

SYLLABUS OF SEMESTER SYSTEM
FOR THE TRADE OF

ELECTROPLATER

Under

Craftsmen Training Scheme (CTS)
(Two years/Four Semesters)

Redesigned in
2014

By
Government of India
Ministry of Labour & Employment (DGE&T)

LIST TRADE EXPERTS, CORE GROUP MEMBERS & MENTOR COUNCIL MEMBERS

(S/Shri)

1. Dr. S.P. Gupta Professor, IIT Roorkee, (CHAIRMAN)
2. R.N. Bandopadhyay Director, CSTARI, Kolkatta
3. R. Senthil Kumar Director, ATI, Chennai
4. A VenkateshwaraRao Joint Director, ATI, Chennai
5. P. Saibaba Joint Director, ATI, Chennai
6. K.L. Kuli Joint Director, CSTARI, Kolkatta
7. K. Srinivasa Rao Joint Director, CSTARI, Kolkatta
8. M. Thamizharasan Joint Director, CSTARI, Kolkatta
9. S. Mathivanan Dy Director, ATI, Chennai (TEAM LEADER)
10. Amrit Pal Singh Dy. Director, DGET, New Delhi (MENTOR)
11. B.N. Sridhar Dy Director, FTI, Bangalore
12. Ketan Patel Dy Director, RDAT, Mumbai
13. B. Ravi Dy Director, CTI, Chennai
14. A.S. Parihar Dy Director, RDAT, Kolkata
15. Nirmalya Nath Asst Director, CSTARI, Kolkatta
16. Parveen Kumar Asst Director, ATI-EPI, Hyderabad
17. C.C. Jose Trg Officer, ATI, Chennai
18. L.M. Pharikal Trg Officer, ATI, Kolkata
19. M. Asokan Trg Officer, CTI, Chennai
20. Mohan Raj Trg Officer, NIMI Chennai
21. U.K. Mishra Trg Officer, ATI, Mumbai
22. C.M. Diggewadi Trg Officer, RDAT, Mumbai
23. A. Chakraborty Trg Officer, CSTARI, Kolkatta
24. T.K. Ghosh Trg Officer, CSTARI, Kolkatta
25. Prasad U.M. Voc Instructor, MITI, Calicut
26. Gabriel Pradeep A.P. JTO. Govt ITI, Hosur Road, Bangalore
27. Latha JTO. Govt ITI, Hosur Road, Bangalore
28. D. Viswanathan ATO. Govt ITI, North Chennai
29. B. Navaneedhan ATO, ITI. North Chennai
30. R . Rajasekar ATO, ITI, Ambattur, Chennai
31. K. Amaresan ATO, Govt ITI, Guindy, Chennai
32. Dr. P. Mahanto Professor, IIT, Guwahati
33. K.K. Seth Ex. Director, BHEL, Noida
34. N. Chattopadhyay Sr. DGM, BHEL, Kolkatta
35. Surendu Adhikari OTIS Elevator Co. India Ltd, Kolkatta
36. K. Raju Consultant- Energy Area, ASCI, Hyderabad
37. Ravi G Deshmukh Certified Energy Auditor, PPS Energy solutions, Pune
38. R. Thiruppathi JTS, IIT, Madras, Chennai
39. M.N. Krishnamurthy Retd. Ex Engineer, TNEB, Chennai
40. S. Kirubanandam Asst. Ex Engineer, TANTRANSCO, Chennai
41. R. Kasi, Asst. Ex Engineer, TANTRANSCO, Chennai
42. L.R. Sundarajan Jr. Works Manager, Heavy vehicles factory
43. B.S. Sudheendara Consultant, VI micro systems pvt ltd, Chennai.
44. S. Ganesh Manager, L&T , Chennai
45. G. Neethimani Vice principal, Rane engine valves ltd, Chennai.

GENERAL INFORMATION

1. **Name of the Trade** : **ELECTROPLATER**
2. **N.C.O. Code No.** : 8223.10
3. **Duration of Craftsmen Training** : 4 Semesters (2 Years)
4. **Entry Qualification** : Pass in 10th Class under 10+2 system of Education
5. **Unit strength** : 16
6. **Space norms** : a) Workshop: 60 Sq. metres.
b) Class room: 20 sq.metres
7. **Power norms** : 16.0 KW
8. **Instructors Qualification** : Degree in Electrical engineering from recognized engg. college/university with one year experience in the relevant field
Or
Diploma in Electrical Engineering from recognized board of technical education with two years' experience in the relevant field
OR
10th pass + NTC/NAC in the Trade of "Electroplater" with 3 years post qualification experience in the relevant field.

JOB DESCRIPTION

AS PER NCO CODE: 8223.10

8223.10 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 degreased components well dipped in side plating solution and connects cathode (negative) to it. Regulates current and allows components to remain dipped in solution for specific period depending upon type and thickness of plating required. Removes components and swills them in hot and cold water baths. Dries them in sawdust or centrifugal air dryer. Transfers components to unrigging rack or other specified place for polishing. May Prepare plating solution under guidance of shop supervisor. Is designated as GILLDER if engaged in gold plating and ANODISER if colours aluminum and light alloys article using specific chemical solutions.

TERMINAL COMPETENCY

At the end of the course the trainee shall be able to -

- Identify conductors, semi-conductors, insulators , types wires, cables and gauges.
- Do Soldering of electrical components and electroplating jobs
- Identify acids and alkalis.
- Use hydrometer and thermometer.
- Connect batteries for charging & observe safety precautions.
- Carryout routine checkup & maintenance of batteries
- Carry out surface preparation process of different jobs.
- Carry out preparation of solutions and de - mineralised water.
- Carry out key factors of cleaning before plating.
- Carry out the process of nickel / copper plating.
- Carry out analysis of nickel plating.
- Carry out chromium plating.
- Carry out Cadmium Plating
- Carry out Silver Plating Process
- Carry out Gold Plating Process
- Carry out Brass Plating
- Carry out Zinc Plating
- Prepare different electrolytes
- Carry out Process of Tin Plating
- Carry out Plating of different alloys
- Carry out anodizing process
- Carry out barrel Plating
- Carry out Quality Control in plating shop
- Carry out Preventive Maintenance of Plating Shop

First Semester (Semester Code no. ELP - 01)

