SYLLABUS FOR

ELECTROPLATOR

UNDER

CRAFTSMEN TRAINING SCHEME

&

APPRENTICESHIP TRAINING SCHEME

As approved by

GOVERNMENT OF INDIA

In consultation with

THE NATIONAL COUNCIL FOR VOCATIONAL TRAINING

&

CENTRAL APPRENTICESHIP COUNCIL

Issued by

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MINISTRY OF LABOUR

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NEW DELHI

1999 - 2000 (Revised)

TRADE COMMITTEE MEMBERS FOR THE TRADE OF ELECTROPLATOR

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11.	M. Murali Krishna, Sr. Instructor	Loco Carriage Workshops, S.C. Railway, Lallaguda, Secunderabad

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17.	B. Venkat Reddy, Junior Manager	Bharat Dynamics Limited, Hyderabad
18.	N. Ayyapparaju Sr. Training Officer	Mishra Dhatu Nigam Limited Hyderabad

General Information
For Craftsmen Training Scheme

1.	Name of the Trade	:	**Electroplator**
2.	N.C.O. Code No.	:	728.10
3.	Entry Qualification	:	Passed 10th class examination under 10+2 system of education or its equivalent.
4.	Duration of Craftsmen Training	:	Two years.
5.	Duration of Apprentice-ship Training	:	3 Years including two year Basic Training
6.	Rebate	:	Full (2 yrs.) for ex-ITI Electroplator trade
7.	Ratio of Apprentice to Workers	:	1 : 7

LLABUS FOR THE TRADE OF ELECTROPLATOR UNDER CRAFTSMEN TRAINING SCHEME

Period of Training : 2 Years

Practical	Theory	Engineering Drawing	Workshop Calculation & Science
2	3	4	5
ction training : familiarisa- with the Institute and its ous Sections. Importance of cular trade training. Study yout of the shop equipment machine and observe the tical training procedure. e of work done by training ie Institute. Introduction to ty devices and first aid box.	Introduction to the trade. Importance of safety, safety precautions observed in the section, elementary first aid resusciation and treatment for electric shock and burns etc. Importance of the trade in the development of industrial economy. Recreational, medical facilities and extra curricular activities of the Institute (All necessary guidance to be provided to the newcomers to become familiar with the working of the Industrial Training Instt. System including stores procedures etc.)		

2	3	4	5
tice in using steel rule, cut- plier, screw driver, electri- 's knife etc. Identification arious electric cables and characteristics. Skinning able insulation and joining tice with single and stand- conductors.	Description, specification and general care and maintenance of common hand tools of electrical trades. Fundamental terms such as electromotive force, resistance to current, potential difference etc. Their units, relation between the above quantities.	Free hand sketching of straight lines, rectangels, squares, circles, polygons etc.	Applied workshop problems involving multiplication and division. Common fraction-addition, subtraction, multiplication and division application of fractions to shop problems.
ering practice, various types ldering iron, soldering gun, er and its composition. Sol- ucker. Dry solder.	Classification of materials, Conductors and insulators. Qualities of good electrical conductor, common conductors, their shape, sizes, Use of wire gauge. Insulated conductors in general use, their kinds and specification as regards insulation and voltage grade.	Free hand sketching with dimension scale and proportionate sketching.	Properties and uses of cast iron, wrought iron, plain carbon steel, high speed steel and alloy steel.
tice in lighting the blow , general care & mainte- e, electrical safety practice. ning : its importance with	Soldering, its purpose different percentage of solder used, use of fluxes, different fluxes for different purposes of metals, use of	Reading of simple Blue print.	Applied workshop problems as in Week No. 2.

2	3	4	5
ical demonstration. How ing of building and equip- is tested, how it is done.	resine core solder. Effect of electric current, heating effect, description of soldering iron.		
aring simple electrical cir- with a switch and fuse, prac- n connecting different com- nts and form simple circuits. rity test of D.C. supply. acteristics of fuses identifi- on and testing of various s. Roll of main fuse in the e, its rating. Use of instru- t fuse.	Heating effect of electric current, Different heating appliances used in day to day use such as electric presses, kettle, heater, hot plate, etc. Resistance, specific resistance, factors affecting the resistance, temperature coefficient of resistance units. Different types of resistances used.	Reading of simple Blue print.	Properties and use of copper, zinc, lead, tin, aluminium, brass, bronze, solder bearing metals, timber & Rubber.
tice in connecting different iances and study the characteristics. Practice in connect- measuring instruments such oltmeter and ammeter etc. ification of Ohm's Law.	Series circuit, application of Ohm's Law characteristic of series, circuit application of series circuit. Use of voltmeter and ammeter.	Free hand sketching with dimension of simple solids such as cubes, rectangular blocks, cylinders etc.	Decimals-additions, subtractions, multiplication, conversion of decimals to common fractions–shop problems.

2	3	4	5
ctice in connecting simple allel circuit and study the dif- nce between series & paral- circuits. Practice in connect- different domestic appli- es and measure the current n by them. Practice in con- ting different electrical ac- ories such as switches, wall kets, lamp holders etc. and method of fixing them on a /. block of box.	Parallel circuit equivalent resistance, total and branch currents characteristics and applications of parallel circuit. Series parallel circuit, a brief introduction and relation of the total and individual resistances. Different common electrical accessories such as S.P.T. switches, 2 pin and 3 pin wall sockets, fuses etc. their specification different insulating materials used. Work, Power and energy their relation, calculation of power and energy of different electrical appliances and circuits.	Sketching of views of simple solid bodies as mentioned above when viewed perpendicular to their surfaces and axis.	Brief description of manufacturing process of pig iron and cast iron. Reduction of common fractions to decimal fractions shop problems.

IENT : Trainees should be able to :

ıke simple circuits with suitable controlling and protecting devices.
nnect voltmeter, ammeter and read them correctly.
miliar with the general precautions to be followed in the section.

2	3	4	5
: ALLIED TRADE TRAINING IN 8TH & 9TH WEEKS–FITTINGS			
pping practice, and practice rinding, hardening and tem- ng of chisels, practice in fil- true to a line.	Introduction to fitting. Safety precautions to be observed in a fitting shop. Description of hammers, chisels, steel rule, try square etc. their general care and maintenance. Description of files, their care and maintenance. Marking tools description and use.	Sketching of views of simple solid bodies & mentioned above when viewed perpendicular to their surfaces and axis. Free hand sketching of nuts and bolts with dimensions from samples.	Brief description of manufacturing properties of steel, copper and aluminium metric system metric weights and measurement units– conversion factors.
rking sewing and drilling, ctice in using hand drilling chine and power drilling ma- ne and grinding of drill bits. ctice in using taps and dies. ctice in cutting internal and ernal threads. Preparation of agonal Head bolts and nuts eading only)	Description of hacksaw frame, hacksaw blade, their specification, grade etc. types of drills, description of drilling machine, proper use, care and maintenance. Description of taps and dies & their uses. Types of rivets and riveted joints.	Free hand sketching of rivets and washers with dimensions from samples. Free hand sketching of keys and screw threads with dimensions from samples.	Meaning of tenacity, elasticity, malleability, brittleness, hardness, compressibility and ductility examples. Shop problems on metric system of weight and measurement.

