform Cadmium plating by different methods, examine various defects in Cadmium plating, causes and their remedies. Remove defective cadmium deposit by different methods. CP/N9413
17. Plan and perform Tin Plating by different methods, examine various defects in Tin plating, causes and their remedies. Remove defective tin deposit by different methods. CP/N9414
18. Plan and perform Silver plating by different methods, examine various defects in Silver plating, causes and their remedies. Remove defective silver deposit by different methods. CP/N9415
19. Plan and perform Gold plating by different methods, examine various defects in Gold plating, causes and their remedies. Remove defective gold deposit by different methods. CP/N9416
20. Plan and perform Brass plating, examine various defects in Brass plating, causes and their remedies. Remove defective brass deposit by different methods. CP/N9417
21. Perform Barrel plating method of electroplating for the plating of copper, nickel, tin, zinc and cadmium. CP/N9418
22. Plan and perform electroless plating of copper, nickel, tin, silver and gold. CP/N9419
23. Plan and perform plating of copper, tin, nickel, zinc, cadmium etc. on aluminium with Zincate dipping process. CP/N9420
24. Plan and perform plating of copper, nickel, chromium, silver and gold on non conductive surface like plastic. CP/N9421
25. Make Printed circuit board with copper, nickel, tin, silver and gold. Perform chemical etching processes for copper and brass. CP/N9422
26. Plan and perform Anodizing to convert metal surface into a decorative, durable and corrosion resistant by different methods. Examine various defects generally encountered in anodising, causes and their remedies. Remove the defective anodised film by various methods. CP/N9423
27. Plan and perform various colouring techniques on anodised aluminium by different colouring dyes and other methods like electro colouring. CP/N9424

28. Perform various conversions coating process on aluminium, magnesium and its alloys. Perform chemical milling on Aluminium and undertake passivation of stainless steel. CP/N9425
29. Plan and perform phosphating, powder coating and metallizing on various metals. CP/N9426
30. Perform quality control aspect of the job and ensure electroplated surfaces are free of any flaws or defects. Perform various tests viz., adhesion, porosity, thickness, corrosion resistance, anodic coating on aluminium, chemical analysis of electrolytes and identification of deposits etc. CP/N9427
31. Prepare layout of electroplating plant, estimate cost, materials and accessories required for electroplating shop. Carryout preventive and breakdown maintenance of machines in electroplating shop. CP/N9428
32. Read and apply engineering drawing for different application in the field of work. CP/N9429
33. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. CP/N9430

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
FIRST YEAR	
1. Prepare profile with an appropriate accuracy as per drawing following safety precautions. CP/N9401	Identify the trade tools; demonstrate their uses with safety.
	Prepare a simple half lap joint using firmer chisel.
	Prepare tray using sheet metal with the safety.
	Demonstrate fixing of surface mounting type of accessories.
2. Prepare electrical wire joints, carry out soldering and crimping. MIN/N3102	Observe safety/ precaution during joints & soldering.
	Identify types of wires, cables and verify their specifications.
	Make simple straight twist and rat-tail joints in single strand conductors.
	Make married and 'T' (Tee) joint in stranded conductors.
	Prepare a Britannia straight and 'T' (Tee) joint in bare conductors.
	Prepare western union joint in bare conductor.
	Solder the finished copper conductor joints with precaution.
	Prepare termination of cable lugs by using crimping tool.
3. Verify characteristics of electrical and magnetic circuits. MIN/N3101, MIN/N3103	Identify polarity of DC power supply.
	Identify the phase and neutral in single phase AC supply system.
	Verify the characteristics of series, parallel and its combination circuit.
	Connect voltmeter and ammeter and measure voltage current and power.
	Demonstrate laws of series and parallel circuits with voltage source in different combinations.
	Demonstrate characteristics of series parallel combination of

	resistors.
	Demonstrate the relationship between V, I and R in a DC circuit.
	Measure the value of resistance by Ohm's Law.
	Trace the magnetic poles of a bar magnet.
	Prepare an electromagnet
4. Carry out Installation, testing and maintenance of batteries with due care and safety. CP/N9402	Assemble a DC source 6V/500 mA using 1.5V cells.
	Determine the internal resistance of cell and make grouping of cells.
	Demonstrate charging of battery and test for its condition with safety/ precaution.
	Demonstrate installation and maintenance Lead acid batteries.
	Determine total number of cells required for a given power requirement.
5. Perform wiring, installation of electrical accessories and earthing of electrical equipment. MIN/N3101, MIN/N3102, MIN/N3105	Comply with safety & IE rules when performing the wiring.
	Identify the types of fuses their ratings and applications.
	Identify the parts of a relay, MCB & ELCB and check its operation.
	Prepare a test board with lamp and other accessories.
	Test, locate the fault and repair a domestic wiring installation.
6. Construct small electronic circuits as per drawing using basic electronic components. CP/N9403	Perform soldering on components, lug and board with quality and safety.
	Identify resistors by their colour codes.
	Identify the passive/active components by visual appearance, Code number and test for their condition.
	Construct and test a half wave rectifier with and without filter circuits.
	Construct and test a full wave rectifier.
7. Explain principles and basic process of plating one metal onto another by electrolysis. Use laboratory apparatus and estimate pH, mass, normality, conductivity, specific	Identify various laboratory apparatus.
	Demonstrate action of pure and salt water on metals and alloys.
	Identify acids and alkalis using litmus paper and other methods.
	Analyse the reactions of anions and cations.
	Measure the specific gravity of liquid sample and check the temperature.
	Determine pH value of given liquid using pH meter.

gravity etc. CP/N9404	Measure boiling point of given liquid.
	Measure melting point of given solid.
	Measure conductivity of given liquid by conductivity meter.
	Determine the normality and mass per litre of sodium hydroxide/ sodium carbonate/ potassium hydroxide/ hydrochloric acid/ sulphuric acid or oxalic acid.
	Estimate the mass of sodium hydroxide/ sodium carbonate/ potassium hydroxide/ hydrochloric acid/ sulphuric acid or oxalic acid in a given solution.
8. Handle different solutions with due care & safety and undertake metal treatment processes and effluent treatment of hazardous chemicals in electroplating workshop. Prepare chemical solutions and undertake cooling, heating, filtering, agitating and other treatments for solutions. Carry out analysis of chemical baths with Hull cell process. CP/N9405	Demonstrate basic safety precautions to be taken while handling different types of electroplating solutions and effluent discharge.
	Work in compliance with safety while handling electroplating solutions, cyanide base electroplating salts and chrome containing effluent discharge.
	Identify hazardous substances viz. Solvents, alkalis, acids and cyanides etc.
	Demonstrate first aid and anti dotes for cyanide poisonings.
	Prevent exposure of hazardous substances.
	Perform effluent treatment of hazardous chemicals
	Perform setting up of plating tanks and electric connections.
	Identify acids and alkalis using Red/ Blue litmus paper.
	Measure the specific gravity of liquid sample
	Demonstrate and practice first aid and anti dotes for cyanide poisonings.
9. Plan and perform all the various aspects of the plating process including surface preparation, mechanical cleaning like polishing, buffing, blasting etc. and chemical cleaning like electro cleaning, ultrasonic cleaning, vapour degreasing, pickling, rinsing, masking etc. CP/N9406	Identify various compounds used in surface preparation process.
	Perform cleaning of articles viz., scrubbing with emery paper, wet sand, scratch brushes, wire wheel etc.
	Prepare glue and emery wheel binding.
	Perform acid cleaning, polishing and buffing of ferrous/ non ferrous alloys.
	Prepare suitable dips and pickling for removing of scales from surface of iron and steel.
	Perform cleaning by means of tumbling barrels.
	Perform ultrasonic cleaning.
	Perform anodic/ cathodic cleaning
	Perform degreasing process to include organic solvent i.e. TCE/PCE.

	Clean oxidation stains on the articles of copper, brass, nickel and silver.
10. Plan and perform Copper plating using different methods, examine various defects in Copper plating, causes and their remedies. Remove defective copper deposit by different methods. CP/N9407	Plan work in compliance with occupational safety and health.
	Ensure the appropriate temperature of the tanks and activate the electroplating process.
	Maintain timing cycles to ensure that all functions happen appropriately.
	Perform electro deposition of copper by cyanide solution.
	Perform electro deposition of copper by acid solution.
	Perform electro deposition of copper by alkaline non-cyanide solution.
	Perform electro deposition of copper by Pyrophosphate.
	Test electroplating quality by Hull cell method.
	Ensure the line and machines are ready for future use.
11. Plan and perform Nickel plating using different methods, examine various defects in Nickel plating, causes and their remedies. Remove defective nickel deposit by different methods. CP/N9408	Plan work in compliance with occupational safety and health.
	Prepare the job for nickel plating.
	Determine ECE of nickel
	Prepare and set up nickel plating vat, ensure the appropriate temperature of the tanks and activate the electroplating process.
	Perform pre-treatment process and maintain timing cycles to ensure that all functions happen appropriately.
	Prepare and test solution for electro deposition of nickel.
	Perform Nickel plating in different articles.
	Demonstrate set-up of current and time for different thickness of deposition.
	Perform adjustment of pH and temperature in bright nickel plating bath.
	Perform carbon treatment and maintenance of brightner level
	Perform testing of nickel plating solution using hull cell apparatus.
	Perform duped nickel plating and electrolysis nickel plating.
	Ensure the line and machines are ready for future use.
12. Plan and perform Bright and Hard Chromium plating by different methods on ferrous and	Demonstrate safety precautions to be observed in Chromium Plating.
	Prepare the job for Chromium Plating.
	Test the electrolyte for Chromium plating.