Duration : Six Months

Syllabus for TP and TT

| Week No. | Trade Practical | Trade Theory |
|----------|--|---|
| 1 | Implementation in the shop floor of the various safety measures. Visit to the different sections of the Institute. Demonstration on elementary first aid. Artificial Respiration Practice on use of fire extinguishers. | Occupational Safety and Health Basic safety introduction, Personal protection. Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution and personal safety message. Use of Fire extinguishers. Visit and observation of sections. Various safety measures involved in the Industry. Elementary first Aid. Concept of Standard. |
| 2 | Demonstration of Trade hand tools. Identification of simple types- screws, nuts & bolts, chassis, clamps, rivets etc. Use, care and maintenance of various hand tools. | Identification of Trade-Hand tools-Specifications |
| 3 | Practice in using cutting pliers, screw drivers, etc. skinning the cables and joint practice on single strand. Demonstration and Practice on bare conductors joints-- such as Britannia, straight, Tee, Western union Joints | Fundamental of electricity. Electron theory- free electron, Fundamental terms, definitions, units and effects of electric current Explanation, Definition and properties of conductors, insulators and semi-conductors- Wires/cable & its specification. Types of wire joint & use. |
| 4 | Practice on soldering- Measurement of Resistance. Determination of specific Resistance. | Solders, flux and soldering technique. Types & properties of resistors Specific Resistance. |
| 5-6 | Verification of Ohm's Law, Verification of Kirchoff's Laws. Verification of laws of series and parallel circuits. Verification of open circuit and closed circuit network. Measuring unknown resistance using different methods- a) Using Wheatstone Bridge b) By voltage drop method. Experiment to demonstrate the | Ohm's Law - Simple electrical circuits and problems. Resistors -Law of Resistance. Series and parallel circuits. Kirchoff's Laws and applications. Wheatstone bridge principle and its applications. Effect of variation of temperature on |

| | | |
|--------|---|---|
| | variation of resistance of a metal with the change in temperature. | resistance. Different methods of measuring the values of resistance. |
| 6 | Demonstration and identification of types of cables. Demonstration and practice on using standard wire gauge & micrometer. Practice on crimping thimbles, Lugs. | Introduction of National Electrical Code Voltage grading of different types of Insulators, Temp. Rise permissible. Types of wires and cables standard wire gauge. Specification of wires and Cables- insulation and voltage grades -Low , medium and high voltage Precautions in using various types of cables / Ferrules |
| 7 | -Identification and use of wiring accessories Practice on installation and overhauling common electrical accessories. Fixing of switches, holder plugs etc. in wooden/PVC/ Metallic boards. | Common Electrical wiring Accessories, their specifications in line with NEC - Explanation of switches, lamp holders, plugs and sockets. Developments of domestic circuits, Alarm & switches, Use & specification of Fire alarm, MCB, ELCB, MCCB. |
| 8 – 10 | Grouping of Dry cells for a specified voltage and current. Practice on Battery Charging, Preparation of battery charging, Testing of cells, Installation of batteries, Charging of batteries by different methods. Charging of a Lead acid cell, filling of electrolytes- Testing of charging .checking of discharged and fully charged battery. Care and maintenance of Batteries | Chemical effect of electric current- Principle of electrolysis. Faraday's Law of electrolysis. Basic principles of Electroplating and Electro chemical equivalents. Explanation of Anodes and Cathodes. Cells - Primary & Secondary Lead acid cell-description, methods of charging-Precautions to be taken & testing equipment, Ni-cadmium & Lithium cell, Cathodic protection. Electroplating, Anodising. Different types of lead acid cells. Application of battery/cell in Inverter, Battery Charger, UPS, etc. Lead Acid cell, general defects and remedies. Nickel Alkali Cell-description charging.Power and capacity of cells. Efficiency of cells.Rechargeable dry cell, description advantages and disadvantages. Care and maintenance of cells Grouping of cells of specified voltage and current, Sealed Maintenance free Batteries, Solar battery. |
| 11-12 | ALLIED TRADES: Marking use of chisels and hacksaw on flats, sheet metal filing practice, filing true to line. Sawing and planing practice. Practice in using firmer chisel and preparing | Introduction of fitting trade. Safety precautions to be observed Description of files, hammers, chisels hacksaw frames and blades- their specification and grades. Care and maintenance of steel rule, try square |

| | | |
|-------|--|--|
| | simple half lap joint. | and files. Marking tools description and use. Description of carpenter's common hand tools such as saws planes, chisels mallet claw hammer, marking, dividing and holding tools-their care and maintenance. |
| 13 | Drilling practice in hand drilling and power drilling machines. Grinding practice Practice in using taps and dies, threading hexagonal and square nuts etc. cutting external threads on stud and on pipes, riveting practice. | Types of drills description and drilling machines, proper use, care and maintenance. Description of taps and dies, types of rivets and riveted joints. Use of thread gauge. |
| 14 | Practice in using snips, marking and cutting of straight and curved pieces in sheet metals. Bending the edges of sheets metals. Riveting practice in sheet metal. Practice in making different joints in sheet metal in soldering the joints. | Description of marking and cutting tools such as snubs shears punches and other tools like hammers, mallets, etc. used by sheet metal workers. Different types soldering materials, fluxes and process. Types of different soldering irons and their proper uses. Use of different bench tools used by sheet metal worker. |
| 15-16 | Trace the magnetic field. Prepare Electromagnet. Use of magnetic compass. Assembly / winding of a simple electro magnet Identification of different types of Capacitors. Charging and discharging of capacitor, Testing of Capacitors using DC voltage and lamp. | Magnetism - classification of magnets, methods of magnetising, magnetic materials. Properties, care and maintenance, methods of magnetising magnetic materials. Para and Diamagnetism and Ferro magnetic materials. Principle of electro-magnetism, Maxwell's corkscrew rule, Fleming's left and right hand rules, Magnetic field of current carrying conductors, loop and solenoid. MMF, Flux density, reluctance. B.H. curve, Hysteresis, Eddy current. Principle of electro-magnetic Induction, Faraday's Law, Lenz's Law. Electrostatics: Capacitor- Different types, functions and uses. |
| 18-19 | Determine the characteristics of R, XL and XC in A.C. Circuits both in series and parallel. Experiment on poly phase circuits. Current, voltage, power and power factor measurement in single & poly- phase circuits. Measurement of energy in single and poly-phase circuits. - Use of phase sequence meter. | Alternating Current -Comparison and Advantages D.C and A.C. Related terms frequency Instantaneous value, R.M.S. value Average value, Peak factor, form factor. Generation of sine wave, phase and phase difference. Inductive and Capacitive reactance Impedance (Z), power factor (p.f) ; Vector diagram. Active and Reactive power, Simple |

| | | |
|-------|---|---|
| | | <p>problems on A.C. circuits, single phase and three-phase system etc.</p> <p>Problems on A.C. circuits.</p> <p>Power consumption in series and parallel, P.F. etc. Concept three-phase Star and Delta connection.</p> <p>Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load.</p> |
| 20 | <p>Practice on Earthing - different methods of earthing. Measurement of Earth resistance by earth tester. Testing of Earth Leakage by ELCB.</p> | <p>Earthing - Principle of different methods of earthing. i.e. Pipe, Plate, etc Importance of Earthing. Improving of earth resistance Earth Leakage circuit breaker (ELCB). In absence of latest revision in respective BIS provision for Earthing it is recommended to follow IEC guidelines.</p> |
| 21 | <p>Determine the resistance by Colour coding Identification of active/passive components.</p> <p>Diodes-symbol - Tests -</p> <p>Construct & Test Half wave rectifier ckt. Full wave rectifier ckt. Bridge rectifier ckt.</p> | <p>Basic electronics- Semiconductor energy level, atomic structure 'P' type and 'N' type. Type of materials –P-N-junction. Classification of Diodes – Reverse and Forward Bias, Heat sink. Specification of Diode PIV rating. Explanation and importance of D.C. rectifier circuit. Half wave, Full wave and Bridge circuit. Filter circuits-passive filter.</p> |
| 22-23 | Industrial visit / project work | |
| 24-25 | NCVT EXAMINATION | |
| 26 | Semester Gap | |