2	3	4	5
MENT : Trainees should be able to :			
ark according to the simple drawings.			
le to an accuracy of 6 mm.			
rill and tap holes.			
ETAL : ALLIED TRADE TRAINING IN 10TH & 11TH WEEK			
ctice in using snips, marking l cutting of straight and curved es in Sheet Metal. Bending edges of sheet metals. Rivet- practice in sheet metal mark- different joints in sheet metal. ctice in soldering the joints.	Description of marking and cutting tools such as snips, shears, punches etc. and other tools like hammer, mallets etc. used by sheet metal workers. Type of soldering irons, their proper uses. Description and proper use of different bench tools used by sheet metal workers, soldering materials, fluxes and process of soldering.	Free hand sketching of rivets and washers with dimensions from samples. Explanation of simple orthographic projection 1st angle.	Effects and alloying elements on properties of cast iron and steel. Square root the square root of a perfect square–the square root of a whole number and a decimal.
paration of a funnel and a p shade. Carry out minor re- r jobs in sheet metal work.	Ferrous sheet metals and their sizes. Use of ferrous sheet metal for different works, galvanising and its advantages. Non ferrous	Explanation of simple orthographic projection 3rd angle. Views of simple hollow and solid bodies with	Mass–Unit of mass, force– absolute unit of force. The weight of body–unit, unit of weight shop problems,

2	3	4	5
	sheet metals, their different sizes and uses. Method of jointing and soldering.	dimensions. Use of different types of lines and symbols for drawings.	percentage and its application – Shop problems.
MENT : Trainees should be able to :			
ɔut minor repairs of sheet metal articles concerning to the trade.			
asurement of electrical power energy by using a voltmeammeter & stop watch or by ıg energy meter.	Magnetic, types of magnets, permanent magnets, different shapes available properties of magnets, different terms used in magnetism. General care and maintenance, methods of magnetising. Magnetic materials.	Views of simple hollow and solid bodies with dimensions. Use of different types of lines and symbols for drawing.	C.G.S. and F.P.S. systems of units of force, weight etc. their conversion problems.
cing the magnetic field of magnet, horse shoe magnet by compass needle and iron ıgs. Study the resultant field wo dis-similar and similar ds poles.	Magnetic effect of electric current practical application electro magnet, its advantages and uses, principle of electromagnetism, cork screw rule, right hand thumb rule, magnetic field of current carrying conductor and loop.	– Do –	Ratio and proportion shop problems. Work unit of work energy. Power unit of power applied.

2	3	4	5
ctice in magnetising methsuch as single touch and ble touch. Training the magc field set up by a current ying conductor and a contor loop. Tracing the field of tromagnet. Study the varia of magnetic strength with of turns and the current. paration of simple electrognet.	Solenoid and its polarity, right hand palm rule etc. Magnetic terms and definitions and the units for different quantities. Principle of electro-magnetic Induction, Faraday's Law, Lenz's Law and their application.	Simple isometric drawings, isometric views of simple objects such as square rectangles, cubes rectangular blocks etc.	Problems, Algebra–algebraic symbols, addition subtraction, multiplication and division of expressions involving algebraic symbols. Simple equations and transposition–problems.
ıting effect of current, proof Jouls Law. Verification of aday's Laws of electrolysis.	Principle of D.C. Generator, Flemming's Right Hand Rule. The function of Commutator.	Simple Isometric drawings, isometric views of simple objects such as square, rectangles, cubes, rectangular blocks etc.	Simple problems on work Energy and power.
ctice in dismantling the D.C. ıerator and study the differ parts and reassemble the chine. Measuring resistance armature, shunt field, series	Parts and function of D.C. generator, E.M.F. equation types of D.C. Generators, self/and separately excited generators, their application.	Simple isometric drawings, isometric views of simple objects such as square, rectangles cubes, rectangular blocks etc.	Standard algebraic formula *e.g.*, $(a + b)^2$ $(a - b)^2$ etc. simple simultaneous equations with two unknown quantities.

2	3	4	5
d etc. and identifying the ter- ıals of a D.C. machine. Prac- : in testing the insulator re- ance.			
ctice in testing and connect- of shunt and compound gen- tors, building up the voltage study the load characteristic shunt Generator.	Types and characteristics of D.C. Generators such as series shunt and compound generators and their applications.	—	Meaning of friction, example. Meaning of centre of gravity, examples, specific gravity examples.
ctice in testing connecting of npound generator, building the voltage, connecting of ıulative compound winding loading them. Study the load racteristic.	Terms used in D.C. motor such as torque, speed, back e.m.f. etc. Their relation and practical application.	Use of drawing instrument and drawing boards.	Mensuration areas of rectangles, squares, triangles, circles, regular polygons etc. Calculation of areas.
ctice in connecting D.C. Gen- or for load with suitable con- ling and protecting devices h as a circuit breaker, fuses	Types and characteristics of D.C. motors, industrial application of D.C. motors, different starting methods.	Construction of simple figures and solids as mentioned above with dimensions and titles.	Simple problems on straight and bell cranked levers.

2	3	4	5
tice in using a megger. Study function of D.C. Generator. nding minor repair work of trical equipment. Use of tronic Megger.	Types of D.C. starters, parts and functions of D.C. 3 point and 4 points starter, protective devices used, their connections.	Construction of simple figures and solids as mentioned above with dimensions and titles. Use of different types of scales in inches and millimetre.	Calculation on volume and weight of simple solid bodies such as cubes, squares, and hexagonal prism shop problems.
ing of D.C. motors identify- ınd connecting, running and rsing of different types of . motors–Study the D.C. 3 ıt starter. Operation M.G.	Different speed controlling devices used in D.C. motor their industrial application and connection, and elementary knowledge of M.G. set.	Lettering numbers and alphabets.	Heat and temperature thermometric scale, Fahrenheit and centrigrade scales and their conversion. Name and use of temperature measuring instruments normally used in workshops.
of Analog and Digital timeter in Measuring : Resistance Voltage A.C./D.C. Current A.C./D.C. Testing of various types of electrical and electronic com-	Different types of rectifiers : Their concept and use in circuit application. Principal of 50 Hz power transformer : a. Single phase b. Three phase	Free hand isometric sketches and sketching of simple objects with dimensions.	Shop problems on determination of volume and weight of simple solid bodies.

2	3	4	5
ɔonents such as capacitor, Re- ɜistance, Transistor, Rectifier, Switches, Potentic-meter, Continuity of any circuit.			
embling and testing of :) Half wave single phase) Full wave single and three phase rectifier circuit.	Auto transformer (*i*) Single phase. (*ii*) Three phase their applications in half wave rectifier circuit full wave rectifier circuit principle of transistors, and concept of three terminal regulator, their application in power supply circuit.	Free hand isometric sketching of simple objects with dimensions.	Meaning of stress, strain, modulus of elasticityand ultimate strength examples.

IENT : Trainees should be able to :

ıce magnetic field of simple magnets.
nnect a call bell of buzzer on 6 volts.
nnect, run and test D.C. Generators and motors.
Identify the various terminals or D.C. machines
Measure the armature and field resistance.
Rectify the minor faults.