non-ferrous metals, examine various defects in Chromium plating, causes and their remedies. Remove defective chromium deposit by different methods. CP/N9409	Ensure the appropriate temperature of the tanks and activate the electroplating process.
	Maintain timing cycles to ensure that all functions happen appropriately.
	Perform Chromium plating on different metals.
	Perform Chromium plating in internal areas.
	Remove metallic impurities in Chromium solutions and demonstrate the regeneration of solution.
	Perform pre-treatment for the Direct Hard Chromium plating and demonstrate precautions to be taken.
	Perform hard chromium plating.
	Ensure the line and machines are ready for future use.
13. Read and apply engineering drawing for different application in the field of work. CP/N9410	Read & interpret the information on drawings and apply in executing practical work.
	Read &analyze the specification to ascertain the material requirement, tools and assembly/maintenance parameters.
	Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
14. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. CP/N9411	Solve different mathematical problems
	Explain concept of basic science related to the field of study
SECOND YEAR	
15. Plan and perform Zinc plating by different methods, examine various defects in Zinc plating, causes and their remedies. Remove defective zinc by different methods. CP/N9412	Plan work in compliance with occupational safety and health.
	Prepare solution for Zinc plating.
	Prepare job for Zinc plating.
	Perform Zinc plating and ensure the appropriate temperature of the tank and activate the electroplating process.
	Perform stripping of Zinc deposit and barrel plating.
16. Plan and perform	Plan work in compliance with occupational safety and health.

Cadmium plating by different methods, examine various defects in Cadmium plating, causes and their remedies. Remove defective cadmium deposit by different methods. CP/N9413	Prepare Job for Cadmium plating.
	Test the acidity and density of the solution.
	Perform setting up of VAT for Cadmium Plating
	Perform Cadmium plating on different jobs.
	Find out defects in electroplated surface and explain causes and remedial actions.
17. Plan and perform Tin Plating by different methods, examine various defects in Tin plating, causes and their remedies. Remove defective tin deposit by different methods. CP/N9414	Plan work in compliance with occupational safety and health.
	Prepare the solution for Tin plating.
	Set up Tin plating bath and maintain timing cycles to ensure that all functions happen appropriately.
	Perform Tin plating for different alloy metals by hot dipping/ wiping/ contact plating method.
	Ensure the line and machines are ready for future use.
18. Plan and perform Silver plating by different methods, examine various defects in Silver plating, causes and their remedies. Remove defective silver deposit by different methods. CP/N9415	Plan work in compliance with occupational safety and health.
	Prepare articles for silver plating.
	Perform Silver Plating by using hot alkaline cleaning method.
	Perform Silver Plating by using cathode cold cleaning or cyanide dips method.
	Demonstrate adjustment of current density and time for the required thickness.
	Perform bright silver plating.
	Demonstrate cathode movement of heavy silver deposit.
	Ensure the line and machines are ready for future use.
19. Plan and perform Gold plating by different methods, examine various defects in Gold plating, causes and their remedies. Remove defective gold deposit by different methods.	Plan work in compliance with occupational safety and health.
	Prepare job for gold plating by hot cleaning or degreasing, pickling etc.
	Demonstrate electro-cleaning, ultrasonic cleaning and steaming.
	Perform base coat of strike/flash layer in the items to be plated.
	Perform gold plating on various articles.
	Perform masking for different platings.
	Demonstrate striping of gold plating by electrolytic/ immersion

CP/N9416	method.
	Perform electro-polishing of gold plated articles.
	Demonstrate masking techniques for different plating and etching operations.
	Ensure the line and machines are ready for future use.
20. Plan and perform Brass plating, examine various defects in Brass plating, causes and their remedies. Remove defective brass deposit by different methods. CP/N9417	Plan work in compliance with occupational safety and health.
	Prepare solution for Brass plating.
	Prepare job for Brass plating.
	Perform Brass plating and ensure the appropriate temperature of the tanks and activate the electroplating process.
	Maintain timing cycles to ensure that all functions happen appropriately.
	Demonstrate effects of current variation in Brass plating.
	Demonstrate stripping of Brass deposit.
21. Perform Barrel plating method of electroplating for the plating of copper, nickel, tin, zinc and cadmium. CP/N9418	Plan work in compliance with occupational safety and health.
	Demonstrate equipment and solutions for barrel plating.
	Demonstrate racking/ wiring for barrel plating.
	Ensure the appropriate temperature of the tanks and activate the electroplating process.
	Maintain timing cycles to ensure that all functions happen appropriately.
	Perform silver/ gold plating on small articles using barrel plating.
	Perform Tin/ nickel plating on various articles using barrel plating.
	Ensure the line and machines are ready for future use.
22. Plan and perform electroless plating of copper, nickel, tin, silver and gold. CP/N9419	Plan work in compliance with occupational safety and health.
	Perform copper plating by electroless method.
	Perform nickel plating by electroless method.
	Perform tin plating by electroless method.
	Perform silver plating by electroless method.
	Perform gold plating by electroless method.
	Ensure the line and machines are ready for future use.
23. Plan and perform plating of copper, tin, nickel, zinc, cadmium etc. on	Plan work in compliance with occupational safety and health.
	Perform copper plating on aluminium articles.
	Perform nickel plating on aluminium articles.

aluminium with Zincate dipping process. CP/N9420	Perform tin plating on aluminium articles.
	Perform zinc plating on aluminium articles.
	Perform cadmium plating on aluminium articles.
	Ensure the line and machines are ready for future use.
24. Plan and perform plating of copper, nickel, chromium, silver and gold on non conductive surface like plastic. CP/N9421	Plan work in compliance with occupational safety and health.
	Perform copper plating on ABS plastic.
	Perform nickel plating on ABS plastic.
	Perform chromium plating on ABS plastic.
	Perform silver plating on ABS plastic.
	Perform gold plating on ABS plastic.
	Ensure the line and machines are ready for future use.
25. Make Printed circuit board with copper, nickel, tin, silver and gold. Perform chemical etching processes for copper and brass. CP/N9422	Plan work in compliance with occupational safety and health.
	Make Printed circuit board with copper/nickel/tin
	Make Printed circuit board with silver/ gold.
	Make letter printing on copper metal by chemical etching process.
	Make letter printing on brass metal by chemical etching process.
	Ensure the line and machines are ready for future use.
26. Plan and perform Anodizing to convert metal surface into a decorative, durable and corrosion resistant by different methods. Examine various defects generally encountered in anodising, causes and their remedies. Remove the defective anodised film by various methods. CP/N9423	Plan work in compliance with occupational safety and health.
	Prepare sulphuric acid solution for aluminium anodizing.
	Set up the anodizing vats and maintain timing cycles to ensure that all functions happen appropriately.
	Perform anodizing by chromic acid/ sulphuric acid/ oxalic acid.
	Ensure the line and machines are ready for future use.
27. Plan and perform various colouring techniques on anodised aluminium by different	Plan work in compliance with occupational safety and health.
	Perform metal colouring by chemical method.
	Perform metal colouring by electrolytic method.
	Demonstrate purification of different solution.

colouring dyes and other methods like electro colouring. CP/N9424	
28. Perform various conversions coating process on aluminium, magnesium and its alloys. Perform chemical milling on Aluminium and undertake passivation of stainless steel. CP/N9425	Plan work in compliance with occupational safety and health.
	Determine amount of substance by measuring the charges using Coulometer.
	Perform conversion coating on aluminium/ Zinc/ Copper/ Steel/ Magnesium alloys.
	Perform alodine treatment on Aluminium alloy.
	Perform chemical etching or chemical milling for steel/ aluminium parts.
	Demonstrate cleaning and surface preparation of stainless steel alloy.
	Demonstrate removal of foreign matter by grinding/ acid pickling method.
	Perform chromate conversion coating to passivate steel/ aluminium/ zinc/ cadmium/ copper/ silver/ magnesium/ tin alloys.
	Ensure the line and machines are ready for future use.
29. Plan and perform phosphating, powder coating and metallizing on various metals. CP/N9426	Plan work in compliance with occupational safety and health.
	Prepare the solution and set up for phosphating.
	Perform phosphating on various metals.
	Perform powder coating on various metals.
	Perform and practice metalizing on various metals.
	Ensure the line and machines are ready for future use.
30. Perform quality control aspect of the job and ensure electroplated surfaces are free of any flaws or defects. Perform various tests viz., adhesion, porosity, thickness, corrosion resistance, anodic coating on aluminium, chemical analysis of electrolytes and	Plan work in compliance with occupational safety and health.
	Find out defects on different electroplated articles by visual inspection.
	Perform corrosion resistance test on stainless steel alloys.
	Determine local thickness by using micrometers/ BNF Jet test method.
	Determine local thickness by using ultrasonic thickness tester.
	Perform testing of adhesion of electrodeposits on given platted alloys.