LIST OF TOOLS and EQUIPMENT

A1. TRAINEES TOOL KIT FOR 16 TRAINEES +1 INSTRUCTOR

| TOOL KIT | | | |
|--|--|-----------------|----------------|
| Sl. No. | Name of the items | Quantity | Remarks |
| 1 | Steel Tape, 15 m length | 17 Nos. | |
| 2 | Plier Insulated, 150 mm | 17 Nos. | |
| 3 | Plier Side Cutting, 150 mm | 17 Nos. | |
| 4 | Screw Driver, 100 mm | 17 Nos. | |
| 5 | Screw Driver, 150 mm | 17 Nos. | |
| 6 | Electrician Connector, screw driver insulated handle thin stem, 100 mm | 17 Nos. | |
| 7 | Heavy Duty Screw Driver , 200 mm | 17 Nos. | |
| 8 | Electrician Screw Driver thin stem insulated handle, 250 mm | 17 Nos. | |
| 9 | Punch Centre , 150 mm X 9 mm | 17 Nos. | |
| 10 | Knife Double Bladed Electrician | 17 Nos. | |
| 11 | Neon Tester | 17 Nos. | |
| 12 | Steel Rule 300 mm | 17 Nos. | |
| 13 | Hammer, cross peen with handle | 17 Nos. | |
| 14 | Hammer, ball peen With handle | 17 Nos. | |
| 15 | Gimlet 6 mm. | 17 Nos. | |
| 16 | Bradawl | 17 Nos. | |
| 17 | Scriber (Knurled centre position) | 17 Nos. | |
| 18 | Pincer 150 mm | 17 Nos. | |
| NOTE: For 2 nd Unit of the Trade, only Trainees Tool Kit (from Sl No- 1 to 18) is required additionally. | | | |

B1. SHOP TOOLS, INSTRUMENTS and MACHINERY

| | | | |
|----|---|------------|--|
| 1 | C- Clamp 200 mm, 150 mm and 100 mm | 2 Nos each | |
| 2 | Spanner Adjustable 150 mm,300mm | 2 Nos each | |
| 3 | Blow lamp 0.5 ltr | 1 | |
| 4 | Melting Pot | 1 | |
| 5 | Ladel | 1No | |
| 6 | Chisel Cold firmer 25 mm X 200 mm | 2 | |
| 7 | Chisel 25 mm and 6 mm | 2 Nos each | |
| 8 | Hand Drill Machine | 1 | |
| 9 | Portable Electric Drill Machine 6 mm capacity | 1 | |
| 10 | Pillar Electric Drill Machine 12 mm capacity | 1 | |
| 11 | Allen Key | 1 set | |
| 12 | Oil Can 0.12 ltr | 1 | |
| 13 | Grease Gun | 1 No | |
| 14 | Out Side Micrometer | 2 | |
| 15 | Motorised Bench Grinder | 1 | |

| | | | |
|----|---|----------------|--|
| 16 | Rawl plug tool and bit | 2 set | |
| 17 | Pully Puller | 2 | |
| 18 | Bearing Puller | 2 | |
| 19 | Pipe vice | 4 | |
| 20 | Thermometer 0 to 100 deg Centigrade | 1 No. | |
| 21 | Scissors blade 150 mm | 4 Nos. | |
| 22 | Crimping Tool | 2 sets | |
| 23 | Wire stripper 20 cm | 2 Nos. | |
| 24 | Chisel Cold flat 12 mm | 2 Nos. | |
| 25 | Mallet hard wood 0.50 kg | 4 Nos. | |
| 26 | Hammer Extractor type 0.40 kg | 4 Nos. | |
| 27 | Hacksaw frame 200 mm 300 mm adjustable | 2 Nos. each | |
| 28 | Try Square 150 mm blade | 4 Nos. | |
| 29 | Outside and Inside Divider Calliper | 2 Nos. each | |
| 30 | Pliers flat nose 150 mm | 4 Nos. | |
| 31 | Pliers round nose 100 mm | 4 Nos. | |
| 32 | Tweezers 100 mm | 4 Nos. | |
| 33 | Snip Straight and Bent 150 mm | 2 Nos. each | |
| 34 | D.E. metric Spanner | 2 Nos. | |
| 35 | Drill hand brace | 4 Nos. | |
| 36 | Drill S.S. Twist block 2 mm, 5 mm 6 mm set of 3 | 4 Set | |
| 37 | Plane, smoothing cutters 50 mm | 2 Nos. each | |
| 38 | Gauge, wire imperial | 2 Nos. | |
| 39 | File flat 200 mm 2 nd cut | 8 Nos. | |
| 40 | File half round 200 mm 2 nd cut | 4 Nos. | |
| 41 | File round 200 mm 2 nd cut | 4 Nos. | |
| 42 | File flat 150 mm rough | 4 Nos. | |
| 43 | File flat 250 mm bastard | 4 Nos. | |
| 44 | File flat 250 mm smooth | 4 Nos. | |
| 45 | File Rasp, half round 200 mm bastard | 4 Nos. | |
| 46 | Soldering Iron 25 watt, 65 watt, 125 watt | 2 Nos. each | |
| 47 | Copper bit soldering iron 0.25 kg. | 2 Nos. | |
| 48 | Desoldering Gun | 4 Nos. | |
| 49 | Hand Vice 50 mm jaw | 4 Nos. | |
| 50 | Table Vice 100 mm jaw | 8 Nos. | |
| 51 | Pipe Cutter to cut pipes upto 5 cm. dia | 4 Nos. | |
| 52 | Pipe Cutter to cut pipes above 5 cm dia | 2 Nos. | |
| 53 | Stock and Die set for 20 mm to 50 mm G.I. pipe | 1 set | |
| 54 | Stock and Dies conduit | 1 No. | |
| 55 | Ohm Meter; Series Type & Shunt Type | 2 Nos. each | |
| 56 | Multi Meter (analog) 0 to 1000 M Ohms, 2.5 to 500 V | 2 Nos. | |
| 57 | Digital Multi Meter | 6 Nos. | |
| 58 | A.C. Voltmeter M.I. 0 -500V A.C | 1 No. | |
| 59 | Milli Voltmeter centre zero 100 - 0 - 100 m volt | 1 No. | |