2	3	4	5
ɟy of D.C. 4 points starter, connection with shunt and ıpound motors, connecting different speed controlling ices.	Chemical effect of electric current application, electrolysis, different term used such as anode, cathode, electrolytes etc. application of electrolysis in industry.	Free hand isometric sketching of simple objects with dimensions.	Geometry–properties of lines, angles, triangles and circles.
ɔtice in using tachometer or ɔlution counter with a stop ch for measuring speed.		Free hand sketching of plan & Elevation of simple objects like hexagonal bar, square bar, circular bar, tappered bar, hollow bar etc.	Factor of safety examples. Different types of stresses–examples. Simple problems on lines angles and circles.
ɔtice in marking & fixing of erent wiring accessories on /. boxes. Preparation of a ple testing board and a sup-extension board. Practice in ɔaration of electrolyte, Lay-marking on wiring board fix-of cleats and running of ca-fixing and connecting the erent accessories forming a	Principle and description of simple voltaic cell. Its defects and remedies. Description of leclanche cell and dry cell. Chemicals used, voltages per cell grouping of cells, for different voltages and currents. Principle of secondary cell, principle advantages of secondary cell over primary cell. Lead acid cell parts & functions, description.	Views of simple solid and hollow bodies cut by sections plane. Views of simple solid and hollow bodies cut by sections plane. Reading of simple blue print. Exercises on the print reading. Signs and symbols used in electrical drawings.	Trigonometry-trigonometric functions–use of trigonometric tables applied problems. Effect of forces on material in such application as expending, bending, twisting & shearing. Mechanical advantage–Velocity ratio-applied problems. Calculation of areas

2	3	4	5
imple circuit in plastic casing capping.	Voltage per cell, grouping of cells, battery normal voltages available.		of triangles. Polygons with the aid of trigonometry.
Practice in casing, capping, wiring, using two or three lamps ontrolled by different switches ndividually. Practice in connecting and charging of batteries.	General defects and remedies of lead acid cell, general upkeep and maintenance of batteries. Putting a new battery into working. General indications of charge, discharge, Ampere hour capacity and efficiency.	—	Useful work of a machine–mechanical-efficiency of a machine problems. Safety precautions in handling electrical equipments.
Practice in fixing batten and ound blocks boxes, etc. Cliping and drawing cables conecting & forming simple circuits.	A general idea of rate of charge and discharge, charging methods, advantage, disadvantages. Different charging equipment used in practice.	—	
ractice in megger testing, furier practice in P.V.C. wiring sing two way switches – Stairase lighting. Practice in testing nd connecting different single	General systems of electrical distribution such as D.C. 2 wire, D.C. 3 wire, the current in line the volt drop in the line etc. Principles of megger. Elementary knowledge of		

2	3	4	5
ise motors.	A.C. and the common term used, basic knowledge about single and polyphase systems. Power in single & polyphase circuits, elementary idea of P.F. relation of K.V.A. an K.W. Elementary knowledge of single phase motors in common use their connection etc.		
ration & maintenance of or defects in M.G. sets. Open & rectification of minor cts of rectifier electroplatets.	Elementary knowledge of 3 phase motors, their starting equipment. Connections of a M.G. set consisting of a 3 phase motor and a D.C. Generator. Conversion of A.C. to D.C. by selenium rectifiers. Rectifiers sets for electroplating and its advantages.	Exercises on Blue Print Reading. Drawing simple circuits using signs and symbols, using colour representation.	Further use of a trigonometric functions and tables applied problems. Machines basic principle determination of velocity ratio, mechanical advantages and efficiency.
	Introduction to chemistry elements compounds, mixture, types of mixture.	Exercises on Blue Print Reading.	Logarithm–Use of logarithmic tables for multiplication & division.
	Distinction between mechanical mixture and chemical compound.	Sketching field poles and yoke of a D.C. Generator.	

2	3	4	5
	Physical & chemical changes and their difference. Specific gravity of different liquids, hydrometer, its parts and function. Chemical action, its causes conditions laws of constant composition and conservation of mass, Symbols, qualitative and quantitative significance. Measurement of weight.		

ENT : Trainees should be able to :

ty in electrical equipment.
ration & installations of M.G. sets and rectifier sets for electroplating work.
tification of minor defects in M.G. sets and rectifier sets.

y precautions to be ob-d in an electroplating shop. ng and identifying of ac-ılkalies & salts. Mixing of rolytes and use of hydro-rs.	Faraday's law of electrolysis, relation between mass liberated, current density, time, and electrochemical equivalent.	Free hand sketching of simple objects related to the trade and preparation of simple working drawings from the sketches. Sketching armature of a D.C. Generator.	Determination of efficiency of simple machine like winch pulleyblocks. Wheel and compound axles.

2	3	4	5
ıent discharge of the plat-hop. Safety precautions to ken while handling cynide Electroplating salts. Differ-/pes of electroplating solu-. Effluent discharge. Stress given with regard to cya-and chrome containing ef-t. First aid antidotes for ide poisonings.	Value of E.C.E. for different solutions. Precautions to be observed. Method of mixing of electrolyte. Use of hydrometer. Theory involved in the treatment of plating affluent Pollution control Board, Standard rules governing discharge of traded effluents.	Flow diagram of effluent treatment plant.	
ıg up the plating vat, secur-at rods in position. Mixing olyte for copper plating and g the electroplating vat for er. Advantages of soft wa-lating vats. Types of lin-Rubber, PVC and lead, e of lining as per type of g solutions.	Types of solutions, saturated unsaturated and super saturated solutions, solubility of solids, importance of soft water, knowledge about molecular weight, equivalent weight.	Free hand sketching of simple objects related to the grade & preparation of simple working drawings from the sketches. Sketching drawing a commutator.	Further practice in the use of logarithmic tables.
imental determination of o chemical equivalent	Atom, atomic weight, Electro positive and negative valency, electro	Free hand sketching of simple objects related to the	Electricity & its uses. Electric current–Positive, nega-

2	3	4	5
ıe for different solutions. :tice in cleaning the articles ›re plating. Standard types vater to be used for Electro- ing work. Testing of water ıg simple methods like her with soap to be included. ıeriment on verification on aday's Laws (*i*) effect of cur- , (*ii*) time (*iii*) Influence ECE olution.	positives and negatives, electro chemical series of elements, positive and negative radicals, Mechanical cleaning.	trade & preparation of simple working drawings from the sketches. Panel board layout of an Electroplating generator.	tive terminals. Use of switches and fuses. Conductors and insulators.
aning articles before plating different methods such as bbing with emery paper, wet d, scratch, brushes, wire eels etc. Suspending anodes l cathodes in Electroplating . Surface preparation of Fer- ıs/Non-ferrous metals and al- 's before plating using Acid se cleaners. Role of Inhibitors :.t. pitting if base metal. Sur-	Equivalent weights of compounds, acids and bases oxide formation, reduction of oxides. Volumetric calculations, standard solution strength of solution, normal solution. Stopping of compounds.	Free hand sketching of simple objects related to the trade and preparation of simple working drawings from the sketches. Panel board layout of an electroplating generator.	Reading of simple graphs.