identification of deposits etc. CP/N9427	
31. Prepare layout of electroplating plant, estimate cost, materials and accessories required for electroplating shop. Carryout preventive and breakdown maintenance of machines in electroplating shop. CP/N9428	Plan work in compliance with occupational safety and health.
	Explain suitability and selection of equipment for electroplating shops.
	Prepare layout of the electroplating shop with details of plant machineries.
	Carry out preventive maintenance of electroplating shop machineries.
32. Read and apply engineering drawing for different application in the field of work. CP/N9429	Read & interpret the information on drawings and apply in executing practical work.
	Read &analyze the specification to ascertain the material requirement, tools and assembly/maintenance parameters.
	Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
33. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. CP/N9430	Solve different mathematical problems
	Explain concept of basic science related to the field of study

7. TRADE SYLLABUS

SYLLABUS FOR ELECTROPLATER TRADE			
FIRST YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
Professional Skill 105 Hrs; Professional Knowledge 24 Hrs	Prepare profile with an appropriate accuracy as per drawing following safety precautions. (MAPPED NOS : CP/N9401)	1. Visit various sections of the institutes and location of electrical installations. (04 hrs.) 2. Identify safety symbols and hazards. (04 Hrs.) 3. Preventive measures for electrical accidents and practice steps to be taken in such accidents. (04 hrs.) 4. Practice safe methods of fire fighting in case of electrical fire. (04 hrs.) 5. Operate a fire extinguisher and put out a fire. (04 Hrs.) 6. Practice elementary first aid. (04 hrs.)	Familiarization with the department, institute, trades etc. Introduction to Electroplater trade. Safety rules and safety signs. Types and working of fire extinguishers. Various safety measures involved in the Industry. First aid safety practice. Hazard identification and prevention. Personal safety and factory safety. Response to emergencies e.g. power failure, system failure

		7. Rescue a person and practice artificial respiration. (04 Hrs.) 8. Disposal procedure of waste materials. (04 Hrs.) 9. Practice on cleanliness and procedure to maintain it. (04 hrs.) 10. Identify hazardous chemicals. (04 hrs.)	and fire etc. Hazardous chemicals and safety. (08 hrs)
		11. Identify trade tools and machineries. (05 Hrs.) 12. Practice on preparing T-joint, straight joint and dovetail joint on wooden blocks. (10 Hrs.) 13. Practice sawing, planning, drilling and assembling for making a wooden switchboard. (10 Hrs.) 14. Practice in marking and cutting of straight and curved pieces in metal sheets, making holes, securing by screw and riveting. (10 Hrs.) 15. Workshop practice on filing and hacksawing. (10 Hrs.) 16. Workshop practice on drilling, chipping, internal and external threading of different sizes. (10 Hrs.) 17. Prepare an open box from metal sheet. (10 Hrs.)	Allied trades: Introduction to fitting tools, safety precautions. Description of files, hammers, chisels hacksaw frames, blades, their specification and grades. Marking tools description and use. Types of drills, description & drilling and grinding machines. Various wooden joints. Carpenter and Sheet metal tools: Description of marking & cutting tools. Types of rivets and riveted joints. Use of thread gauge. Physical and mechanical properties of engineering metals: colour, weight, structure, conductivity, magnetic, fusibility and specific gravity. Mechanical properties: ductility, malleability hardness, brittleness, toughness, tenacity, and elasticity. (16 hrs)
Professional	Prepare electrical	18. Prepare terminations of	Conductors and insulators.

Skill 50 Hrs; Professional Knowledge 09 Hrs	wire joints, carry out soldering and crimping. (MAPPED NOS : MIN/N3102)	cable ends (06hrs.) 19. Practice on skinning, twisting and crimping. (06Hrs.) 20. Identify various types of cables and measure conductor size using SWG and micrometer. (06Hrs.) 21. Make simple twist, married, Tee and western union joints. (10Hrs.) 22. Make britannia straight, britannia Tee and rat tail joints. (10Hrs.) 23. Practice in Soldering of joints/ lugs. (12Hrs.)	Conducting materials and their comparison. Wires and cables- types, measurement of wire size, voltage grading. SWG and outside micro meter. Crimping and crimping tool. Joints in electrical conductors. Techniques of soldering. Types of solders and flux. (08 hrs)
Professional Skill 50 Hrs; Professional Knowledge 09 Hrs	Verify characteristics of electrical and magnetic circuits. (MAPPED NOS : MIN/N3101, MIN/N3103)	24. Identify polarity of DC supply by various methods. (05 hrs.) 25. Connection of voltmeter and ammeter and to measure voltage current and power. (05hrs.) 26. Verify laws of series and parallel circuits with voltage source in different combinations. (08Hrs.) 27. Verify the characteristics of series parallel combination of resistors. (05Hrs.) 28. Verify the relationship between V,I and R in a DC circuit. (08hrs.) 29. Measure the value of resistance by Ohm's Law. (05Hrs.) 30. Trace the magnetic poles of a bar magnet. (05 hrs.) 31. Prepare an electromagnet	Fundamentals of electricity, definitions, units & effects of electric current. Types of electrical supply. Comparison and Advantages of DC and AC. Polarity test in DC. Resistance and specific resistance. Laws of Resistance and various types of resistors. Measurement of low and medium resistance. Electrical measuring instruments such as Voltmeter, Ammeter and Ohmmeter. Series and parallel combinations of resistors. Ohm's Law. Simple electrical circuits and problems. Magnetic terms; magnetic materials and properties of magnet. Electro magnet,

		(05 hrs.) 32. Identify the phase and neutral in single phase AC supply by various methods. (04hrs.)	Faradays laws of electro-magnetic induction. Alternating current - vector diagrams. (08 hrs)
Professional Skill 50 Hrs; Professional Knowledge 09 Hrs	Carry out Installation, testing and maintenance of batteries with due care and safety. (MAPPED NOS : CP/N9402)	33. Practice proper use of different types of cells. (05hrs.) 34. Practice on grouping of cells for specified voltage and current under different conditions and care. (10 Hrs.) 35. Prepare and practice on battery charging. (15Hrs.) 36. Practice on routine, care and maintenance of batteries. (10 hrs.) 37. Perform testing of batteries. (10Hrs.)	Types of cells, advantages/ disadvantages and their applications. Primary cells and secondary cells, Grouping of cells. Charging of battery, care and maintenance. Sealed Maintenance free Batteries. (08 hrs)
Professional Skill 70 Hrs; Professional Knowledge 12 Hrs	Perform wiring, installation of electrical accessories and earthing of electrical equipment. (MAPPED NOS : MIN/N3101, MIN/N3102, MIN/N3105)	38. Demonstrate wiring accessories. (05 hrs.) 39. Practice on installation and overhauling common electrical accessories. (05 hrs.) 40. Fixing of switches, holder plugs etc. in wooden/PVC/ Metallic boards. (10 hrs.) 41. Wire up a test board and test it. (10 hrs.) 42. Practice of various types of electrical circuit connections such as one lamp, two lamp, three lamp with wall socket, stair case wiring, tube light connection etc. (20 hrs.) 43. Wire up two lamps	Common Electrical wiring Accessories, their specifications and B.I.S. Symbols. Diagrams and systems used in domestic wiring. (12 hrs)

		alternatively ON and OFF, bright and dim, godown wiring, railway signal wiring. (20 hrs.)	
Professional Skill 50 Hrs; Professional Knowledge 08 Hrs	Construct small electronic circuits as per drawing using basic electronic components. (MAPPED NOS : CP/N9403)	44. Determine the resistance by colour coding. (05hrs.) 45. Identify active and passive electronic components. (05hrs.) 46. Identify terminals of different electronic components viz., resistors, diodes, transistors etc. (05hrs.) 47. Verification of characteristics of diode. (05hrs.) 48. Construct and test half wave rectifier circuit. (10hrs.) 49. Construct and test full wave rectifier circuit. (10hrs.) 50. Construct and test bridge rectifier circuit. (10hrs.)	**Basic electronics** Semiconductor energy level, atomic structure, types of materials, P-N-junction. Doping, Intrinsic and extrinsic semiconductor, Covalent bond. PN junction diode, Forward and Reverse characteristics. Specification and applications of diodes. Explanation of D.C. rectifier circuit. Half wave, Full wave and Bridge circuit. (08 hrs)
Professional Skill 70 Hrs; Professional Knowledge 16 Hrs	Explain principles and basic process of plating one metal onto another by electrolysis. Use laboratory apparatus and estimate pH, mass, normality, conductivity, specific gravity etc. (MAPPED NOS : CP/N9404)	51. Identify the laboratory apparatus. (04 hrs.) 52. Verify action of pure and salt water on metals and alloys. (04hrs.) 53. Practice identification of acids and alkalis using litmus paper and other methods. (04 hrs.) 54. Prepare a solution with de ionized water. (04 hrs.) 55. Analyse the reactions of anions (04 hrs.) 56. Analyse the reactions of	Familiarization of laboratory apparatus. Hard and soft water, water for industrial purposes. Technique to convert hard water to soft water. Types of solutions, saturated, unsaturated, super saturated solutions, solubility of solids, distilled and de-ionized water, melting and boiling points. Reactions of anions and cations. Exothermic and endothermic reactions.