| | | | |
|---|--|------------|--|
| 60 | D.C. Milli ammeter 0 -500m A | 1 No. | |
| 61 | Ammeter MC 0-5 A, 0- 25 A | 1 No. each | |
| 62 | A.C. Ammeter M.I. 0-5A, 0-25 A | 1 No. each | |
| 63 | Kilo Wattmeter 0-1-3 kw | 1 No. | |
| 64 | A.C. Energy Meter, Single phase 5 amp. Three Phase 15 amp | 1 No. each | |
| 65 | Power Factor Meter | 1 No. | |
| 66 | Frequency Meter | 1 No. | |
| 67 | Flux meter | 1 No. | |
| 68 | Wheat Stone Bridge with galvanometer and battery | 1 No. | |
| 69 | Laboratory Type Induction Coil | 1 No. | |
| 70 | DC Power Supply 0-30V, 2 amp | 1 No. | |
| 71 | Rheostat 0 -1 Ohm, 5 Amp 0 -10 Ohm, 5 Amp 0- 25 Ohm, 1 Amp 0- 300 Ohm, 1 Amp | 1 No. each | |
| 72 | 1 Phase Variable Auto Transformer | 1 No. | |
| 73 | Battery Charger | 1 No. | |
| 74 | Hydrometer | 1 No. | |
| 75 | Miniature Breaker 16 amp (Raw Material) | 1 No. | |
| 76 | Working Bench 2.5 m x 1.20 m x 0.75 m | 4 Nos. | |
| 77 | Fire Extinguisher CO ₂ , 2 KG | 2 Nos. | |
| 78 | Fire Buckets | 2 Nos. | |
| Note: The items which are available in the market nearest of the specification as mentioned above may be procured. | | | |

C1. FURNITURE :

| <i>Sl. No.</i> | <i>Name of the items</i> | <i>Quantity</i> | <i>Remarks</i> |
|----------------|---------------------------------------|-----------------|----------------|
| 1 | Instructor's table | 1 No. | |
| 2 | Instructor's chair | 2 Nos. | |
| 3 | Metal Rack 100cm x 150cm x 45cm | 4 Nos. | |
| 4 | Lockers with 16 drawers standard size | 2 Nos. | |
| 5 | Almirah 2.5 m x 1.20 m x 0.5 m | 1 No. | |
| 6 | Black board/white board | 1 No. | |

Syllabus for the Trade of “Electroplater” Under Craftsman Training Scheme

Second Semester (Semester Code no. ELP- 02)

Duration : Six Months

Syllabus for TP and TT

| Week No | Trade Practical | Trade Theory |
|----------------|--|---|
| 1-2 | Practice on dismantling of DC Generator, study different parts, measurement of resistance of armature, shunt field & series field. Voltage building up, Assembling & testing of 1 Ph & 3 Phase Rectifiers | Principles of DC Generator, Right hand rule, function of commutator. Parts & functions of DC generator, EMF Equation etc.. Auto transformer- single phase, 3phase application etc.. |
| 3-5 | Effluent treatment of hazardous chemicals in plating shop.Safety precautions to be taken while handling cyanide base electroplating salts, different types of electroplating solutions, effluent discharge, stress to be given with regard to cyanide and chrome containing effluent, first aid , anti dotes for cyanide poisonings. Identification of soft water& Demineralised water. Identification of Anode & Cathode Setting up of plating tanks & lining Experimental determination of ECE values of different solutions. To practice identification of acids& alkalis using RED /BLUE litmus paper. To measure the specific gravity of the sample liquid & to check the temperature of the same. | Terms used in Electroplating. Chemical formulas of different acids, alkalies & cyanides. Identification of acids & alkalizes. Values of ECE for different solution, precautions to be observed, method of mixing of electrolyte, use of hydrometer & thermometer. Environmental pollution related to the trade, consequences, mitigation & control. 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, importance of soft water, technique to convert water to Demineralised water, knowledge about molecular weight, equivalent weight, atom, Atomic weight, electropositive and negative valency. |
| 6-7 | Cleaning the articles before plating such as scrubbing with emery paper, wet sand, scratch brushes, wire wheel etc. Surface preparation for ferrous / non ferrous alloys and acid cleaning, polishing and buffing operation, preparation of glue, emery wheel binding. | Abrasives and Adhesives used for the preparation of wheels, various compounds used for polishing and buffing Corrosion and its types. Importance of cleaning, its types, ex. a) Mechanical / chemical. b) polishing / buffing c) abrasive cleaning Degreasing, pickling, hot alkaline cleaning & final cleaning. different types of compounds. |
| 8-9 | Practice in cleaning by means of tumbling barrels, preparing of suitable dips and pickling of removing of scales from | Equivalent of weight of compounds, acids, oxide, reduction of acids and stopping off compounds. Chemical cleaning methods by |

| | | |
|-------|---|--|
| | surface of iron and steel, ultrasonic cleaning, and anodic/ cathodic cleaning. | acid dipping, alkaline soak cleaning, alkaline electro cleaning etc. oxidation – reduction – reaction analytical chemistry |
| 10-11 | Cleaning specific metals such as iron, steel, stainless steel, nickel, brass, copper etc.. Degreasing process to include organic solvent i.e. TCE/PCE. Practice in using cleaning tanks, preparing suitable solution, practice in cleaning of copper, brass, nickel, silver articles of oxidation stains. | Metals and alloys their properties such as hardness, conductance, malleability, ductility, luster, specific heat, specific gravity. Properties of metals , corrosion and rusting , fundamental knowledge about atomic structure and ionic theory. Different plating techniques for ferrous & non-ferrous metals. General care and maintenance of plating baths, electroplating tank & lining. General uses of electroplating |
| 12-13 | Practice in plating articles for copper plating, electroplating of Iron rods, plates with copper . Further practice electro deposition of copper (cyanide, acid & Pyrophosphate) Practice Hull cell method. | Properties of acid, alkalis & salts, general chemicals used in plating, common metals & their commercial names, calculation of time required or given plating with given current density. Normality of solution, relation between strength, normalities and equivalent weight of solution, knowledge of exothermic and endothermic reactions, principles of copper volt meter. Hull cell method for find current density for different plating's |
| 14-15 | Practice in preparing the job for nickel plating, different process involved , methods to be adopted for articles made of iron , copper ,brass, and other alloys and different process of nickel plating. | Different process of nickel plating and its applications, heavy nickel plating for corrosion resistance. Electroforming precautions for trouble free plating. Pre treatment for nickel plating, filtration, agitation, heat requirements for nickel plating. Nickel plating solution , types of nickel plating |
| 16-17 | Preparation and testing of solution for electro deposition of nickel, preparation and setting up of nickel plating vat, determination of ECE of nickel. Test the solution that has failed to give results accounts for sediments, incorrect solution etc.. | Volumetric analysis concentration of solution |
| 18-19 | Practice in nickel plating , adjusting of current and time for different thickness of deposition. Adjustment of pH, carbon treatment, maintenance of brightner level, testing of nickel plating solution using hull cell apparatus, thickness of deposit in ferrous metals. Further practice in nickel plating | Sulphamate nickel plating, Nickel plating, bath treatment and maintenance. Causes and remedies for different defects in Nickel plating. |

