CURRICULUM

FOR THE TRADE OF

BATTERY REPAIRER

UNDER

APPRENTICESHIP TRAINING SCHEME

सत्यमेव जयते
Government of India

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

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1. ACKNOWLEDGEMENT

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2. BACKGROUND

2.1 Apprenticeship Training Scheme under Apprentice Act 1961

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

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

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

2.2 Changes in Industrial Scenario

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

2.3 Reformation

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

- Prescription of number of apprentices to be engaged at establishment level instead of trade-wise.

- Establishment can also engage apprentices in optional trades which are not designated, with the discretion of entry level qualification and syllabus.

- Scope has been extended also to non-engineering occupations.

- Establishments have been permitted to outsource basic training in an institute of their choice.

- The burden of compliance on industry has been reduced significantly.

3. RATIONALE

(Need for Apprenticeship in Battery Repairer trade)

It is generally observed that institutionally trained youth have not produced desired result because training imparted in institutions alone is not enough for acquisition of skills but needs to be supplemented by training in the actual world of work.

The electrical sector plays a very important role not only in GDP growth but also in providing employment in the country. It is estimated that it requires almost 80,000 to 90,000 skilled workers every year in Electrical Equipment Industry alone.

It is therefore needed to provide on the job training to the Semi skilled workers and also make changes in the curriculum. So to supply the skilled manpower demand, the Apprenticeship Training approach with the revised, industrial friendly curriculum is required.

Batteries are used in all sectors like telecom, houses, trains, aviation, transport etc and important part of every person. Normal Electrician cannot repair and cannot find the defect of battery. Life of Battery is fixed and mainly depends on charge/discharge rate. Due to completion of life span or by means of otherreason numbers of Batteries are being replaced day to day, such type of Batteries can be reused after repair or by changing their faulty/damaged parts. It's save money as well as our environment also.

4. JOB ROLES:

Brief description of Job roles:

1. Inspects electrical connections, wiring charging relays, charging resistance box, and storage batteries, following wiring diagram.
2. Removes and disassembles cells and cathode assembly, using tension handles, pry bars, and hoist, and cuts wires to faulty cells.
3. Inspects battery for defects, such as dented cans, damaged carbon rods and terminals, and defective seals.
4. Tests condition, fluid level, and specific gravity of electrolyte cells, using voltmeter, hydrometer, and thermometer.
5. Positions and levels, or signals worker to position and level, cell, anode, or cathode, using hoist and leveling jacks.
6. Installs recharged or repaired battery or cells, using hand tools.
7. Cleans cells, cell assemblies, glassware, leads, electrical connections, and battery poles, using scraper, steam, water, emery cloth, power grinder, or acid.
8. Disconnects electrical leads and removes battery, using hand tools and hoist.
9. Carryout UPS / INVERTER wiring.

REFERENCE NCOCODE: 859.65

5. GENERAL INFORMATION

1. **Name of the Trade : BATTERY REPAIER**

2. **N.C.O. Code No.**: 859.65

3. **Duration of Apprenticeship Training**

(Basic Training + Practical Training):15 month

3.1 For Fresher's :Duration of Basic Training: -

a) Block –I : 3 months

Total duration of Basic Training: 03 months

Duration of Practical Training (On -job Training): -

a) Block–I: 12 months

Total duration of Practical Training: 12 months

4. **Entry Qualification** : 10^{th} Class under 10+2 System of Education

5. **Selection of Apprentices:** The apprentices will be selected as per Apprentices Act amended time to time.

6. **Rebate for ITI passed trainees**:**NIL**

Note: Industry may impart training as per above time schedule for different block, however this is not fixed. The industry may adjust the duration of training considering the fact that all the components under the syllabus must be covered. However the flexibility should be given keeping in view that no safety aspects is compromised.