		cations (04 hrs.) 57. Determine the normality and mass per litre of sodium hydroxide, sodium carbonate, potassium hydroxide, hydrochloric acid, sulphuric acid and oxalic acid. (10 hrs.) 58. Estimate the mass of sodium hydroxide, sodium carbonate, potassium hydroxide, hydrochloric acid, sulphuric acid and oxalic acid in a given solution. (10 hrs.) 59. Measure the specific gravity of liquid sample and check the temperature in degree centigrade and convert to Fahrenheit. (04 hrs.) 60. Determine pH value of different liquids using pH meter. (04hrs.) 61. Study the change in pH of acetic acid on the addition of sodium acetate. (04 hrs.) 62. Determine the conductivity of different liquids using conductivity meter. (04hrs.) 63. Measure boiling point a liquid. (05 Hrs.) 64. Measure melting point of a solid. (05hrs.)	Qualitative analysis. Reactions of cations and anions. The terms involved in volumetric analysis i.e. Standard solution, normality, titration, titrant, titrate, end point, indicator etc. Principles of volumetric analysis, equivalent masses, normality, molarity, indicators. Acidimetry and alkalimetry. Density and specific gravity. Thermometer and hydrometer. Degree Centigrade, Fahrenheit and its conversion. Definition of pH, pH scale, Chemical effect of electric current, ECE and principle of electrolysis. Faraday's Law of electrolysis. Explanation of Anodes and cathodes. (16 hrs)
Professional Skill 75 Hrs; Professional	Handle different solutions with due care & safety and undertake metal	65. Identify and demonstrate soft water & de-mineralized water. (05 hrs.) 66. Identify and demonstrate	Various types of corrosions and importance of protective treatments. Principles and applications of

Knowledge 12 Hrs	treatment processes and effluent treatment of hazardous chemicals in electroplating workshop. Prepare chemical solutions and undertake cooling, heating, filtering, agitating and other treatments for solutions. Carry out analysis of chemical baths with Hull cell process. (MAPPED NOS : CP/N9405)	various types of corrosions. (05 hrs.) 67. Demonstrate basic safety precautions to be taken while handling different types of electroplating solutions and effluent discharge. (05hrs.) 68. Demonstrate safety precautions to be taken while handling cyanide base electroplating salts and chrome containing effluent. (05hrs.) 69. Perform effluent treatment of hazardous chemicals in plating shop. (08hrs.) 70. Demonstrate and practice first aid and antidotes for cyanide poisonings. (08 hrs.) 71. Perform setting up of plating tanks and connections. (10hrs.) 72. Determine ECE values of different solutions. (05 hrs.) 73. Practice identification of acids and alkalis using Red/ Blue litmus paper. (05 hrs.) 74. Determine pH value using pH paper and digital pH meter. (05 hrs.) 75. Measure the specific gravity of liquid sample and check the temperature. (06hrs.) 76. Carry out analysis of chemical baths with Hull	electroplating. General terms and definitions subjected to electroplating. Safety precautions in electroplating shop. First aid and antidotes for chemical poisoning. Exothermic and endothermic reactions. Chemical formulas of different acids, alkalis & cyanides. Properties and Values of ECE for different metals. Precautions to be observed. Method of mixing of electrolyte, use of hydrometer & thermometer. Environmental pollution related to the trade, consequences, mitigation & control. Knowledge about molecular weight, equivalent weight. Hard and soft water, water for industrial purposes. Technique to convert hard water to soft water. Theory involved in the treatment of plating effluent, pollution control, standard rules governing discharge of effluents. Types of solutions, saturated, unsaturated, super saturated solutions, solubility of solids, Analysis of chemical baths

		cell process. (08hrs.)	with Hull cell process. (12 hrs)
Professional Skill 90 Hrs; Professional Knowledge 21 Hrs	Plan and perform all the various aspects of the plating process including surface preparation, mechanical cleaning like polishing, buffing, blasting etc. and chemical cleaning like electro cleaning, ultrasonic cleaning, vapour degreasing, pickling, rinsing, masking etc. (MAPPED NOS : CP/N9406)	77. Identify and demonstrate the equipments used in electroplating shop. (05 hrs.) 78. Demonstrate various polishing wheels and compounds used in surface preparation process. (06 hrs.) 79. Practice cleaning of articles before plating viz., scrubbing with emery paper, wet sand, scratch brushes, wire wheel etc. (07 hrs.) 80. Prepare glue and emery wheel binding. (06 hrs.) 81. Practice surface preparation of ferrous/ non ferrous alloys including acid cleaning, polishing, buffing and blast cleaning. (12 hrs.) 82. Prepare suitable dips and pickling for removing of scales from surface of iron and steel. (07 hrs.) 83. Practice in cleaning by means of tumbling barrels. (05 hrs.) 84. Practice ultrasonic cleaning to remove soil from inaccessible places as crevices, blind holes, and gear teeth etc. (06 hrs.) 85. Practice anodic/ cathodic cleaning. (08 hrs.) 86. Practice cleaning of specific	Requirements of a plating shop. Abrasives and Adhesives used for the preparation of wheels. Various compounds used for polishing and buffing. Importance of cleaning, its types, ex. a) Mechanical / chemical. b) Polishing / buffing c) Abrasive cleaning d) Degreasing, pickling, hot alkaline cleaning& final cleaning. Equivalent weight of compounds, acids, oxide, reduction of acids and stopping off compounds. Chemical cleaning methods by acid dipping, alkaline soak cleaning, vapour degreasing, ultrasonic cleaning, alkaline electro cleaning etc. Different plating techniques for ferrous & non-ferrous metals. General care and maintenance of plating baths, electroplating tank & lining. Various methods of masking. (21 hrs)

		metals such as iron, steel, stainless steel, nickel, brass, copper etc. (10 hrs.) 87. Practice degreasing (vapour and immersion) process to include organic solvent i.e., TCE/PCE. (03 hrs.) 88. Practice in using cleaning tanks, preparing suitable solution and methods of masking. (10 hrs.) 89. Practice cleaning of oxidation stains on the articles of copper, brass, nickel and silver. (05 hrs.)	
Professional Skill 70 Hrs; Professional Knowledge 12 Hrs	Plan and perform Copper plating using different methods, examine various defects, causes and their remedies. Remove defective copper deposit by different methods. (MAPPED NOS : CP/N9407)	90. Practice setting up of copper plating in acid bath. (10 hrs.) 91. Prepare the acid solution for copper plating. (05 hrs.) 92. Perform copper plating on different ferrous metals from acid bath. (15 hrs.) 93. Practice setting up of copper plating in cyanide bath. (10 hrs.) 94. Prepare the cyanide solution for copper plating. (05 hrs.) 95. Practice and perform electro deposition of copper on different ferrous metals by cyanide solution. (20 hrs.) 96. Practice to remove the defective copper deposit from ferrous metal by immersion and electrolytic	Properties of copper, Applications and uses of copper plating in acid bath. Equipments for copper plating in acid bath, Various types of copper solutions in acid type, their compositions and operating conditions, their preparation and maintenance. Processing steps of copper plating in acid bath. Various defects generally encountered in the acid type copper plating, causes for these defects and their remedies Applications and uses of copper plating in cyanide bath. Equipments for copper plating in cyanide bath, Various types of copper solutions in cyanide

		methods. (05 hrs.)	type, their compositions and operating conditions, their preparation and maintenance. Processing steps of copper plating in cyanide bath. Various defects generally encountered in the cyanide type copper plating, causes for these defects and their remedies. Various methods for the removal of copper deposit. (09 hrs)
Professional Skill 70 Hrs; Professional Knowledge 09 Hrs	Plan and perform Nickel plating using different methods, examine various defects in Nickel plating, causes and their remedies. Remove defective Nickel deposit by different methods. (MAPPED NOS : CP/N9408)	97. Practice setting up of nickel-plating bath. (05 hrs.) 98. Prepare the solution for Nickel plating. (05 hrs.) 99. Perform Nickel plating in articles made of iron. (15 hrs.) 100. Perform Nickel plating in articles made of copper. (15 hrs.) 101. Perform Nickel plating in articles made of brass. (15 hrs.) 102. Practice to remove the defective nickel deposit from different metals by immersion and electrolytic methods. (10 hrs.) 103. Perform carbon treatment and other maintenance of nickel solution. (05 hrs.)	Properties of nickel. Applications and uses of nickel plating. Equipments for nickel plating, Various types of nickel solutions like dull, bright, black etc, their chemical compositions, operating conditions and their preparation. Importance and maintenance of pH value, density, agitation and filtration. Removal of impurities by carbon treatment and filtration. Processing steps of nickel plating. Various defects generally encountered in the nickel plating, causes for these defects and their remedies Various methods for the removal of nickel deposit from different metals. (12 hrs)

Professional Skill 90 Hrs; Professional Knowledge 21 Hrs	Plan and perform Bright and Hard Chromium plating by different methods on ferrous and non-ferrous metals, examine various defects in Chromium plating, causes and their remedies. Remove the defective Chromium deposit by different methods. (MAPPED NOS : CP/N9409)	104. Practice setting up of bright chromium plating bath. (10 hrs.) 105. Prepare the solution for bright chromium plating. (05 hrs.) 106. Perform bright chromium plating in articles made of iron. (15 hrs.) 107. Perform bright chromium plating in articles made of copper. (15 hrs.) 108. Practice setting up of hard chromium plating bath. (10 hrs.) 109. Prepare the solution for hard chromium plating. (05 hrs.) 110. Perform hard chromium plating in articles made of iron. (10 hrs.) 111. Perform hard chromium plating in articles made of copper. (10 hrs.) 112. Practice to remove the defective chromium deposit from different metals by immersion and electrolytic methods. (10 hrs.)	Safety precautions & Exhaust, preventive methods for removing fumes from chromium plating solutions. Applications and uses of bright chromium plating. Equipments for chromium plating, Anodes for chromium plating Regeneration of chromium plating solutions, Proper maintenance, removal of excess sulphate, rectification of trivalent chromium. Various types of bright chromium solutions like regular, self regulating and black chromium, their chemical compositions, operating conditions and their preparation. Processing steps of bright chromium plating. Various defects generally encountered in the bright chromium plating, causes for these defects and their remedies. Applications and uses of hard chromium plating. Various types of hard chromium solutions like regular, high speed and self regulating chromium, their chemical compositions, operating conditions and their preparation. Processing steps of hard chromium plating.