2.	3	4	5
e preparation of base metals ıg polishing and buffing op- tions. Preparation of emery els using different types of ergy grit. Use of polishing buffering compounds.			
ctice in cleaning by means of bling and burnishing barrels, paring of suitable dips and cles, removing of scale from ace of iron and steel. Ultra- ic cleaning. Preparation of e (bonding material) for em- wheels.	Importance of through cleaning of jobs before plating, mechanical and electrical methods of cleaning and their applications.	Further practice in Blue print Reading & exercise related to the trade.	Calculation of volume and weight of simple solid bodies by using logarithm.
ıning metallic surface of oil, ıse and dirty matters rough- smooth surfaces, prelimi- electroplating. Practice in ning by electric current such :athodic cleaning anodic ning alcholic electro clean-	Chemical cleaning methods by Acid dipping, alkaline soak cleaning alkaline electro cleaning etc.	Further practice in Blue Print Reading and exercises related to the trade.	Further problems on mensuration as above.

2	3	4	5
and striking in one step. aning specific metals such as ı, steel, stainless steel, nickel, ss, copper etc. Degreasing cess to include organic/sol- t. Degreasing using chloro- lro carbon like Trichloro eth- ne. Liquor/vapour degreasing cess.			
ctice in using cleaning tanks, paring suitable solution. Prac- : in cleaning copper, brass, kel and silver articles of oxi- ion & other stains. Proper e and maintenance of elec- plating vat for copper. Prac- : inconducting the analytical t of solution. Process of osphotising suspending of ode & cathode.	Metals and alloys their properties such as hardness conductance, malleability, ductility lusture specific heat, specific gravity etc. Effect of impurities, on the properties of metals, action of air on metals, atmospheric condition, varnishing corrosion and rusting.	– Do –	Revision

2	3	4	5
ıctice in plating articles for ferent thicknesses of deposi- ı (copper plating) Electroplat- ; iron rods and plates with ıper.	Fundamental knowledge about atomic structure ionic theory.	Further practice in Blue Print Reading & Exercises related to the trade.	Meaning of horse-power and brake horse power. Simple problems on work, energy & power.
ıther practice in electro depo- on of copper.	Properties of acids, alkalies and salts. General chemicals, used in plating. Common metals and alloys their commercial names, properties and uses. Calculation of time required for a given plating with given current density.	Free hand sketching of simple objects related to the trade and preparation of simple working drawings from the sketches. Sketching and electroplating barrel.	Plotting & Reading of simple graphs.
ıctice in electroplating involv- ; copper deposition adjusting ·rent and times required.	Normality of solution relation between strength normality and equivalent weight of a solution, elementary knowledge of exothermic and endothermic compounds, heat of reaction, heat of formation and heat of neutralisation Principle of copper voltmeter.	Free hand sketching of simple objects related to the trade and preparation of simple working drawings from the sketches & Electroplating vat.	Different forms of energy heat, mechanical and electrical examples. Conversion from one to another.

2	3	4	5
ıctice on preparing an article nickel plating, different proc- involved, method to be ɔpted for articles made of iron, ɔper, brass & other alloys. fferent process of nickel plat-	Different process of nickel plating and its application. Heavy nickel plating for corrosion and wear resistance. Electroforming, precautions for trouble free plating pre-treatment for nickel plating. Filtration, agitation and heating requirement for nickel plating.	Care and use of drawing board, T-square and instruments.	Practice in the use of Logarithmic tables for Multiplication, division square, cube, square root, cube, root etc
ɛparation and testing of solun for electro deposition of ɛkel. Preparation and setting of nickel plating vat. Deternation of electrochemical ıivalent of nickel. Test soluɲ that has failed to give good ıults account for sediments in ɛorrect solution.	Preparation of nickel plating solution, types of nickel plating solutions, choice of a suitable solution. Different materials used in electroplating such as sulphuric acid, nitric acid, acqua regia, acetic acid, their strength, specify gravity.	Free hand sketching of nuts and bolts.	Brief description of manufacturing process of pig iron-properties and uses of pig-iron.
ıctice in nickel plating, adting of current and time for fferent thicknesses of deposi-	Different alkalies like causic potash, caustic soda, Ammonia American potash etc. Their sym-	Preparation of drawings of the above (measuring of working drawing) should be	Use of logarithmic table as above.

2	3	4	5
ɲ. Adjustment of pH, carbon ɛatment, maintenance of ightener levels, testing of ɛkel plating solution using ıllcill apparatus. Thickness of ɛkel deposits in ferrous/non ɛrous base metals.	bols and equations. Mixed alkalies, alkali cyanides, specifications of cyanides, specific gravity of potassium cyanide solution.	explained.	
rther practice in nickel plat-ɡ, inspecting and testing plated rfaces finding faults and their nedies.	Analysis of cyanides, precautions while using cyanides, catalysis, addition agents, catalytic agents, colloides, throwing power, factors, influencing throwing power.	Simple Blue Print reading objects as far as possible related to the above.	Brief description of manufacturing process of cast iron properties and uses of cast iron.
ɛctro-plating of nickel - Duped ɛkel plating. Electroless nickel ıting etc.	Acidity in plating solutions, Elementary knowledge of pH scale & its significance, pH values for different plating solutions, common pH indicators. Description of capilator and its use. Hellige comparator, B.H.H. lovihond comparator and pH test papers.	Free hand sketching of different forms of thread.	Use of logarithimic tables as above.

2	3	4	5
ractice in barrel plating of small ·ticles like pins, screws, wash-rs studs, buttons etc. with ickel.	Throwing efficiency, B.S.I. scale, nickel solution for barrel plating, plating of small articles in trays, Salts for block nickel plating. Nickel anodes care and maintenance of electroplating vat.	Preparation of drawings of above conventional representation of threads.	Brief description of manufacturing process of steel.
ractice in maintaining the ickel plating vat.	Different troubles in nickel plating, their causes, diagnosis and remedies such as imperfect adhesion, pitting or deposit, dark deposit etc. Description and proper use of different polishing & buffing equipment.	Reading of simple Blue Print – simple exercises (44th week). Free hand sketching of locking devices (44th week)	Use of logarithmic tables as above. Brief description of manufacturing process of copper & aluminium properties and uses.
		Drawing of above indicating the lockings in position (14th week)	Calculation on area volume & weight of simple solid bodies such as cube, squares hexagonal prisms application to shop problems.
ractice in preparing the jobs or chromplating, base coating	Safety precautions of exhaust. Composition of chromium plat-	Simple exercises on Blue Print Reading.	Properties and uses of Lead, tin, zinc, brass, bronze, high