3. COURSE STRUCTURE

Training duration details: -

Time (in months)	1-3	4-15
Basic Training	Block– I	-----
Practical Training (On - job training)	----	Block – I

Components of Training	Duration of Training in Months →														
↓	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Basic Training Block - I															
Practical Training Block - I															

SYLLABUS

7.1 BASIC TRAINING
(BLOCK – I)
DURATION: 03 MONTHS

GENERAL INFORMATION

1) **Name of the Trade** :**BATTERY REPAIRER**
2) **Hours of Instruction** : 500 Hrs.
3) **Batch size** : 16
4) **Power Norms** : 5.2 KW for Workshop
5) **Space Norms** : 98 Sq.m.
6) **Examination** : The internal assessment will be held on completion of the each Block.
7) **Instructor Qualification** :

1. INSTRUCTORS' QUALIFICATION	: Degree in Electrical Engineering with one year experience in relevant field. **OR** Diploma in Electrical and allied with two years experience in relevant field. **OR** 10^{th} Class Pass + NTC/NAC in the Trade of "Battery Repairer" With 3 years' post qualification experience in the relevant field.
2. DESIRABLE QUALIFICATION	**:** Preference will be given to a candidate with CIC (Craft Instructor Certificate) in Electrician trade.

8) **Tools, Equipments & Machinery required** : - As per Annexure – I

7.1.1 DETAILSYLLABUS OF CORE SKILL

A. Block– I
Basic Training

S.No.	Workshop Calculation and Science	Duration (hrs.)	Engineering Drawing	Duration (hrs.)
1.	**Unit**: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	20	Introduction to Engineering Drawing and Drawing Instruments : - Conventions - Viewing of engineering drawing sheets. - Method of Folding of printed Drawing Sheet as per BIS SP:46-2003 - Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.	30
2.	**Basic Mathematics** - BODMAS rule Fraction-Addition, Subtraction, multiplication and Division-Problem solving, Decimal-Addition. Simple calculation using Scientific Calculator.		Lines : - Definition, types and applications in Drawing as per BIS SP:46-2003 - Classification of lines (Hidden, centre, construction, Extension, Dimension, Section) - Drawing lines of given length (Straight, curved) - Drawing of parallel lines, perpendicular line - Methods of Division of line segment	
3.	Conversion of Fraction to Decimal and vice-versa.		Free hand drawing of - Lines, polygons, ellipse, etc. - geometrical figures and blocks with dimension Transferring measurement from the	

			given object to the free hand sketches.	
4.	**Percentage**: Introduction, Simple calculation. Changing percentage to fraction and decimal & vice-versa.		**Signs & Symbols of AC/DC System** Symbols used in electrical circuits. Electrical components.	
5.	Square Root: Square and square root, method of finding out square roots. Simple problem using calculation.		Sizes and Layout of Drawing Sheets - Selection of sizes - Title Block, its position and content - Item Reference on Drawing Sheet (Item List)	
6.	**Mass, Weight and Density**: Mass, Unit of Mass, Weight, difference between mass and weight. Density, unit of density. Relation between mass, weight & density. Simple problems related to mass, weight, and density.		Method of presentation of Engineering Drawing - Pictorial View - Orthographic View - Isometric view	
7.	**Mensuration :** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Volume of solids – cube, cuboid, cylinder and Sphere. Surface area of solids – cube, cuboid, cylinder and Sphere.		- Drawing of Solid figures (Cube, Cuboids, Cone) with dimensions. - Free hand Drawing of Solid figures (Prism, Pyramid, Frustum of Cone and Pyramid.) with dimensions. - Free Hand sketch of hand tools and measuring tools used in respective trades. -Free Hand Sketching of different shapes of Batteries & its component. -Circuit Diagram of charging circuit	