			Various defects generally encountered in the hard chromium plating, causes for these defects and their remedies. Various methods for the removal of chromium deposit from different metals. (21 hrs)
ENGINEERING DRAWING (40 Hrs.)			
Professional Knowledge ED- 40 Hrs.	Read and apply engineering drawing for different application in the field of work. (MAPPED NOS : CP/N9410)	**Engineering Drawing:** Introduction to Engineering Drawing and Drawing Instruments – Conventions Sizes and layout of drawing sheets Title Block, its position and content Drawing Instrument Free hand drawing of – Geometrical figures and blocks with dimension Transferring measurement from the given object to the free hand sketches. Free hand drawing of hand tools. Drawing of Geometrical figures: Angle, Triangle, Circle, Rectangle, Square, Parallelogram. Lettering & Numbering – Single Stroke Dimensioning Practice Types of arrowhead Symbolic representation – Different electrical symbols used in the related trades Reading of Electrical Circuit Diagram Reading of Electrical Layout drawing	
WORKSHOP CALCULATION & SCIENCE (38 Hours)			
Professional Knowledge WCS - 38 Hrs.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (MAPPED NOS : CP/N9411)	**WORKSHOP CALCULATION & SCIENCE:** **Unit, Fractions** Classification of unit system Fundamental and Derived units F.P.S, C.G.S, M.K.S and SI units Measurement units and conversion Factors, HCF, LCM and problems Fractions - Addition, substraction, multiplication & division Decimal fractions - Addition, subtraction, multiplication & division Solving problems by using calculator **Square root, Ratio and Proportions, Percentage** Square and square root	

		Simple problems using calculator Applications of Pythagoras theorem and related problems Ratio and proportion Ratio and proportion - Direct and indirect proportions Percentage Percentage - Changing percentage to decimal and fraction **Material Science** Types metals, types of ferrous and non-ferrous metals Physical and mechanical properties of metals Introduction of iron and cast iron Difference between iron & steel, alloy steel and carbon steel Properties and uses of rubber, timber and insulating materials **Mass, Weight, Volume and Density** Mass, volume, density, weight Related problems for mass, volume, density, weight and specific gravity **Heat & Temperature and Pressure** Concept of heat and temperature, effects of heat, difference between heat and temperature, boiling point & melting point of different metals and non-metals Scales of temperature, Celsius, Fahrenheit, kelvin and conversion between scales of temperature **Basic Electricity** Introduction and uses of electricity, molecule, atom, how electricity is produced, electric current AC, DC their comparison, voltage, resistance and their units Conductor, insulator, types of connections - series and parallel Ohm's law, relation between V.I.R & related problems Electrical power, energy and their units, calculation with assignments **Mensuration** Area and perimeter of square, rectangle and parallelogram Area and perimeter of Triangles Area and perimeter of circle, semi-circle, circular ring, sector of circle, hexagon and ellipse Surface area and volume of solids - cube, cuboid, cylinder, sphere and hollow cylinder **Trigonometry** Measurement of angles Trigonometrical ratios Trigonometrical tables
Project work / Industrial visit **Broad Areas:** a) Copper electroplating		

b) Nickel electroplating
c) Bright and hard chromium plating

SYLLABUS FOR ELECTROPLATER TRADE			
SECOND YEAR			
Duration	**Reference Learning outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
Professional Skill 125 Hrs; Professional Knowledge 40 Hrs	Plan and perform Zinc plating using different methods, examine various defects in Zinc plating, causes and their remedies. Remove defective Zinc deposit by different methods. (MAPPED NOS : CP/N9412)	113. Practice setting up of zinc plating for acid bath. (10 hrs.) 114. Prepare the acid solution for zinc plating. (10 hrs.) 115. Perform zinc plating on different ferrous metals in acid bath and passivate with different colours. (20 hrs.) 116. Perform zinc plating on different non-ferrous metals in acid bath and passivate with different colours. (20 hrs.) 117. Practice setting up of zinc plating for cyanide and alkaline zinc bath. (10 hrs.) 118. Prepare the cyanide and alkaline zinc solution for zinc plating. (10 hrs.) 119. Perform zinc plating on different ferrous metals in cyanide and alkaline zinc bath and passivate with different colours. (20 hrs.) 120. Perform zinc plating on different non ferrous metals in cyanide and alkaline zinc bath and passivate with different	Properties of zinc. Applications and uses of zinc plating. Equipments for zinc plating in acid bath. Various types of zinc solutions for acid bath, their compositions and operating conditions, their preparation and maintenance. Processing steps of zinc plating in acid bath. Equipments for zinc plating in cyanide bath. Various types of zinc solutions for cyanide bath, their compositions and operating conditions, their preparation and maintenance. Processing steps of zinc plating In cyanide bath. Various colouring solutions for passivating the zinc deposit. Various defects generally encountered in the zinc plating in acid and cyanide bath, causes for these defects and their remedies Methods for the removal of zinc deposit from various

		colours. (15 hrs.) 121. Practice to remove the defective zinc deposit from various metals by immersion and electrolytic methods. (10 hrs.)	metals. (28 hrs)
Professional Skill 40 Hrs; Professional Knowledge 11 Hrs	Plan and perform Cadmium plating using different methods, examine various defects in Cadmium plating, causes and their remedies. Remove defective Cadmium deposit by different methods. (MAPPED NOS : CP/N9413)	122. Setting up of cadmium plating bath. (10 hrs.) 123. Prepare the solution for cadmium plating. (05 hrs.) 124. Perform cadmium plating on different ferrous metals and passivate with different colours. (05 hrs.) 125. Perform cadmium plating on different non ferrous metals and passivate with different colours. (10 hrs.) 126. Practice to remove the defective cadmium deposit from various metals by immersion and electrolytic methods. (10 hrs.)	Properties of cadmium. Applications and uses of cadmium plating. Equipments for cadmium plating. Various types of cadmium solutions, their compositions and operating conditions, their preparation and maintenance. Various colouring solutions for passivating the cadmium deposit. Processing steps of cadmium plating. Various defects generally encountered in the cadmium plating, causes for these defects and their remedies Methods for the removal of cadmium deposit from various metals. (12 hrs)
Professional Skill 40 Hrs; Professional Knowledge 11 Hrs	Plan and perform Tin plating using different methods, examine various defects in Tin plating, causes and their remedies. Remove defective Tin deposit by different methods. (MAPPED NOS : CP/N9414)	127. Practice setting up of Tin plating bath. (05 hrs.) 128. Prepare the solution for Tin plating. (05 hrs.) 129. Perform Tin plating on different ferrous metals. (10 hrs.) 130. Perform Tin plating on different non ferrous metals. (10 hrs.) 131. Practice to remove the defective Tin deposit	Properties of Tin, Applications and uses of Tin plating. Equipments for Tin plating in acid bath. Various types of Tin solutions for acid bath, their compositions and operating conditions, their preparation and maintenance. Processing steps of Tin plating in acid bath. Equipments for Tin plating in cyanide bath. Various types of

		from various metals by immersion and electrolytic methods. (10 hrs.)	Tin solutions for cyanide bath, their compositions and operating conditions, their preparation and maintenance. Processing steps of Tin plating In cyanide bath. Various defects generally encountered in the Tin plating in acid and cyanide bath, causes for these defects and their remedies Methods for the removal of Tin deposit from various metals. (12 hrs)
Professional Skill 65 Hrs; Professional Knowledge 16 Hrs	Plan and perform Silver plating using different methods, examine various defects in Silver plating, causes and their remedies. Remove defective Silver deposit by different methods. (MAPPED NOS : CP/N9415)	132. Setting up of Silver plating bath. (10 hrs.) 133. Prepare the solution for Silver plating. (05 hrs.) 134. Perform Silver plating on different ferrous metals. (20 hrs.) 135. Perform Silver plating on different non ferrous metals. (20 hrs.) 136. Practice to remove the defective Silver deposit from various metals by immersion and electrolytic methods. (10 hrs.)	Properties of Silver, Applications and uses of Silver plating. Equipments for Silver plating. Various types of Silver solutions, their compositions and operating conditions, their preparation and maintenance. Processing steps of Silver plating. Various defects generally encountered in the Silver plating, causes for these defects and their remedies. Methods for the removal of Silver deposit from various metals. (18hrs)
Professional Skill 40 Hrs; Professional Knowledge 11 Hrs	Plan and perform Gold plating by different methods, examine various defects in Gold plating, causes and their remedies.	137. Practice setting up of Gold plating bath. (05 hrs.) 138. Prepare the solution for Gold plating. (05 hrs.) 139. Perform Gold plating on different ferrous metals.	Properties of Gold, Applications and uses of Gold plating. Equipments for Gold plating. Various types of Gold solutions, their compositions and operating conditions, their preparation and