2	3	4	5
ıd plating practice precautions ı be observed.	ing solution, process of preparing, precautions to be observed. Temperature of the plating bath testing the electrolyte, pre-coating or under-coating. Calculation of time required for a given plating with a given current density.		carbon steel and alloy steel.
ractice in chromium plating ifferent ferrous metals. Micro-orous chromium plating.	Re-generation of chromium plating solutions proper maintenance of solution, removal of excess sulphate, rectification of trivalent chromium description & use of dechromator, removal of iron by drag out, throwing power and its tests, current density and current efficiency. Calculation of current Density and time for different thickness of deposition.	Free hand sketching of rivets and riveted joints.	Problems on mensuration as above.
ractice in chromium plating ifferent non-ferrous metals.	Types of chromium deposits plating of die-castings, bright chromium and sheet chromium depos-	Free hand sketching of different types of riveted joints.	Forms and properties of matter. The molecules and atoms. Difference between

2	3	4	5
	its, chromium plating on aluminium testing of plated surfaces, stripping of faulty deposits, health hazards and chromium colouring.		mass and weight.
ctice in chromium plating of ll articles. Locating techies of jobs and location of des.	Different troubles in chromium plating, their causes.	Preparation of drawings of riveted joints.	Problems on mensuration as above.
ision	Revision	Further practice in Blue Print reading & experience related to the trade.	Revision

IENT : Trainees should be able to :

ean simple jobs by various methods including electric current.
end to general maintenance of electroplating vat for copper.
st coppr plating solution and copper plating of simple jobs.
pare simple jobs for nickel plating.
pare the solution and set the vat for nickel plating.
rry out nickel plating for deposition of different thickness.
st and maintain the nickel plating vat.
pare and test solutions set the vat for chromium plating.
rry out chromium plating of simple jobs.

2	3	4	5
THE SYLLABUS FOR THE REMAINING 1 YEAR FOR 52 WEEKS			
ct hard-chrome plating prac- and pre-treatment for the and precautions. Insoluble es configuration.	As per week 46.	Free hand sketching and Blue Print reading.	Problems on mensuration. Preparation of simple estimation.
tice of hard-chrome on dif- it ferrous metals having dif- it configuration.	As per week 47, 48.	—	—
ice of hard-chrome on dif- it non ferrous metal solid ollow.	As per week 49.	—	—
aration of the job for cad- n plating preparation of so- n testing the acidity and den- of the solution, setting and or plating.	Properties of cadmium, cadmium solution, preparation of cadmium solution, analysis of the solution, thickness of deposits testing of solution, process of preparaing the job for cadium of plating.	Exercise on Blue Print Reading.	Problems on mensuration as above.
ice in cadmium, plating of rent articles, practice in	General maintenance of the plating vats, heat treatment of cad-	Preparation of drawings of above.	Trigonometric functions use of trigonometric tables–

2	3	4	5
ing defects, causes and rec-ation.	mium deposits, cadmium colour-ing, general troubles, diagnosis and correction.	Free hand sketching of pipe joint-flanged joints.	applied problems such as calculation of area of trian-gles, polygons etc. Density of solids and liq-uids-simple experimental determination.
ɔaration articles, made of ɔer, nickel iron and steel etc. silver plating. Using the hods such as hot alkaline ring cathode, cold cleaning yanide, dips-willing.	Factors considered for a good electroplating plant, erection of plat-ing tanks, capacity of plating tanks, general process of silverplating, types of solutions, pre-treatment for silver plating, sequence of plat-ing operations.	Free hand sketching of pipe joint-screwed sleeve joint.	Simple problems involving trigonometric functions.
:tice in silver plating, adjust-current density and time for ·equired thickness of plating ifferent articles such as wrist :h cover, spectacle frame and era parts etc.	Arrangement of vats, conductors connections rheostat, and instru-ments in an ideal electroplating plant process of aimalgamating sil-ver strike solution for nickel plated articles, process of bright silver plating, cathode movement of heavy silver deposit.	Operation of drawings of pipe joints.	Specific gravity principle of archimedes. Relation be-tween specific gravity and density.

2	3	4	5
ıer practice in silver plating tice in amalgamation and tice in heavy silver deposi- Electroplate scalps and ery etc. with silver.	Description and use of silver weight recording meter rectifying the silver plating troubles, strip-ping of silver deposit methods of testing solutions. Principle of sil-ver voltmeter.	Exercise on Blue Print Reading.	Problems on trigonometry as above.
tice in silver coating, pre-ıg the solution. Use of test for checking free cyanide maintenance of the silver ng vats. Finding out gen-defects causes and rectifi-ın.	General troubles, causes and di-agnosis and their correction such as blishers in deposit, too hard to finish but fine grained etc. Filtra-tion and heating the solution used in electroplating plant combined agitation and filtration.	Free hand sketching of shaft couplings. Muff-coupling with keys, spigetted flanged coupling forged with shaft or keyed in place, cottered sleeve joint, knuckle joint Preparation of drawings of the joints from the sketches drawn.	Quantity of heat specific heat of solids. Liquids and gases heat gained and heat lost.
aration of jobs made of non-ıus metals and alloys for gold ing by hot cleaning or easing, pickling etc. Prac-in gold plating.	General process of gold plating, gold plating solution, gold alloys pre-treatment in plating operation. Alloy gold plating or carat plat-ing. Coseving & Recovering of gold. Electroguilding mercurial	– Do –	Simple problems on heat gained and heat lost.

2	3	4	5
	guilding, applications of gold deposition.		
r practice in gold plating ing of solution for green Pink gold & rose gold, e in heavy gold plating. aining gold plating vats.	Stripping of gold plating by electrolytic method of immension method. General troubles, causes diagnosis & rectification.	Exercises on Blue Print Reading.	Further problems on mensuration area of circle and elips-Volume and weight of regular cone and spheres - calculation of area, volume and weight of simple hollow bodies-problems related to the trade.
ive practice of gold plat- amental articles and prac- barrel plating.	Polishing equipment required in electroplating, mechanical devices buffing machines, buffing materials like wheels, soaps, etc. their grades and proper place and use of electropolishing equipments. Different polishing methods.	Free hand sketching of simple bearings with hearing blocks.	Triangle of forces and parallelogramme of forces.

NT : Trainees should be able to :

re & test solutions & set the vats for admium plating

2	3	4	5
ilver plating old plating out silver plating (for wrist cover, spectacles, spoons etc. and gold plating on ornamental articles) d to general maintenance of electroplating vats for cadmium, silver and gold.			
e in preparing solution for lating, testing for acidity the vat for plating, prac- electro deposition of brass.	Properties and preparation of brass salts preparation of the solution, process of electro-deposition of brass effects of verification of current density general troubles, causes and their remedies.	Free hand sketching of simple bearings with bearing blocks.	Problems on mensuration as above.
e in preparing solution for lating, preparing job for ; practice in zinc plating, e in stripping of zinc de- Barrel plating of zinc. ng of deposited materi- ipping of metals, nickel, ium lead, Tin, cadmium, and copper from base	Zinc and its properties atmospheric effect on zinc protection of iron and steel by zinc. Types of zinc baths, preparing the work for plating, electro-galvanising. Process of preparing solution, comparison of acid and alkaline zinc deposits.	Preparation of working drawings of simple bearings. Free hand sketching on pulleys and preparation of working drawing.	Resolution and composition of forces. Problems on Mensuration as above.