7.1.2DETAIL SYLLABUS OF PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

A. Block –I

Basic Training

Week No.	PROFESSIONAL SKILL (275 Hours)	PROFESSIONAL KNOWLEDGE (120 Hour)
1	Implementation of various safety measures in the shop floor. Visit to different sections of the Institute. Demonstration of elementary first aid. Artificial Respiration. Practice on use of fire extinguishers. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Identification of safety signs for Danger, Warning and Caution. Safe operational procedure for breakdown maintenance.	**Occupational Safety & Health** Basic safety introduction, Personal protection:- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Use of Fire extinguishers. Visit & observation of sections. Various safety measures involved in the Industry. Elementary first Aid. Concept of Standard
2	Familiarization with signs and symbols of Electrical accessories. Description of properties of insulating material.	Fundamental of electricity: Electron theory- free electron,protons & neotrons. Fundamental terms- Current, Voltage definitions, AC, DC, Phase, Neutral, Earth. Units & effects of electric current. Common insulating material
	Demonstration of trade hand Tools. Use, care & maintenance of various hand tools.	Identification of Trade-Hand tools-Specifications.
3.	Practice on Soldering, Use of flux, Uses of resign and soldering equipments. Skinning the cables Demonstration & Practice on bare conductors joints--such as rat tail, Britannia, straight, Tee, Western union Joints Practice in soldering &Tinning. Practice on crimping thimbles, Lugs. Demonstration and identification of types of cables. Demonstration & practice on using standard wire gauge &micrometer.	Soldering, flux and soldering technique. Resistors types of resistors & properties of resistors. Introduction of National Electrical Code. Explanation, Definition and properties of conductors, insulators and semi-conductors. Types of wires & cables, standard wire gauge. Specification of wires & Cables-insulation & voltage grades- Low , medium & high voltage
4.	Identify & select different type of Instruments. Use of **-P**MMC , MI meter, Multi-meter(Digital/Analog) , Wattmeter, P F meter, Energy meter, Frequency meter, Phase sequence meter, Digital Instruments, etc Range extension of meters.	**Electrical Measuring Instruments -** -types, indicating types PMMC & MI meter (Ammeter, Voltmeter) -Range extension -Multimeter(Digital/Analog) -Wattmeter - P.F. meter - Energy meter (Digital/analog) –Insulation Tester (Megger), Earth tester.

		-Frequency meter -Phase Sequence meter -Multimeter –Analog and Digital -Tong tester -Techometer.
5	Verification of Ohm's Law, Measuring unknown resistance Verification of laws of series and parallel circuits. Kirchoff's Law 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.	Ohm's Law – Kirchoff's Law- Simple electrical circuits and problems. Reading of simple Electrical Layout. **Resistors -**Law of Resistance. Series and parallel circuits & related calculation. Measurement of resistance using Wheatstone Bridge. **Alternating Current -**Comparison and Advantages D.C and A.C. Related terms Frequency, Instantaneous value, R.M.S. value Average value, Peak factor, form factor, sine wave, phase and phase difference. Inductive and Capacitive reactance, Impedance (Z), power factor (p.f). Active and Reactive power. Single Phase and three-phase system etc.
6.	**Diodes**-symbol - Tests - Construct & Test Half wave rectifier ckt. Full wave rectifier ckt. Bridge rectifier ckt. Singl phase & three phase rectifier ckt Measurement & calculation of electrical parameters using C.R.O. Different wave shapes of rectifiers and their values using C.R.O. Identification of terminals, construction & Testing of transistor. Operation, maintenance & troubleshooting of inverter, Voltage stabilizer, DC regulated power supply, UPS, etc	**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 DC, rectifier circuit. Half wave, Full wave and Bridge circuit. Filter circuits-passive filter. Working principle and uses of an oscilloscope. Types of transistors & its application. Specification and rating of transistors.
7.	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,