	Remove defective Gold deposit by different methods. (MAPPED NOS : CP/N9416)	(10 hrs.) 140. Perform Gold plating on different non ferrous metals. (10 hrs.) 141. Practice to remove the defective Gold deposit from various metals by immersion and electrolytic methods. (10 hrs.)	maintenance. Processing steps of Gold plating. Various defects generally encountered in the Gold plating, causes for these defects and their remedies Methods for the removal of Gold deposit from various metals. (12 hrs)
Professional Skill 40 Hrs; Professional Knowledge 11 Hrs	Plan and perform Brass plating using different methods, examine various defects in Brass plating, causes and their remedies. Remove defective Brass deposit by different methods. (MAPPED NOS : CP/N9417)	142. Prepare the solution for Brass plating and setting up the bath. (05 hrs.) 143. Perform Brass plating on different ferrous metals. (15hrs.) 144. Perform Brass plating on different non ferrous metals. (15hrs.) 145. Practice to remove the defective Brass deposit from various metals by immersion and electrolytic methods. (05 hrs.)	Properties of Brass, Applications and uses of Brass plating. Equipments for Brass plating. Various types of Brass solutions, their compositions and operating conditions, their preparation and maintenance. Processing steps of Brass plating. Various defects generally encountered in the Brass plating, causes for these defects and their remedies Methods for the removal of Brass deposit from various metals. (12 hrs)
Professional Skill 40 Hrs; Professional Knowledge 11 Hrs	Perform Barrel plating method of electroplating for the plating of copper, nickel, tin, zinc and cadmium. (MAPPED NOS : CP/N9418)	146. Perform copper plating of small articles by barrel method. (08 hrs.) 147. Perform nickel plating of small articles by barrel method. (08 hrs.) 148. Perform tin plating of small articles by barrel method. (08 hrs.) 149. Perform zinc plating of	Applications of barrel plating in electroplating industry. Types of barrels used for barrelling. Automatic barrel plating plants in the modern industry. Preparation of articles prior to barrel plating. Barrel plating solutions and the operating conditions used for barrel

		small articles by barrel method. (08 hrs.) 150. Perform cadmium plating of small articles by barrel method. (08 hrs.)	plating of copper, nickel, tin, zinc and cadmium. General defects, their causes and remedies in barrel plating. (12 hrs)
Professional Skill 40 Hrs; Professional Knowledge 11 Hrs	Plan and perform electroless plating of copper, nickel, tin, silver and gold. (MAPPED NOS : CP/N9419)	151. Perform copper plating by electroless method. (08 hrs.) 152. Perform nickel plating by electroless method. (08 hrs.) 153. Perform tin plating by electroless method. (08 hrs.) 154. Perform silver plating by electroless method. (08 hrs.) 155. Perform gold plating by electroless method. (08 hrs.)	Applications of electroless plating in electroplating industry. Preparation of articles prior to electroless plating. Electroless plating solutions and their operating conditions of copper, nickel, tin, silver and gold. General defects, their causes and remedies in electroless plating. (12 hrs)
Professional Skill 40 Hrs; Professional Knowledge 11 Hrs	Plan and perform plating of copper, tin, nickel, zinc, cadmium etc. on aluminium with Zincate dipping process. (MAPPED NOS : CP/N9420)	156. Perform copper plating on aluminium articles. (08 hrs.) 157. Perform nickel plating on aluminium articles. (08 hrs.) 158. Perform tin plating on aluminium articles. (08 hrs.) 159. Perform zinc plating on aluminium articles. (08 hrs.) 160. Perform cadmium plating on aluminium articles. (08 hrs.)	Applications of electroplating on aluminium. Preparation of aluminium articles prior to plating. Solution composition, preparation and operating conditions of zincate dipping process. Processing steps of copper, nickel, tin, zinc and cadmium plating on aluminium. General defects, their causes and remedies in plating of aluminium. Removal of copper, nickel, tin, zinc and cadmium deposit from aluminium articles. (12 hrs)
Professional	Plan and perform	161. Perform copper plating	Applications of electroplating

Skill 40 Hrs; Professional Knowledge 11 Hrs	plating of copper, nickel, chromium, silver and gold on non conductive surface like plastic. (MAPPED NOS : CP/N9421)	on ABS plastic. (08 hrs.) 162. Perform nickel plating on ABS plastic. (08 hrs.) 163. Perform chromium plating on ABS plastic. (08 hrs.) 164. Perform silver plating on ABS plastic. (08 hrs.) 165. Perform gold plating on ABS plastic. (08 hrs.)	on plastic and non conductive surfaces. Properties of ABS plastic. Preparation of ABS plastics prior to plating. Solution composition, preparation and operating conditions of plating on plastic processes. Processing steps of copper, nickel, chromium, silver and gold plating on ABS plastic. General defects, their causes and remedies in plating of non conductive surfaces. Removal of coating from ABS plastic surfaces. (12 hrs)
Professional Skill 65 Hrs; Professional Knowledge 17 Hrs	Make Printed circuit board with copper, nickel, tin, silver and gold and chemical etching processes for copper and brass. (MAPPED NOS : CP/N9422)	166. Make Printed circuit board with copper. (08 hrs.) 167. Make Printed circuit board with nickel. (08 hrs.) 168. Make Printed circuit board with tin. (08 hrs.) 169. Make Printed circuit board with silver. (08 hrs.) 170. Make Printed circuit board with gold. (08 hrs.) 171. Make letter printing on copper metal by chemical etching process. (10 hrs.) 172. Make letter printing on brass metal by chemical etching process. (15 hrs.)	Applications printed circuit boards in electronic industry. Types of base materials of PCB. Methods of Layout marking. Immersion copper and etching solutions and operating conditions. Processing steps for making PCB with copper, nickel, tin, silver and gold. General defects, their causes and remedies in making of PCBs. Solution Solution composition, operating conditions and processing steps of brass etching. (18 hrs)
Professional Skill 40 Hrs; Professional	Plan and perform Anodizing to convert metal surface into a	173. Prepare solution for anodizing in sulphuric acid and set up the bath. (05 hrs.)	Properties of aluminium and its corrosion. Applications and uses of anodizing.

Knowledge 11 Hrs	decorative, durable and corrosion resistant by different methods. Examine various defects in anodizing, causes and their remedies. Remove the defective anodized film by various methods. (MAPPED NOS : CP/N9423)	174. Perform and practice aluminium anodizing in sulphuric acid bath. (05 hrs.) 175. Prepare solution for anodizing in chromic acid and set up the bath. (05 hrs.) 176. Practice anodizing by using chromic acid. (05 hrs.) 177. Prepare solution for anodizing in oxalic acid and set up the bath. (05 hrs.) 178. Practice anodizing by using oxalic acid. (10 hrs.) 179. Practice removal of anodised film from aluminium articles. (05 hrs.)	Preparation of aluminium articles prior to anodizing. Types of anodizing solutions, preparation and operating conditions. Processing steps of anodizing process. Post treatments of anodizing. General defects, their causes and remedies in anodizing of aluminium. Removal of anodized film from aluminium articles. (12 hrs)
Professional Skill 40 Hrs; Professional Knowledge 12 Hrs	Plan and perform various colouring techniques on anodized aluminium by different colouring dyes and other methods like electro colouring. (MAPPED NOS : CP/N9424)	180. Prepare solution for various colouring solutions by various colour dye stuffs. (08 hrs.) 181. Practice colouring on anodised aluminium article by using various colouring solutions. (08 hrs.) 182. Prepare solution for electro colouring and setting up the bath. (08 hrs.) 183. Practice electro colouring on anodised aluminium article with various colour shades. (08 hrs.) 184. Remove the colour	Applications and uses of anodized colouring. Methods of various colouring techniques. Preparation and operating conditions of various colouring solutions for anodized aluminium articles. Processing steps for colouring. Post treatments of colouring. General defects, their causes and remedies in colouring of anodized parts. Removal of colour film from anodized aluminium articles. (12 hrs)