2	3	4	5
paring the solution for tin ing, setting up for tin plat- vat practising, different esses of tinning.	Tin and its uses, advantages of tin coating, alkaline bath and the acid baths their analysis, other different solutions. Process of tin plating, different tinning processes such as hot dipping, chemical replacement wipping and contact plating.	Exercise on Blue Print Reading.	Representation of forces by vectors. Simple problems on lifting tackles like jib crane wall crane etc. and solution of problems with the aid of vector.
paring solution for different lloy plating, tin alloy plat- on different articles.	Tin alloy plating, the solution used, their analysis, current densities and thicknesses of deposits. Preparing the job for plating, different tin alloys such as tin, zinc, tin-nickel tin-lead etc.	Free hand sketching of gears-spur, helocal and bevel, Exercises on Blue Print Reading.	Problems on mensuration as above. Simple problems on lifting tackles.
o –	As in column No. 3 of Week no. 74. – Do –	Isometric drawing construction of isometric scales.	Moment of a force, couples. Simple problems.
paring the sulphuric acid so- on for aluminium anodising, ng up the anodising vats,	Purpose, advantages and general methods. Properties of chemical film.	Isometric views of simple objects related to the trade.	Problems on mensuration as above.

2	3	4	5
ictice in aluminium anodis-			
fferent anodising processes : *i*) Chromic acid *i*) Sulphuric acid *i*) Oxalic acid	Advantages of agitation and celling of anodising vats.	As above from given views in orthographic projections.	Example on simply supported lead beams.
ictice in metal colouring by ferent methods such as me- anical, thermal, chemical and ctrolytic.	Brass etching, applications process electrolytic, cleaning for metals colour.	Views of simple solids cut by section planes-ture views.	Problems in mensuration as above.
ictice in purification of dif- ent plating solutions and prac- e in brass etching, such as a me plate, a simple flower vase . Electroplate the steel name ite with nickel.	– Do –	– Do –	General conditions equilibrium for a series of forces acting on a bond.
ensive practice or gold and ver plating of very small arti-	Barrel plating and its applications. Different types of barrels, their	Development of surfaces of simple objects.	Plotting of points plotting of graphs simple equations

2	3	4	5
like paper pins, safety pins, ı clips etc.	description, place of use. Brief description about the automatic barrel plating equipment.		reading of graphs.
ctice in plating different ys such as muntz metal, delta ys etc. Preparing the solu-, setting up the vats, adjust-the current rating for differ-hicknesses. General care and ntenance.	Electro deposition of different alloys their processes, solution used for different alloys, method of preparing the corresponding electrolytes etc.	Development of surfaces of simple objects.	Simple problems on inclined plane.
:tice in conversion coating lifferent materials such as nium zinc, aluminium, cop-brass and silver etc.	Conversion coatings, current efficiency anodic efficiency, cathode efficiency, coulometers, different types, description and use. Use of supplementary anodes shields and bipolar electrodes.	Construction of simple curves of interpenetration.	Reading and plotting of simple graphs.
:tice in testing different :d jobs for determining the l thickness of coat, adhesion, eposit on base metal by dif-	Inspection of plated surfaces and its test, using micrometer, cliper, test meslechord, testing the adhesion of the deposit on the base	– Do –	Centre of gravity simple experimental determination.

2	3	4	5
t methods such as micro r and thickness gauge.	metal and different methods of testing.		

ENT : Trainees should be able to :

'y out the electro deposition process of nickel, silver, gold, chromium, cadmium, zinc, tin and alloys aluminium for :rent thickness.

'are the plating solution. 3. Analyse the solution.

y out general maintenance. 5. Carry out metal colouring process.

ce in plating gold, silver, l, chromium copper etc. on ent non-conducting mate-such as porcelain plastic	Plating on non-conducting materials, different processes used, commercial applications. Conducting an analytical test for solutions. Lacquer, lacquering process, its application, advantages, process of using lacquer and composition of lacquer.	Development of surfaces.	Reading and plotting simple graphs.
– Do – elf regulating, high speed ium plating.	Process of electro printing and typing their application, method of preparing moulds, method of giving face plating with different application.	– Do –	Stable, unstable and neutral equilibrium of bodies-simple explanation.

2	3	4	5
:e in preparing wax and moulds, facing plate with , silver, gold, copper etc. :ctroplating process.	– Do –	Free hand sketching of small parts related to the trade.	Reading and plotting of simple graphs.
– Do –	As for Week No. 92 Safety precautions, first aid and antindotes recommended.	Free hand sketching of simple assembled parts.	Friction–Limiting Friction–laws of friction–Coefficient of friction–angle of friction.
:tion and testing of Elected articles.	Inspection and testing procedures to be adopted for various electroplating jobs.	Free hand sketching of simple assembled parts.	Simple estimation on the requirement of materials etc. related to the trade.

ENT : Trainees should be able to :

are different solutions for electro deposition of different metals and alloys of common use.
are wax moulds and facing coats for electroplating and to plate on non-conducting materials.
ect, test and maintain the plating, baths.

lation of machinery for oplator shops. Practical with regards to suitability election of equipment, adges and disadvantages.	Calculation pertaining to consumption of a anodes. Estimation of materials and quantity required for constructing and erecting platting vats, cleaning and depress-	Free hand sketching of detailed parts and production of working drawing of the parts. Production of working drawings as above.	Problems on simple estimation as above. Simple problems on work, energy & power.

2	3	4	5
	ing tanks etc. suitability and selection of equipment advantages and disadvantages. Calculation of the capacity of plating vats.		
mplete lay out of a Electrotor shop with details of plant chines and their technical cifications.	Different plating tanks methods of construction & erection etc.	Free hand sketching of detailed components from assemblies.	Mechanical advantages, velocity ratio and efficiency of simple machine pulley, wheel and axel, screw jack winch etc.
rking out a detailed electroting shop layout and calcue approximate cost of the mplete electroplator shop. yout taking into account list various range of equipments l accessories.	Electroplating shop lay out characteristics, factors, to be taken into consideration. Availability of indigenous materials, equipment. Important methods of waste disposal.	Production of working drawings as above.	Problems on simple estimation as above.
:ventive maintenance of Elecplating workshops.	Electroplating shop lay out characteristics, factors, to be taken into consideration. Availability of in-	Production of working drawings as above.	Problems on simple estimation as above.

2	3	4	5
	digenous materials, equipment. Important methods of waste disposal.		
dustrial visits to study indus-al practice.	Appraisal about pollution control methods etc.	Exercise on Blue Print Reading.	Magnetic substances–natural and artificial methods of magnetisation–use of magnets.
Revision.	Revision.	Revision and exercise on Blue Print Reading.	Simple electric circuit, Ohm's law, simple calculation.
Revision.	Revision.	– Do –	Revision.

.....FINAL TEST.....

ΓUDIES : The syllabus has already been approved bythe DEG&T and same for all the trades.

'HIEVEMENT : TO BE OBTAINED AFTER COMPLETION OF THE TWO YEARS TRAINING.

ıpetence :

o make use of electrical instruments in voltmeter, ammeter and megger.
o undertake simple wiring work, cleat, casing and capping and T.R.S.