| | | |
|-------|--|---|
| | , inspection & testing of plated surface and finding faults. | |
| 20-21 | Electroplating of nickel, duped nickel plating, electrolysis nickel plating. Practice in barrel nickel plating of small jobs like pins, screws, washers, studs, buttons etc.. Practice in maintaining nickel plating vat. | Analysis of cyanides , catalysis, addition agents, catalytic agents, colloids, throwing power, factors influencing throwing power. Acidity in plating solution elementary knowledge of PH and significant of PH values. Description of capacitors and its use, comparator paper and its use, PH meter, Different troubles in nickel plating, causes, diagnosis and remedies. |
| 22-23 | Project work /Industrial visit | |
| 24-25 | Revision / Examination | |
| 26 | Semester gap | |

LIST OF TOOLS AND EQUIPMENTS, ELECTROPLATER- SEMESTER-2

A2. TRAINEES ADDITIONAL TOOL KIT F O R 16 TRAINEES +1 INSTRUCTOR, COMMON FOR SEMESTERS 2, 3, 4

| SL. NO | NAME OF THE ITEMS | Broad Specifications | QUANTITY | Expected life span(depending upon usage /quality of equipment) |
|--------|---|----------------------|----------|---|
| 1 | Canvas apron | Medium ,large | 17 Nos. | 1 years |
| 2 | Respirators | Common size | 17 Nos. | 6 months |
| 3 | Rubber gloves | Medium | 17 Nos. | 3 months |
| 4 | Rubber Gum boots | 8,9,10 | 17 Nos. | 1 years |
| 5 | First aid box | ISI | 17 Nos. | 2 years |
| 6 | Goggles | Common size | 17 Nos. | 1 years |
| 7 | Rubber/Leather Apron | Medium ,large | 17 Nos. | 1 years |
| 8 | Hand vice(50mm jaw) | Nos | 13 Nos. | 5 years |
| 9 | File flat 200mm,2nd cut | Nos | 9 Nos. | 1 years |
| 10 | File flat 200mm smooth | Nos | 13 Nos. | 1 years |
| 11 | Cutting plier insulated 200mm | Nos | 17 Nos. | 2 years |
| 12 | Brush hand scratch | Nos | 17 Nos. | 2months |
| 13 | Brush circular brass | Nos | 17 Nos. | 2months |
| 14 | File 2 nd cut half round 150mm | Nos | 13 Nos. | 1years |
| 15 | File round 2 nd cut 200mm | Nos | 13 Nos. | 1years |
| 16 | File round 200 mm smooth | Nos | 13 Nos. | 1 years |

B2.General Machinery, Shop outfit for semester II, Electroplater

| SL.NO | NAME OF THE ITEMS | Broad Specifications | QUANTITY | Expected life span(depending upon usage /quality of equipment) |
|-------|-------------------------|---|----------|---|
| 1 | Weigh Balance m/c | Electronic, 5kg capacity. | 4 nos | 4 years |
| 2 | Hydrometer with syringe | | 4 nos | 6-1 years |
| 3 | Thermometer (0 to 100) | | 5 nos | 6 months |
| 4 | Glue pot | (5kg capacity) | 2 nos | 5 years |
| 5 | Oil can | 500ml | 2 nos | 3 years |
| 6 | Exhaust fan 1 phase | | 4 nos | 1 years |
| 7 | Work bench | (2mtrs x 1.5 x 1.5 x 1m) | 4 nos | 3 years |
| 8 | Oil can | Item at Sl.No.12 of semester I to be used | | |

| | | | | |
|----|--|---|----------------------|-----------|
| 9 | Voltmeter 0-30V DC Digital | | 4 nos | 2 years |
| 10 | Ammeter MC 0-300 A Digital | | 4 nos | 2 years |
| 11 | Ammeter MC 0-2000mA | | 4 nos | 2 years |
| 12 | Adjustable resistance board with ammeter & voltmeter | | 4 nos | 2 years |
| 13 | Digital Multi Meter | Item at Sl.No.57 of semester I to be used | | |
| 14 | PVC Polypropylene (PP) Vat/ Tank with SS stand for nickel , copper, brass, silver,tin,zinc,cadmium,(L-2ft, B-1.5ft ht-1.5ft) anodizing etc | | 1no each 8 nos | 2 years |
| 15 | Perforated barrel (10 kg capacity) | | 2 nos | 3 years |
| 16 | Cleaning tank (L-2ft,b-1.5ft,ht-1.5ft)made out of hard Polypropylene (PP) | | 8 nos | 1 years |
| 17 | Dust & spray proof polishing machine 1phase,250V/5A | | 2 nos | 5 years |
| 18 | Dust & spray proof polishing Machine 3phase,440v/15A | | 1 nos | 5 years |
| 19 | Nickel comparator test set Digital pH meter, Table top type | | 1No | 2 years |
| 20 | Buffing machine with spindle and roller bearing motorised heavy duty 3 phase, 440V, 15 Amps. Bench Grinder and portable angle grinder hand type 1 phase | | 2 nos | 4 years |
| 21 | Electroplating rectifiers, 3 phase,380/440V,50 c/s, AC supply,16 Volts DC with an output of 500Amps 300A, Dc voltages adjustable from 3.5 0 to 16 20V with voltage control 63 steps of load complete with required meter panel sand change over switch | | 2 no | 4-5 years |
| 22 | AC to DC Motor Generator set for electroplating shop. Induction Motor: 3 ph, 5HP, 440V. DC Generator: 15V, 300A | | 1 Set | 10 years |
| 23 | Folding desk made out wood | | 16 desks | 3 years |
| 24 | Fire extinguishers | Item at Sl.No.75 of semester I to be used | | |

| | | | | |
|----|---|--|--------|-----------|
| 25 | Fire extinguishers (chemical) | | 1No | 2 years |
| 26 | Heating coil (copper, lead titanium /suitable material for long life) 1kw, length 10/12'' | | 10 nos | 2 years |
| 27 | Work tables (wooden) 10ft by 8ft, 5ft by 2ft | | 2 Nos | 8 years |
| 28 | Safety charts (chemical / electrical) | | 2 Nos | 2 years |
| 29 | Mechanical Air agitation unit | | 2 no. | 2-3 years |
| 30 | Centrifugal Dryer | | 2 no. | 2-3 years |
| 31 | Cartridge solution filter | | 1 nos | 2 years |
| 32 | Plastic siphon 12mm dia | | 5 nos | 1 years |
| 33 | Hull cell unit (complete set for chemical analysis) | | 2 nos. | 4 years |
| 34 | BNF jet test apparatus Salt spray testing chamber for quality testing of plated surface. | | 2 nos. | 1 years |