	Identification of types of Transformers. Connection of transformers, Transformation ratio, testing of transformer, calculates the losses & efficiency. Use of Current Transformer (C.T.) and Potential (Voltage) transformer (P.T.) Testing of single phase and Three Phase Transformers - Cleaning, maintenance, testing and changing of oil.	Working principle of **Transformer,** losses & efficiency. classification C.T., P.T. Instrument and Auto Transformer(Variac), Construction, Single phase and Poly phase. Type of Cooling for transformer. Protective devices. Components, Auxiliary parts i.e. breather, Conservator, buchholz relay, other protective devices. Transformer oil testing and Tap changer (off load and on load). Dry type transformer. Bushings and termination.
8.	Identification of parts of battery. Types of Battery, Parts of Battery,Practice on Battery Charging, Preparation of battery charging, Testing of cells, Installation of batteries, Charging of batteries by different methods. Routine care & maintenance of Batteries	Theory of Chemical Reaction, Electrolysis(Faradays Law) , Electro Chemical Equivalent. **Chemical** effect of electric current-Principle of electrolysis. Faraday's Law of electrolysis Lead acid cell-description, methods of charging-Precautions to be taken & testing equipment, Bond Theory & concept of ions. Different types of lead acid cells. Sealed Maintenance free Batteries, Solar battery. Load & back up time calculation
9	Practice of all types of test of battery Identify fully charged Battery Defects & remedies.	Principle of Storage Cell Chemical change on charging & discharging Indication of fully charged Battery. Testing of Battery i.e. using hydrometer, voltmeter, High rate discharge cell tester, Cadmium stick test
10.	Identify defects of battery, Ampere hour capacity. Prepare Electrolyte and use of special purpose batteries.	General defects of Lead Acid Battery- 1. Sulphation 2. Sedimentation 3. Buckling of plates Battery defects like leakage, cracks, oer charging & short circuiting of plates. Palarisation & back emf. Ampere Hour Capacity of Battery Process of Preparing Electrolyte Special Purpose Batteries-Steel Alkaline, Zinc Silver & motor cycle battery.
11	Practice on maintenance & upkeep of lead acid battery. Identify parts of Nickel Iron or Alkaline cell. Practice of charging battery using both methods.	General Maintenance and methods of upkeep of lead acid battery. Trickle charging Parts of Nickel Iron or Alkaline cell Difference between lead acid & Alkaline Cell Connection diagram of charging & lamp discharging board. Types of Charging a) constant voltage charging b)

		Constant current charging Precautions during charging of battery.
12	Practice to assemble new batteries. To find Internal resistance of lead acid Battery.	Methods of Assembly new Batteries. Process of Lead burning set& gas welding set Internal resistance of lead acid Battery.
13	Practice to connect cell in series, parallel, series-parallel. Calculate metal deposition on the basis of atomic weight/chemical equivalent.	Grouping of cells- series, parallel, series-parallel. Metal depositing on the basis of atomic weight/chemical equivalent.
	Assessment/Examination 03days	

7.1.3 EMPLOYABILITY SKILLS

GENERAL INFORMATION

1)	**Name of the subject**	**:**	**EMPLOYABILITY SKILLS**
2)	**Applicability**	**:**	ATS- Mandatory for fresher only
3)	**Hours of Instruction**	**:**	**55Hrs.**
4)	**Examination**	**:**	The examination will be held at the end of Training by NCVT.
5)	**Instructor Qualification**	**:**	

i)MBA/BBA with two years experience or graduate in sociology/social welfare/Economics with two years experience and trained in Employability skill from DGT Institute.

And

Must have studied in English/Communication Skill and Basic Computer at 12th /diploma level

OR

ii) Existing Social Study Instructor duly trained in Employability Skill from DGT Institute.

7.1.3.1 SYLLABUS OF EMPLOYABILITY SKILLS

Block – I
Basic Training

Topic No.	Topic	Duration (in hours)
	English Literacy	**7**
1.	**Reading** Reading and understanding simple sentences about self, work and environment	
2.	**Writing** Construction of simple sentences Writing simple English	
3.	**Speaking / Spoken English** Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality,Resumes or curriculum vita essential parts, letters of application reference to previous communication.	
	I.T. Literacy	**10**
1.	**Basics of Computer** Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.	
2.	**Word processing and Worksheet** Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets. Use of External memory like pen drive, CD, DVD etc,	
3.	**Computer Networking and INTERNET** Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication.	
	Communication Skill	**18**
1	**Introduction to Communication Skills** Communication and its importance Principles of Effective communication Types of communication - verbal, non verbal, written, email, talking on phone. Non verbal communication - components-Para-language Body - language Barriers to communication and dealing with barriers.	