		without attacking the anodised film. (08 hrs.)	
Professional Skill 40 Hrs; Professional Knowledge 12 Hrs	Perform various conversions coating process on aluminium, magnesium and its alloys. Perform chemical milling on aluminium and undertake passivation of stainless steel. (MAPPED NOS : CP/N9425)	185. Prepare solution for conversion coating on aluminium. (05 hrs.) 186. Practice conversion coating on aluminium and magnesium parts. (05 hrs.) 187. Remove the conversion coating without attacking the base metal. (05 hrs.) 188. Prepare and set up the bath for chemical milling. (05 hrs.) 189. Practice chemical milling on aluminium. (05 hrs.) 190. Prepare solution for stainless steel passivation. (05 hrs.) 191. Practice passivation on stainless steel. (10 hrs.)	Properties and applications for conversion coating. Preparation of solution and operating conditions. Processing steps of conversion coating on aluminium. Removal of conversion coating. Application and uses of chemical milling on aluminium. Preparation of solution and operating conditions. Processing steps of chemical milling on aluminium. Application and uses of passivation on stainless steel. Preparation of solution and operating conditions for passivation on stainless steel. Processing steps for passivation on stainless steel. (12 hrs)
Professional Skill 40 Hrs; Professional Knowledge 12 Hrs	Plan and perform phosphating, powder coating and metallizing on various metals. (MAPPED NOS : CP/N9426)	192. Prepare the solution and set up for phosphating. (05 hrs.) 193. Perform and practice phosphating on various metals. (10 hrs.) 194. Perform and practice powder coating on various metals. (10 hrs.) 195. Perform and practice metallizing on various metals. (15 hrs.)	Application and uses of phosphating. Types of phosphating solutions. Preparation of solution and operating conditions for phosphating. Processing steps for phosphating. Post treatment for phosphating. Application and uses of powder coating. Equipments for powder coating. Preparation and operating conditions for powder coating. Processing steps and post treatments for powder

			coating. General care and maintenance for powder coating machine. Application and uses of metallizing. Equipments for metallizing. Preparation and operating conditions for metallizing. Processing steps and post treatments for metallizing. General care and maintenance for metallizing machine. (12 hrs)
Professional Skill 65 Hrs; Professional Knowledge 18 Hrs	Perform quality control aspect of the job and ensure electroplated surfaces are free of any flaws or defects. Perform various tests viz., adhesion, porosity, thickness, corrosion resistance, anodic coating on aluminium, chemical analysis of electrolytes and identification of deposits etc. (MAPPED NOS : CP/N9427)	196. Carry out visual inspection of different electroplated articles for any defects. (05 hrs.) 197. Perform adhesion tests by various methods. (10 hrs.) 198. Perform porosity tests by various methods. (05 hrs.) 199. Perform corrosion resistance tests by various methods. (05 hrs.) 200. Practice in testing different plated jobs for determining the local thickness by various methods. (10 hrs.) 201. Practice in testing different anodised jobs for determining the thickness and insulation. (15hrs.) 202. Practice in analysing different electroplating solutions. (15hrs.)	Quality control in electroplating shops. Inspection of platted surfaces by appearance and to test thickness by using micrometer, BNF jet test methods, ultrasonic thickness tester etc. and to check the adhesion on the base metals by various methods like burnishing test, bend test, lifting test, impact test, grinding wheel test, baking test etc. Various Corrosion resistance tests by using various salt spray tests, corrodekote test, sulphur dioxide test etc. various porosity tests like Hcl test, ferri cyanide test, hot water test, salt spray test, hydrogen peroxide salt test etc. Methods of testing anodic coating on aluminium. Chemical analysis of various plating electrolytes. (18 hrs)
Professional	Prepare layout of	203. Demonstrate Installation	Electroplating shop layout,

Skill 40 Hrs; Professional Knowledge 12 Hrs	electroplating plant, estimate cost, materials and accessories required for electroplating shop. Carryout preventive and breakdown maintenance of machines in electroplating shop. (MAPPED NOS : CP/N9428)	of machinery for electroplating shops using visual aids. (05 hrs.) 204. Practical study with regards to suitability and selection of equipment for electroplating shops. (05 hrs.) 205. Prepare a complete layout of the electroplating shop with details of plant machineries and technical specifications. (05 hrs.) 206. Working out detailed electroplating layout and calculate the approximate cost of the shop. (05 hrs.) 207. Carry out preventive maintenance of electroplating shops. (05 hrs.) 208. Estimate materials and quantity required for constructing electroplating plant. (15 hrs.)	characteristics, factors to be considered i.e. availability of indigenous materials, waste disposal. Installation of machinery for electroplating shops. Practical study with regards to suitability and selection of equipment, advantages, disadvantages and technical specification. Calculation pertaining to consumption of anodes, estimation materials and quantity required for constructing and etching, plating vats, cleaning etc. Suitability selection of equipments advantages and disadvantages. Calculation of the capacity of the plating vats. (12 hrs)
ENGINEERING DRAWING (40 Hrs.)			
Professional Knowledge ED- 40 Hrs.	Read and apply engineering drawing for different application in the field of work. (MAPPED NOS : CP/N9429)	**<u>Engineering Drawing:</u>** Reading of Electrical Sign and Symbols Sketches of Electrical components Reading of Electrical wiring diagram and Layout diagram Reading of Electrical earthing diagram. Drawing the schematic diagram of plate and pipe earthing. Drawing of Electrical circuit diagram Drawing of Block diagram of Instruments & equipment of trades	
WORKSHOP CALCULATION & SCIENCE (22 Hours)			

Professional Knowledge WCS - 22 Hrs.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (MAPPED NOS : CP/N9430)	**WORKSHOP CALCULATION & SCIENCE:** **Area of cut out regular surfaces and area of irregular surfaces** Area of cut out regular surfaces - circle, segment and sector of circle Related problems of area of cut out regular surfaces - circle, segment and sector of circle Area of irregular surfaces and application related to shop problems **Profit and Loss** Profit and loss - Simple problems on profit & loss Profit and loss - Simple and compound interest **Estimation and Costing** Estimation and costing - Simple estimation of the requirement of material etc., as applicable to the trade Estimation and costing - Problems on estimation and costing

Project work / Industrial visit

Broad Areas:

a) Electroless plating
b) Plating on aluminium
c) Plating on ABS plastic
d) Anodizing
e) Metal colouring
f) Conversion coating
g) Plating on PCB
h) Etching and chemical milling
i) Project report on installation of electroplating shop

SYLLABUS FOR CORE SKILLS
1. Employability Skills (Common for all CTS trades) (120 Hrs. + 60 Hrs.)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for a group of trades, provided separately in www.bharatskills.gov.in/ dgt.gov.in

ANNEXURE-I

LIST OF TOOLS & EQUIPMENT			
ELECTROPLATER (for batch of 20 candidates)			
S No.	**Name of the Tools and Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT (For each additional unit trainees tool kit Sl. 1-20 is required additionally)			
1.	Pliers Combination	150 mm	7 Nos.
2.	Pliers Side Cutting	150 mm	7 Nos.
3.	Screw Driver	100 mm	7 Nos.
4.	Screw Driver	150 mm	7 Nos.
5.	Connector, screw driver insulated handle thin stem	100 mm	7 Nos.
6.	Punch Centre	150 mm X 9 mm	7 Nos.
7.	Knife Double Bladed	steel	7 Nos.
8.	Neon Tester	Heavy duty	7 Nos.
9.	Steel Rule	300 mm	7 Nos.
10.	Hammer, cross peen with handle	300g	7 Nos.
11.	Hammer, ball peen with handle	300g	7 Nos.
12.	Bradawl	Standard size	7 Nos.
13.	Pincer	150 mm	7 Nos.
14.	File flat	150mm, smooth	7 Nos.
15.	File triangular	150mm, smooth	7 Nos.
16.	File half round	150mm, smooth	7 Nos.
17.	File round	150mm, smooth	7 Nos.
18.	File flat	200 mm, rough	7 Nos.
19.	Crimping Tool	Medium size	7 Nos.
20.	Wire stripper	20 cm	7 Nos.
B. SHOP TOOLS, INSTRUMENTS & MACHINERY (For 2 (1+1) units no additional items are required)			
21.	Hand vice	50mm jaw	5 Nos.
22.	Spanner Adjustable	300mm	5 Nos.
23.	Heavy Duty Screw Driver	200 mm	5 Nos.
24.	Screw Driver thin stem insulated handle	250 mm	5 Nos.
25.	Firmer Chisel	25 mm X 200 mm	5 Nos.
26.	Hand wood saw	15 inch	5 Nos.
27.	Portable Electric Drilling Machine	6 mm capacity	2 Nos.
28.	Pillar Electric Drill Machine	12 mm capacity	1 No.