C2. WORKSHOP FURNITURE common for 2, 3, 4 semesters:

| Sl. No. | Name of the items | Quantity |
|---------|---------------------------------------|--|
| 1 | Instructor's table | Item at Sl.No.1 furniture of semester I to be used |
| 2 | Instructor's chair | Item at Sl.No.2 furniture of semester I to be used |
| 3 | Metal Rack 100cm x 150cm x 45cm | Item at Sl.No.3 furniture of semester I to be used |
| 4 | Lockers with 16 drawers standard size | Item at Sl.No.4 furniture of semester I to be used |
| 5 | Steel Almirah 2.5 m x 1.20 m x 0.5 m | Item at Sl.No.5 furniture of semester I to be used |
| 6 | Black board/white board | Item at Sl.No.6 furniture of semester I to be used |
| 7 | Wooden rack standard size | 4 Nos |
| 8 | Wooden table 5 ft x 5ft | 2 Nos |

Syllabus for the Trade of “*Electroplater*” Under Craftsman Training Scheme

Third Semester (Semester Code no. ELP - 03)

Duration : Six Months

Syllabus for TP and TT

| Week No | Trade Practical | Trade Theory |
|---------|--|---|
| 1 – 2 | Practice in Preparing the job for Chromium Plating, Coating and Plating Practice. Precautions to be observed. Practice in Chromium plating on different metals. Practice in Chromium plating on non ferrous metals. Practice in chromium plating of small jobs, coating techniques of jobs and location of anodes. Chromium plating in internal areas. | Safety precautions & Exhaust, composition of chromium plating solutions. Process of preparing and precautions to be observed temperature of plating bath, testing the Electrolyte, pre coating or under coating, calculation of time required for a give plating with given current density. Re-generation of chromium plating solutions, Proper maintenance, removal of excess sulphate, rectification of trivalent chromium, description and use of dechromator, removal of iron by drag out, throwing power and its test, current density, current efficiency calculation of the same and time for different deposition. Anodes for chromium plating |
| 3 – 4 | Direct Hard Chromium plating Practice and pre treatment for the same and precaution to be taken, insoluble anodes configuration. Practice of hard chromium plating on different ferrous metals having different configuration. Practice of hard chromium on different non ferrous metals(solid & hallow) | Types of Chromium Deposits, plating on die castings, bright chromium on sheet, Chromium on aluminum and testing of plated surface, stripping, faulty deposit, causes and remedies, health hazard and chromium coloring. |
| 5-7 | Preparation of Job for Cadmium plating, preparation of solution on testing the acidity and density of solution, setting up of VAT for Plating. Practice in cadmium plating of different jobs, practice in finding defects, causes and remedies. | Properties of cadmium, cadmium solution preparation, analysis, thickness of deposit, testing of solution. Preparing the job for cadmium plating. General maintenance of plating VAT, heat treatment of cadmium deposits, cadmium coloring, general troubles, diagnosis and correction. |
| 8- 10 | Preparation of articles made of copper, nickel, steel etc., for silver plating, Using the methods such as hot alkaline cleaning, cathode cold cleaning or cyanide dips. Cadmium plating on stainless steel. | Factors considered for a good electro plating erection plating tanks, capacity of plating tanks, general process of silver plating. Types, pre treatment for silver plating, silver strike, sequence of plating operations. maintenance, defects causes and remedies. |
| 11- 12 | Practice in silver plating, adjusting current density and time for the required | Arrangements of VATS, conductors connecting, rheostat and instruments in an |

| | | |
|--------|---|---|
| | thickness of plating on different articles such as wrist watch cover, spectacles frames and camera parts etc., | ideal electro plating plant process, amalgamating silver strike solution for nickel plated jobs, process of bright silver plating, cathode movement of heavy silver deposit |
| 13- 14 | Preparation of jobs made of non ferrous metals and alloys for gold plating by hot cleaning or degreasing, pickling etc., practice in gold plating. | General process of gold plating solution, Gold alloys pre treatment, plating operation of alloys or carat plating and recovering of gold, electro gilding of metals, applications of gold deposit. Anodes for gold plating. |
| 15- 16 | Further practice in gold plating, Preparing the solution for green gold, pink gold, rose gold, practice in heavy gold plating, maintenance of gold plating VATS. Practice of gold plating of ornamental articles. Practice masking for different plating's. | Striping of gold plating by electrolytic method, immersion method, general troubles, causes, rectification. Electro Polishing. Different masking techniques for different plating and etching operations. |
| 17-19 | Practice in preparing solution for brass plating, testing for acidity, setting up of the VAT, and practice in electro deposition of brass. | Properties and preparation of brass salts, preparation of solution, process of electro deposition of brass, effects of verification of current density, general troubles, causes and remedies. |
| 20-21 | Practice in preparing solution for zinc plating, preparing job for the same, zinc plating practice, stripping of zinc deposit, barrel plating, stripping of different metals eg. nickel, chromium, lead, tin, cadmium, copper etc., | Zinc and its properties, effect on zinc, protection of iron and steel by zinc, types of zinc baths, preparing the work for plating, electro galvanizing process, causes, remedies and diagnosis. |
| 22-23 | Project work /industrial visit | |
| 24-25 | Revision / Examination | |
| 26 | Semester gap | |