2	3	4	5

ɔ connect and to run Generators, Motors, M.G. sets, Rectifiers and to attend to minor repairs.
ɔ calculate areas, volumes and weights of simple solid bodies and parts related to the trade, simple estimation.
ɔ know and read simple Blue Print Reading and making of free hand sketches. Use of reference tables. The purpose of safety ecautions and regulations, basic knowledge of materials, tools and equipment used in trade, care and maintenance.
ɔ perform various operations involved in the electroplating workshop.
epare different plating solution for electro-deposition of different metals and alloys in common use to carry out the electro-position process of copper, nickel, chromium, cadmium, silver, gold, zinc, tin and alloys for different thicknesses.
spect test and maintain these plating solutions.
spect and test the quality of the plated surfaces.
ɔle to prepare wax moulds and facing coats for electroplating and to place on non-conducting materials.
lect and instal plant and machines for electroplating shop.
epare simple estimates for various types of jobs.

TRADE : ELECTROPLATOR

II. LIST OF TOOLS AND EQUIPMENT FOR A BATCH OF UNIT OF 16 TRAINEES

S. No.	Description	Quantity
1	2	3
1.	Canvas Apron	16 + 1 = 17 nos.
2.	Respirator	17
3.	Gloves Rubber	16 pairs + 1 pair
4.	Goggles	17 pairs
5.	Rubber Apron	16 nos.
6.	Gum Boots Rubber	16 pairs
SHOP OUTFIT PER UNIT		
1.	Vice Hand 50 mm Jaw	4
2.	File Flat 200 mm 2nd cut	4
3.	File Flat 200 mm smooth.	4
4.	Cutting Plier insulated 200 mm	4
5.	Screw Driver 200 mm	4
6.	Screw Driver 150 mm	4
7.	Connector Screw Driver 100 mm	4
8.	Bradwal	4
9.	Electrician-knife double bladed	4
10.	Leather Chamois Piece 50 cm × 60 cm	4
11.	Brush Hand Scratch	8
12.	Brush searing	8
13.	Brush Circular Brass 75 mm dia	4
14.	Brush Circular Steel 100 mm dia	4
15.	Bob Felt 200 mm	16
16.	Bob stitched 150 mm dia	16
17.	Mop polishing	16
18.	Mop Dresser	16
19.	Dresser Emery	1
20.	Tong Flat Jaw 100 mm length	4
21.	Hydrometer with Syringe	2
22.	Thermometers	2
23.	Basin 300 mm Enamel	6
24.	Glue Pot 1 Kg.	1
25.	File 2nd cut Half Round 150 mm	4
26.	File Rounded 2nd cut 200 mm	4 *
27.	File Triangular 2nd cut 150 mm	6 *

1	2	3
33.	Vice Table 400 mm Jaw	2 *
34.	Vice Table 150 mm Jaw	1
35.	Oil Can 1 pint	1
36.	Measure 0.25 litre	1
37.	Work Bench 2 m × 1.3 m × 0.75 m	3
38.	Exhaust Fans	1
39.	Vat for Bright Nickel Plating Lead lined 125 × 100 × 60 cm	1
40.	Dull vat for Nickel Plating lead lined 125 × 100 × 60 cm	1
41.	Antimonial Lead lined with reinforced glass lining inside	1
42.	Bright vat for chromium plating with outside water jacket 125 × 100 × 60 cm	1
43.	Hardchrome plating vat with antimonial lead lining with reinforced glass lining 125 × 100 × 60 cm Thermostat control attached with outside water jacket.	1
44.	Electric Heater Silica lined (for bright nickel) 2 K.W. Capacity	1
45.	Electric Heater Lead lined (for hard chrome) 2 K.W. capacity.	1
46.	Vat for anodising lead lined for sulphuric acid process.	1
47.	Vat silver plating rubber 100 × 60 × 45 cm	1
48.	Vat Cadmium plating, plain steel 100 × 60 × 45 cm	1
49.	Vat Zinc Plating plain steel 100 × 60 × 45 cm	1
50.	Vat Tin Plating, plain steel 100 × 60 × 45 cm	1
51.	Vat for Stripping 100 × 60 × 45 cm	1
52.	Vat for copper plating plain steel for cynide copper 100 × 60 × 45 cm	1
53.	Vat for copper Plating Plastic lined for acid copper 100 × 60 × 45 cm	1
54.	Cleaning Tank 100 × 60 × 45 cm	1
55.	Cold Plating Vat enamelled from (small size)	
56.	Grinder with high revolution emerity wheel	1
57.	Dust & Spray proof polishing machine	1
58.	Motor Polisher (4 bearing type)	1
59.	Barrel Plating outfit complete for nickel	1
60.	Polishing Barrel 40 × 90 cm	1
61.	Polishing Barrel 45 × 90 cm	1
62.	Burnishing Set 150 mm to 200 mm	1

1	2	3
68.	Nickel Comparator Test Set	1
69.	B.T.F. Jet Test Apparatus	1
70.	Buffing machine in spindle with roller bearing motorised	1
71.	Adjustable Resistance Board complete with voltmeter & Ammeter	9 nos.
72.	Electroplating Rectifier three phase set to operate from 380/440 volts. 50 cycles, 3 phase, A.C. supply, 16 volts, D.C. with an output of 500 amperes, D.C. voltage adjustable from 3.5 to 16 with 63 step of load, complete with the required meter panels and change over switch.	1
73.	Electroplating Rectifier three phase set to operate from a 380/440 volts, 50 cycles, 3 phase, A.C. supply with an output of 7.5 volts, DC. 500 amperes D.C. voltage adjustable from 0 to 7.5 in steps on load separate regulator complete with the required meter panel.	1 no.
74.	Steel locker with 8 drawers (standard size)	2 nos.
75.	Black Board with EaSel	1
76.	Desk	1
77.	Stool	1
78.	Fire Extinguishers	2
79.	Fire Buckets (with stand)	4

NOTES : 1. No additional items of the above list are required to be provided for a batch of 16 trainees working in the second shift except the items under 'Safety Tool Kit' and trainees lockers.

2. Additional number of items marked (*) are not required to be provided for additional number of batches.
3. Items marked ( ) need not be purchased and facilities availed in the Institute in other sections may be utilised.
4. IS : 2679-1964 should be followed as far as possible for procurement of equipment.
5. A few hand tools for Fitting and Sheet metal work have not been included in the list. Facilities available in the Institute in other sections may be utilised.
6. The specifications of the number of items in the above list have been given in English Units and some in Metric Units. The items which are available with Metric specifications nearest to the English Units should be procured. Measuring instruments such as Steel Rule which are graduated both in English an Metric Units may be procured if

BASIC TRAINING – For the 1st and 2nd year for both Theory & Practical as per the CTS Syllabus

Shop Floor Training (3rd Year)

The syllabus for shop floor training during the 3rd year of the Apprenticeship Training will be as follows :