29.	Micrometer (Digital display)	0-1”/25mm range	2 Nos.
30.	Bench Grinder	150mm, 250W	1 No.
31.	Pipe vice	Standard size	2 Nos.
32.	Chisel Cold flat	12 mm	5 Nos.
33.	Mallet hard wood	0.50 kg	5 Nos.
34.	Hammer Extractor type	0.40 kg	5 Nos.
35.	Hacksaw frame adjustable	300 mm	5 Nos.
36.	Try Square	150 mm blade	5 Nos.
37.	Pliers flat nose	150 mm	5 Nos.
38.	Pliers round nose	100 mm	5 Nos.
39.	Tweezers	100 mm	5 Nos.
40.	Snip Straight and Bent	150 mm	5 Nos.
41.	D.E. Spanner set of 12 pieces	6x7 to 25x28	2 Nos.
42.	Jack plane with smoothing cutters	50 mm	5 Nos.
43.	Standard Wire Gauge	Standard size	5 Nos.
44.	File Rasp	200 mm	5 Nos.
45.	Soldering Iron	25W, 220V	5 Nos.
46.	De soldering Gun	30W, 220V	2 Nos.
47.	Bench Vice	100 mm jaw	6 Nos.
48.	Multi Meter (analog)	0 to 1000 M Ohms, 2.5 to 500 V	2 Nos.
49.	Digital Multi Meter	AC 4-750V,40mA-10A and DC 400mV-1000V, 40mA-10A	2 Nos.
50.	A.C. Voltmeter M.I.	0 -500V A.C	2 Nos.
51.	Milli Voltmeter centre zero	100 - 0 - 100 m volt	2 Nos.
52.	D.C. Milli ammeter	0 -500m A	2 Nos.
53.	Ammeter MC	0-5 A, 0- 25 A	2 No. each
54.	A.C. Ammeter M.I.	0-5A, 0-25 A	2 No. each
55.	Rheostat	0 -1 Ohm, 5 Amp 0 -10 Ohm, 5 Amp 0- 25 Ohm, 1 Amp 0- 300 Ohm, 1 Amp	2 Nos. each
56.	Variable Auto Transformer	1 Phase	2 Nos.
57.	Battery Charger	10A,48V DC output	1 No.
58.	Thermometer	0 to 100^0C	2 Nos.
59.	Thermometer digital	Pen type	2 Nos.
60.	Hydrometer	For heavy liquids	2 Nos.
61.	Hydrometer with syringe	For battery testing	2 Nos.
62.	Portable digital density meter	Laboratory use	2 Nos.
63.	Weighing Balance Digital	10kg capacity with 0.05g accuracy	2 Nos.
64.	Conductivity meter Digital	Table top, LED display, 230V	2 Nos.

65.	Glue pot	5kg capacity	2 Nos.
66.	Digital Voltmeter AC	10-750V	2 Nos.
67.	Digital Voltmeter DC	0-100V	2 Nos.
68.	Digital Ammeter DC	0-100 A	2 Nos.
69.	Digital Ammeter AC	0-50A	2 Nos.
70.	Adjustable resistance board with DC digital ammeter & voltmeter	0-20V,0-100A	10 Nos.
71.	Pedestal buffing machine mounted in heavy duty CI stand, complete with push button starter & wheel guard	3phase, 3HP, 3000rpm	2 Nos.
72.	Industrial pedestal polishing machine with dust collectors	2HP	2 Nos.
73.	Flexible shaft polishing machine	0.5HP, 2m shaft length, 2800 rpm.	1 No.
74.	Bed blaster machine for blast cleaning	Standard size	1 No.
75.	Ultrasonic cleaner	Mini compact table top, 3.5 litre capacity	1 No.
76.	Vapour degreaser	Mini compact table top, 3.5 litre capacity	1 No.
77.	Dipping basket perforated	Titanium or PP, 6x5 inch height	4 Nos.
78.	Titanium anode basket	4.5x6 inch height	4 Nos.
79.	Moulded buckets	PP, 10 litre capacity	4 Nos.
80.	Moulded buckets	PP, 5 litre capacity	4 Nos.
81.	Digital pH meter equipment	Table top type, 0-14 range	2 Nos.
82.	Digital pH meter	Pen type	2 Nos.
83.	Portable angle grinder hand type	1phase,230V/5A	*5 Nos.
84.	Rectifier transformer DC power supply	3phase, 415V,300A	1 No.
85.	Electroplating rectifier	1 phase 230V, DC output Approximately 100A, 30V	1 No.
86.	Electroplating rectifier	Small size, 1 phase 230V, DC output Approximately 25A, 12V	1 No.
87.	Electric immersion heater (Silica, Stainless steel, lead, Titanium and Glass)	0.5KW, length 10-12''	2 Nos. each
88.	Plating Tank with SS stand	L-2ft, B-1.5ft ht-1.5ft made out of Polypropylene (PP)	15 Nos.
89.	Miniature fully immersed portable plating barrel with DC motor	Perforated, PP, 7x5 inch barrel size, up to 2kg capacity	2 Nos.
90.	Submersible plating barrel with tank and complete setup	7kg capacity, 12x8 inch barrel size, 0.125 HP motor	1 No.
91.	Oblique tumbling barrel with motor and complete setup	3.5 litre capacity, 275mm depth barrel	1 No.
92.	Cleaning tank	L-2ft,b-1.5ft,ht-1.5ft made out of	15 Nos.

		Polypropylene (PP)	
93.	Hot air oven	600x600x900mm, 6KW	1 No.
94.	Hot plate	12 inch dia. Digital temp controller	1 No.
95.	Side channel blower	0.5 HP	2 Nos.
96.	Centrifugal Dryer	5kg capacity, 10x8 inch basket size	1 No.
97.	Hull cell apparatus (with fittings like air agitation, immersion heater, thermostatic control, MS and brass cathode, wire clips, hull cell anode, hot water bath controls, 0-60m timer, glass thermometer, DC rectifier 0-12V, 0-10A)	Minimum size available in the market	1 No.
98.	Pen plating touch up plating unit with DC rectifier, digital display, Anode tipped pen, lead wire cathode for touch up multi metal.	Complete set	1 No.
99.	Powder coating machine (complete set)		1 No.
100.	Solution filter unit	Disc type, PP filter chamber, mounted on C.I wheels, 1HP,65W	2 Nos.
101.	Industrial water cooler	Compressor power, 1000W	1 No.
102.	Water demineraliser, Mixed system	D series, 1phase,230V	1 No.
103.	Direct plating thickness measurement meter	Non destructive, digital	2 Nos.
104.	Salt spray apparatus with humidity chamber, humidity controller, water level controller, mica plate heater, temperature indicator, filtered salt solution feed of minimum 0.5 litre per hour 130 litre salt solution reservoir, peristaltic pump, hour counter, control panel, compressor unit, pressure regulating valve, flow meter etc.	Minimum size available in the market	1 No.
105.	Laptop	Latest configuration	1 No.
106.	Mini Projector (High resolution display)	Table top, latest configuration	1 No.
107.	Laser Printer	Colour, latest configuration	1 No.
C. Shop Floor Furniture and Materials (For 2 (1+1) units no additional items are required)			
108.	Instructor's table	Teakwood, with one drawer and one shelf with inbuilt locks	2 Nos.
109.	Instructor's chair	Teakwood, Armed	2 Nos.
110.	Wooden stool	Standard size	2 Nos.
111.	Wooden table	Teakwood, 3 ft x 2ft	2 Nos.
112.	Wooden Almirah (10 drawers with inbuilt locks)	Teakwood, standard size	5 Nos.

113.	Wooden Almirah	Teakwood, 2.5x1.20x0.5m	2 Nos.
114.	White board	Standard size with Al frame	2 Nos.
115.	Showcase (for displaying the models of plated articles)	Standard size	1No.
116.	Wooden rack (for keeping the trainee shoes and bags)	Teakwood,100x150x45cm	2 Nos.
117.	Wooden rack (for the storage of chemicals)	Teakwood, 2x2x0.5m	5 Nos.
118.	Wooden stand (for hanging uniforms)	Teakwood, Standard size	1 No.
119.	Work bench	2x 0.5 x 1.5m ht	5 Nos.
120.	Working Bench	2.5 m x 1.20 m x 0.75 m	5 Nos.
121.	Fire Extinguisher	Arrange all proper NOCs and equipment from municipal / competent authorities.	As per requirement

Note: -

1. *All the tools and equipment are to be procured as per BIS specification.*
2. *Internet facility is desired to be provided in the class room.*
3. *Safety gloves, leather gloves, safety mask or respirator, goggles, rubber shoe, rubber apron and canvas apron must be provided to each trainee as consumable safety kit.*
4. *The workshop must be provided first aid box with acid and cyanide antidotes, olive oil and general first aid medicines.*
5. *Separate storage must be provided in the chemical lab for the storage of chemicals.*
6. *Sufficient heavy-duty exhaust fans and fumes extraction unit must be provided in workshop.*
7. *An effluent treatment system must be provided with the workshop for the treatment of acid, alkali, cyanide and chromates effluents.*
8. *A washing area with shower and toilet must be attached with the workshop and to ensure an uninterrupted water supply.*
9. *An air conditioning system must be provided in the inspection cabin.*
10. *Laboratory equipment and apparatus must be provided in the chemical analysis lab.*

ABBREVIATIONS

CTS	Craftsmen Training Scheme
ATS	Apprenticeship Training Scheme
CITS	Craft Instructor Training Scheme
DGT	Directorate General of Training
MSDE	Ministry of Skill Development and Entrepreneurship
NTC	National Trade Certificate
NAC	National Apprenticeship Certificate
NCIC	National Craft Instructor Certificate
LD	Locomotor Disability
CP	Cerebral Palsy
MD	Multiple Disabilities
LV	Low Vision
HH	Hard of Hearing
ID	Intellectual Disabilities
LC	Leprosy Cured
SLD	Specific Learning Disabilities
DW	Dwarfism
MI	Mental Illness
AA	Acid Attack
PwD	Person with disabilities


कौशलं बलम्