LIST OF TOOLS AND EQUIPMENTS, ELECTROPLATER- SEMESTER-3

A3. TRAINEES ADDITIONAL TOOL KIT for 16 TRAINEES +1 INSTRUCTOR, COMMON FOR SEMESTERS 2, 3, 4 is to be used

B3.General Machinery, Shop outfit for semester III, Electroplater

| SL.NO | NAME OF THE ITEMS | Broad Specifications | QUANTITY | Expected life span(depending upon usage /quality of equipment) |
|-------|--|---|----------|---|
| 1 | Weigh Balance m/c | Item at Sl.No 1 of semester II is to be used | | |
| 2 | Hydrometer with syringe | Item at Sl.No 2 of semester II is to be used | | |
| 3 | Thermometer (0 to 100) | Item at Sl.No 3 of semester II is to be used | | |
| 4 | Glue pot | Item at Sl.No 4 of semester II is to be used | | |
| 5 | Oil can | Item at Sl.No 5 of semester II is to be used | | |
| 6 | Exhaust fan 1 phase | Item at Sl.No 6 of semester II is to be used | | |
| 7 | Work bench | Item at Sl.No 7 of semester II is to be used | | |
| 8 | Oil can | Item at Sl.No.12 of semester I to be used | | |
| 9 | Voltmeter 0-30V DC Digital | Item at Sl.No 9 of semester II is to be used | | |
| 10 | Ammeter MC 0-300 A Digital | Item at Sl.No 10 of semester II is to be used | | |
| 11 | Ammeter MC 0-2000mA | Item at Sl.No 11 of semester II is to be used | | |
| 12 | Adjustable resistance board with ammeter & voltmeter | Item at Sl.No 12 of semester II is to be used | | |
| 13 | Digital Multi Meter | Item at Sl.No.57 of semester I to be used | | |
| 14 | PVC Polypropylene (PP) Vat/ Tank with SS stand for nickel , copper, brass, silver,tin,zinc,cadmium,(L-2ft, B-1.5ft ht-1.5ft) anodizing etc | Item at Sl.No.14 of semester II to be used | | |
| 15 | Chromium plating tank made out of Antimonial lead lining with reinforced glass lining. , L-2ft,b-1.5ft,ht-1.5ft | | 5 nos | 2 years |
| 16 | Perforated barrel (10 kg capacity) | Item at Sl.No 15 of semester II is to be used | | |
| 17 | Cleaning tank (L-2ft,b-1.5ft,ht-1.5ft)made out of hard Polypropylene (PP) | Item at Sl.No 16 of semester II is to be used | | |
| 18 | Dust & spray proof polishing machine 1phase,250V/5A | Item at Sl.No 17 of semester II is to be used | | |
| 19 | Dust & spray proof polishing Machine | Item at Sl.No 18 of semester II is to be used | | |

| | | |
|----|--|---|
| | 3phase,440v/15A | |
| 20 | Buffing machine with spindle and roller bearing motorised heavy duty 3 phase, 440V, 15 Amps. Bench Grinder and portable angle grinder hand type 1 phase | Item at Sl.No 20 of semester II is to be used |
| 21 | Electroplating rectifiers, 3 phase,380/440V,50 c/s, AC supply,16 Volts DC with an output of 500Amps 300A, Dc voltages adjustable from 3.5 0 to 16 20V with voltage control 63 steps of load complete with required meter panel sand change over switch | Item at Sl.No 21 of semester II is to be used |
| 22 | Folding desk made out wood | Item at Sl.No 23 of semester II is to be used |
| 23 | Fire extinguishers | Item at Sl.No.75 of semester I to be used |
| 24 | Fire extinguishers (chemical) | Item at Sl.No 25 of semester II is to be used |
| 25 | Heating coil (copper, lead titanium /suitable material for long life) 1kw, length 10/12'' | Item at Sl.No 26 of semester II is to be used |
| 26 | Work tables (wooden) 10ft by 8ft, 5ft by 2ft | Item at Sl.No 27 of semester II is to be used |
| 27 | Safety charts (chemical / electrical) | Item at Sl.No 28 of semester II is to be used |
| 28 | Mechanical Air agitation unit | Item at Sl.No 29 of semester II is to be used |
| 29 | Centrifugal Dryer | Item at Sl.No 30 of semester II is to be used |
| 30 | Cartridge solution filter | Item at Sl.No 31 of semester II is to be used |
| 31 | Plastic siphon 12mm dia | Item at Sl.No 32 of semester II is to be used |
| 32 | Hull cell unit (complete set for chemical analysis) | Item at Sl.No 33 of semester II is to be used |
| 33 | BNF jet test apparatus Salt spray testing chamber for quqlity testing of plated surface. | Item at Sl.No 34 of semester II is to be used |

C3. WORKSHOP FURNITURE common for 2, 3, 4 semesters:

| Sl. No. | Name of the items | Quantity |
|----------------|---------------------------------------|--|
| 1 | Instructor's table | Item at Sl.No.1 furniture of semester I to be used |
| 2 | Instructor's chair | Item at Sl.No.2 furniture of semester I to be used |
| 3 | Metal Rack 100cm x 150cm x 45cm | Item at Sl.No.3 furniture of semester I to be used |
| 4 | Lockers with 16 drawers standard size | Item at Sl.No.4 furniture of semester I to be used |
| 5 | Steel Almirah 2.5 m x 1.20 m x 0.5 m | Item at Sl.No.5 furniture of semester I to be used |
| 6 | Black board/white board | Item at Sl.No.6 furniture of semester I to be used |
| 7 | Wooden rack standard size | Item at Sl.No.7 of semester I to be used |
| 8 | Wooden table 5 ft x 5ft | Item at Sl.No.8 of semester to be used |

Syllabus for the Trade of “*Electroplater*” Under Craftsman Training Scheme

Fourth Semester

(Semester Code no. ELP - 04)

Duration : Six Months

Syllabus for TP and TT

| Week No | Trade Practical | Trade Theory |
|---------|---|--|
| 1- 2 | Preparing the solution for Tin plating, Setting up for Tin plating bath, Practice Tin Plating Process. Preparing solution for different alloy metals. Plating, Tin alloy plating on different articles | Tin and its uses, advantages of tin coating, alkaline bath and acid bath their analysis, Process of tin plating of different types, such as hot dipping, chemical replacement (Wiping) and contact Plating. Tin Alloy plating solution used their analysis, current density and thickness, preparing job for different tin alloys such as tin, zinc, tin nickel, tin lead, etc., |
| 3- 5 | Preparing the sulphuric acid solution for aluminium anodizing, setting up the anodizing vats and to practice the same. To practice anodizing by using different types of electrolytes i.e. chromic acid, sulphuric acid and oxalic acid. | Anodizing and its types, applications, uses. Different solutions, defects cause and remedies, maintenance, Inspection and testing. |
| 6-7 | Practice in metal coloring by different Methods such as chemical, electrolytic etc. Practice in purification of different solution and practice in brass etching such as name plate, flower vas etc...Electroplating the steel name plate with nickel. | Brass etching and application and electrolytic process of cleaning the metals for coloring, |
| 8- 9 | Practice on gold, silver plating on small articles like paper pins, safety pins and gem clips etc... | Barrel plating and its application and different Types of barrels, their description and place of use. Brief description about the automatic barrel plating equipment. |
| 10- 11 | Practice in plating different alloys such as muntez metal, delta alloys etc. Chemical etching or chemical milling for steel and aluminum parts. Practice stainless steel passivation. | Chemical etching or chemical milling for steel and aluminium parts. Stainless steel passivation and its methods |
| 12- 13 | Practice in conversion coating on different materials such as aluminium, zinc, , copper, Steel, magnesium alloys | Conversion coatings process, phosphating, bonderising, alodine, chromate conversion, Blackening etc. current efficiency, anode efficiency, cathode efficiency, coulometer use of supplementary anodes , shields and |