1. To connect and verification of Faraday's Laws of Electrolysis.
2. Practice in Polishing with heavy size articles such as Square, Round, Rectangular shapes and zig-zag articles. Practice with Automatic polishing machine.
3. Practice in Buffing in various types such as Contact buffing Mush buffing.
4. Practice of lapping for finishing work of the materials.
5. Practice in Barrel Polishing, Burnishing with various metals and non-metals and different types of jobs in connection with these.
6. Practice in preparing suitable degressing solution.
7. Practice in solvent clearing vapour and vacuum technology both Trichlorthylen and Perchicrethylene Plants.
8. Practice and operation with maintenance of Copper, Nickel, Bright Nickel–chromium Hard (Industrial)

Chromium, aluminium, Anodizing Processes for final finishing by using the three types Principle such as :

1. Flow Chart for sequence operation of Chrome Acid anodizing.
2. Sulphuric Acid process.
3. Hard Anodizing methods.
9. Practice in Electropolishing of various metals such as Nickel, Silver, Stainless steel, Aluminium and Aluminium Alloys.
10. Further practice in Copper Coating in Acid copper and Cynamide Electrolytes for various purpose.
11. Further practice in under coatings of alloy metals such as zinc die castings, ferrous casting aluminium and aluminium alloy boremetals.
12. Identification and Application in operation of Coated tools.
13. Practice of Electrocoating and finishing of metal surfaces.
14. Practice in Copper Deposits plating both electrolytic and auto catalyte (Electroless) electrolysis alkaline and acid methods.
15. Study and operation process of Copper plating Equipment.
16. Study the various characteristics of copper plating.
17. Nickel plating decoration finishes industrial finishing Electroforming salvage by building up dimensions, plating on non metallic jobs. Both Multilayer, Engineering and Electroforming types.
18. Further practice stopping off Nickel deposits.
19. Tin Nickel alloy deposits and solution maintenance preparation practice.
20. Further practice in Nickel plating inspecting and testing plated surfaces.
21. Study and Practice in Hard (Industrial) Chromium plating and their process

23. Study the layout and use for Industrial Chromium Plating equipment.
24. Study of stripping methods of Industrial chromium removal from surface its recovery and disposal of waste.
25. Practice in study Data Sheet on depositing Nickel and finding the thickness of deposit.
26. Practice in Approved Tests on Nickel.
27. Practice in regular Chromium deposits – on Nickel Deposits base of Decorative for Industry and Heavy Deposits.
28. Study the various parameters of plating condition due to temperature variations.
29. Practice in Chromium deposits on various non-ferrous metals such as Aluminium, Brass, Bronze etc.
30. Further indirect chromium plating on non-ferrous metals.
31. Practice in chromating of Magnesium and Magnesium rick alloys.
32. Study the Principle application of iron plating and iron plating solutions.
33. Practice for Iron Plating processing equipment.
34. Practice on basic plating on Cadmium plating both Steel plating and Barrel plating.
35. Practice on basic cast/iron plating.
36. Practice on Zinc plating/galvanizing.
37. Practice in Tin-plating.
38. Study the equipment and operation for Electrocutting process equipment of Batch Hot Dip and Galvanizer coatings.
39. Study the processing equipment and its controlling for preparation of Printed Circuit Boards and their application in Electronic circuits.
40. Practice in Mechanical Process of plating in GI.
41. Practice in porcelain Enamelling process of steel, Cast iron and Aluminium.
42. Practice in Laboratory and analysing the solutions and additions in various metallic electrolytes.
43. Practice in Silver Plating Industrial and Domestic decorative purposes.
44. Practice in Allymetals deposits.
45. Practice in the following operation :
    - (*i*) Passivation
    - (*ii*) Phosphating
    - (*iii*) Blasting both short and sand
    - (*iv*) Blackening
    - (*v*) Vacuum metallising
    - (*vi*) Metal spraying
    - (*vii*) Lacquering
    - (*viii*) Spray Painting
    - (*ix*) Enamelling

SYLLABUS FOR RELATED INSTRUCTIONS FOR THE TRADE OF ELECTROPLATER

Related Instructions should be imparted to all the apprentices during the entire period of training including basic training.

The syllabus given for related instructions should be considered as a guide.

1. Trade Theory
2. Workshop Calculation & Science
3. Engineering Drawing
4. Social Studies

1. Trade Theory : (Third year)

1. Safety at work-first aid treatment for poisoning.
2. Revision of work of previous 2 years.
3. Description of common tools, ancillary equipments in electroplating shop such as temperature control, heating of solution, electrical control panels, fume extract on fans, filters, rectifiers and their safety devices, various modern plating vats related to all type of solutions.
4. Use of tables connected to electrode position thickness; current, time hardness, tensile strength etc.
5. Importance of correct surface, preparation of the basic metal by solvent cleaning and its equipment.
6. Analysis of plating baths :
   General : (*a*) Qualitative, quantitative, gramonmetic volumetric-acidimetry-oxidation and reductions.
   (*b*) Precification–cyanometric–calorimetric and spectro–photometric, spectrographic polarographic.
7. Routine, maintenance of plating baths all types and analytical control and its equipments and chemicals.
8. To study typical layout of various automatic electroplating plant and working principle.
9. Modern development in aluminium producing and commercial application of dying colours.
10. The process of electro-forming building up such as plastic, wax moulder, play records and preparation of surface.
11. Related process possivation–phosphatising–lacquering–enamelling–short blasting–sand blasting–blackening–vacuum metallising–spray painting.
12. Purification of water for electroplating shops–effluent treatment effluent disposal.
13. Calculation of chemical requirement for preparation–replenishing of various electrolytic baths.
14. Testing of deposits :
    (*a*) Thickness–microscopic method stripping methods.
    (*b*) Dropping test–jet test.

(*h*) Special topics.

15. Importance of barrel plating in all types of solutions and modern type of automatic barrels.
16. Revision and test.

2. Workshop Calculation & Science :

1. Revision of the work of previous two years.
2. Mensuration–perimeters and areas of rectangles squares, triangles, circles and regular polygons calculation of area, volume and weight of simple solid and hollow bodies, such as cube, square, hexagonal prism, cone and sphere – applied problems.
3. Advanced problems on work, power and energy.
4. Determination of weight, diameter and length of different types of wires and cables. Estimation of requirements of materials for layout of house-wiring etc.
5. Meaning of tenacity, elasticity, malleability, brightleness, hardness, compressibility and ductility.
6. Meaning of stress, strain, modulus of elasticity, ultimate tensile strength, factor of safety and different types of stresses.
7. Description of expansion of solids, liquids and gases to heat. Brief description of transference of heat conduction, convection and radiation.
8. Heat and temperature. Thermo-metric scales–Fahrenheit and centigrade. Conversion of Fahrenheit scale to centigrade and vice-versa. Measurement of temperature. Name and brief description of simple temperature measuring instruments used in the workshop.

3. Engineering Drawing :

1. Revision of previous two years work.
2. Advanced Blue Print Reading.
3. More advanced circuit diagrams.
4. Free hand sketching of actual parts of simple object related to the trade.
5. Free hand sketching of electrical circuit diagram using standard symbols.
6. Drawings of sectional views of armatures, cores, switches bearing, stators etc.
7. Code of practice for general Engineering Drawing according to ISI (IS : 696–1960)

4. Social Studies :

The syllabus has already been approved and is same for all the trades.