| | | |
|-------|--|---|
| | | bipolar electrodes. Supplementary coating ex. Passivation, silchrome, colouring, sealing. |
| 14-15 | Practice in testing different plated jobs for determining the local thickness, adhesion of deposit on base metals by using different methods such as micrometers, BNF Jet test methods etc.. | Inspection of plated surfaces and to test using micrometer, BNF jet test methods ultrasonic thickness tester etc. and to check the adhesion on the base metals. Corrosion resistance test, visual testing. |
| 16-17 | Inspection and testing of electroplated articles. | Inspection and testing procedures to be adopted for various electroplating jobs. |
| 18-21 | Installation of machinery for electroplating shops, practical study with regards to suitability and selection of equipment, advantages and disadvantages. Complete layout of the electroplating shop with details of plant machineries and technical specification. Working out detailed electroplating layout and calculate the approximate cost of the shop. Preventive maintenance of electroplating workshops. | Calculation pertaining to consumption of anodes, estimation materials and quantity required for constructing and etching, plating vats, cleaning etc.. Suitability selection of equipments and advantages and disadvantages and calculation of the capacity of the plating vats. Electroplating shop layout characteristics, factors to be considered i.e. availability of indigenous materials, equipments and waste disposal. |
| 22-23 | Industrial visit /project work | |
| 24-25 | Revision /Examination | |
| 26 | Semester gap | |

LIST OF TOOLS AND EQUIPMENTS, ELECTROPLATER- SEMESTER-4

A4. TRAINEES ADDITIONAL TOOL KIT for 16 TRAINEES +1 INSTRUCTOR, COMMON FOR SEMESTERS 2, 3, 4 is

to be used

B4.General Machinery, Shop outfit for semester IV, Electroplater

| SL.NO | NAME OF THE ITEMS | Broad Specifications | QUANTIT Y | Expected life span(depending upon usage /quality of equipment) |
|-------|--|----------------------|-----------|---|
| 1 | Weigh Balance m/c | | | Item at Sl.No.1 of semester II to be used |
| 2 | Hydrometer with syringe | | | Item at Sl.No.2 of semester II to be used |
| 3 | Thermometer (0 to 100) | | | Item at Sl.No.3 of semester II to be used |
| 4 | Glue pot | | | Item at Sl.No.4 of semester II to be used |
| 6 | Oil can | | | Item at Sl.No.5 of semester II to be used |
| 7 | Exhaust fan 1 phase | | | Item at Sl.No.6 of semester II to be used |
| 8 | Work bench | | | Item at Sl.No.7 of semester II to be used |
| 9 | Oil can | | | Item at Sl.No.12 of semester I to be used |
| 10 | Voltmeter 0-30V DC Digital | | | Item at Sl.No.9 of semester II to be used |
| 11 | Ammeter MC 0-300 A Digital | | | Item at Sl.No.10 of semester II to be used |
| 12 | Ammeter MC 0-2000mA | | | Item at Sl.No.11 of semester II to be used |
| 13 | Adjustable resistance board with ammeter & voltmeter | | | Item at Sl.No.12 of semester II to be used |
| 14 | Digital Multi Meter | | | Item at Sl.No.57 of semester I to be used |
| 15 | PVC Polypropylene (PP) Vat/ Tank with SS stand for nickel , copper, brass, silver,tin,zinc,cadmium,(L-2ft, B-1.5ft ht-1.5ft) anodizing etc | | | Item at Sl.No.14 of semester II to be used |
| 16 | Perforated barrel (10 kg capacity) | | | Item at Sl.No.15 of semester II to be used |
| 17 | Cleaning tank (L-2ft,b-1.5ft,ht-1.5ft)made out of hard Polypropylene (PP) | | | Item at Sl.No.16 of semester II to be used |
| 18 | Dust & spray proof polishing machine 1phase,250V/5A | | | Item at Sl.No.17 of semester II to be used |
| 19 | Dust & spray proof polishing Machine 3phase,440v/15A | | | Item at Sl.No.18 of semester I to be used |
| 21 | Buffing machine with spindle and roller bearing motorised heavy duty 3 phase, | | | Item at Sl.No.20 of semester I to be used |

| | | |
|----|---|---|
| | 440V, 15 Amps. Bench Grinder and portable angle grinder hand type 1 phase | |
| 22 | Electroplating rectifiers, 3 phase, 380/440V, 50 c/s, AC supply, 16 Volts DC with an output of 500Amps 300A, Dc voltages adjustable from 3.5 0 to 16 20V with voltage control 63 steps of load complete with required meter panel sand change over switch | Item at Sl.No.21 of semester I to be used |
| 24 | Folding desk made out wood | Item at Sl.No.23 of semester I to be used |
| 25 | Fire extinguishers | Item at Sl.No.75 of semester I to be used |
| 26 | Fire extinguishers (chemical) | Item at Sl.No.25 of semester I to be used |
| 27 | Heating coil (copper, lead titanium /suitable material for long life) 1kw, length 10/12'' | Item at Sl.No.26 of semester I to be used |
| 28 | Work tables (wooden) 10ft by 8ft, 5ft by 2ft | Item at Sl.No.27 of semester I to be used |
| 29 | Safety charts (chemical / electrical) | Item at Sl.No.28 of semester I to be used |
| 31 | Centrifugal Dryer | Item at Sl.No.30 of semester I to be used |
| 32 | Cartridge solution filter | Item at Sl.No.31 of semester I to be used |
| 33 | Plastic siphon 12mm dia | Item at Sl.No.32 of semester I to be used |
| 34 | Hull cell unit (complete set for chemical analysis) | Item at Sl.No.33 of semester I to be used |
| 35 | BNF jet test apparatus Salt spray testing chamber for quqlity testing of plated surface. | Item at Sl.No.34 of semester I to be used |

C4. WORKSHOP FURNITURE common for 2, 3, 4 semesters to be used:

| Sl. No. | Name of the items | Quantity |
|---------|----------------------------------|--|
| 1 | Instructor's table | Item at Sl.No.1 furniture of semester I to be used |
| 2 | Instructor's chair | Item at Sl.No.2 furniture of semester I to be used |
| 3 | Metal Rack 100cm x 150cm x 45cm | Item at Sl.No.3 furniture of semester I to be used |
| 4 | Lockers with 16 drawers standard | Item at Sl.No.4 furniture of semester I to be used |

| | | |
|---|--------------------------------------|--|
| | size | |
| 5 | Steel Almirah 2.5 m x 1.20 m x 0.5 m | Item at Sl.No.5 furniture of semester I to be used |
| 6 | Black board/white board | Item at Sl.No.6 furniture of semester I to be used |
| 7 | Wooden rack standard size | Item at Sl.No.7 of semester II to be used |
| 8 | Wooden table 5 ft x 5ft | Item at Sl.No.8 of semester II to be used |

Further Learning options

After successful completion of CTS Course in the trade of Electroplater, the trainees have the option to continue their further studies by joining 3 year Diploma course in polytechnic.