2	**Listening Skills** Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening.	
3	**Motivational Training** Characteristics Essential to Achieving Success The Power of Positive Attitude Self awareness Importance of Commitment Ethics and Values Ways to Motivate Oneself Personal Goal setting and Employability Planning.	
4	**Facing Interviews** Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview	
	Entrepreneurship skill	**8**
1.	**Concept of Entrepreneurship** **Entrepreneurship**- Entrepreneurship - Enterprises:-Conceptual issue. Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.	
2.	**Institutions Support** Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes& procedure & the available scheme.	
	Productivity	
1.	**Productivity** Definition, Necessity.	
2.	**Affecting Factors** Skills, Working Aids, Automation, Environment, Motivation How improves or slows down.	
3.	**Personal Finance Management** Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.	
	Occupational Safety, Health & Environment Education	**6**
1	**Safety & Health** Introduction to Occupational Safety and Health importance of safety and health at workplace.	
2	**Occupational Hazards** Basic Hazards, Chemical Hazards, Vibro-acoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.	
3	**Accident & safety** Basic principles for protective equipment. Accident Prevention techniques - control of accidents andsafety measures.	
4	**First Aid**	

	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person	
	Labour Welfare Legislation	
1	**Welfare Acts** Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Employees Provident Fund Act.	
	Quality Tools	**6**
1.	**Quality Consciousness :** Meaning of quality, Quality Characteristic	
2.	**Quality Circles :** Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles.	
3.	**House Keeping :** Purpose of Housekeeping, Practice of good Housekeeping.	
4.	**Quality Tools** Basic quality tools with a few examples	

7.2 PRACTICAL TRAINING (ON-JOB TRAINING)

(BLOCK – I)

DURATION: 12 MONTHS

GENERAL INFORMATION

1) **Name of the Trade** :**BATTERY REPAIRER**
2) **Duration of On-Job Training** : As per Apprentices Act amended time to time.
3) **Batch size** : 16
4) **Examination** : i) The internal assessment will be held on completion of each block

ii) NCVT exam will be conducted at the end of Training period.

5) **Instructor Qualification** :

i) Degree/Diploma in Electrical Engg. from recognized university/Board With one/two year post qualification experience in the relevant field.

OR

ii) NTC/NAC in the trade of Battery Repairer with three year post qualificationexperience in the relevant field.

Preference will be given to a candidate with Craft Instructor Certificate (CIC)

6) **Tools, Equipments& Machinery required** : - As per Annexure – II

7.2.1 BROAD SKILL COMPONENT TO BE COVERED DURING ON-JOB TRAINING

A. BLOCK – I (12 Months)

S.No.	Professional Skills
1.	Observe & practice safety in all industry works. Practice providing First Aid/Artificial respiration. Safe operational procedures for breakdown/preventive maintenance.
2.	Identify & usetrade hand tools.
3.	Carryout chipping, filing, grinding, hack sawing, fitting & carpentry jobs. Drill and tap hole. Cutting and riveting practice. Making single and double rectangular boards.
4.	Connect & measure voltage, current, resistance power & energy in DC & AC(1ph & 3ph) circuits
5.	Replacing the bulbs, tubes, trouble shooting, repair & maintenance. Wire up in PVC casing & capping.
6.	Domestic appliances: Connecting, testing, repairing & maintaining.
7.	Testing of different wiring installations by meggar. Practice in wiring/repairing of domestic appliances. Attending to minor faults in machines, their controls in appliances.
8.	Ohms law, Faradays law of Electrolysis.
9.	Trouble shooting rectifiers, filters, power supplies, voltage stabilizers, controlled rectifiers. Identifying faulty thyristors in circuits, replacing them
10.	Introduction to primary & Secondary cells
11.	Identification of batteries for correct applications. Identification of different parts of storage batteries, cells i.e. Plates, Electrolyte, container. Bottom grooved support blocks, Connecting bar, Terminal/Pillar, Vent plug/Filler caps, External connecting strips.
12.	Charging & maintenance of Batteries (all type). Checking specific gravity, voltage etc. Dilution of Acid/Electrolyte.
13.	Maintenance of Battery-Topping up with distilled water, cleaning terminals & vent plug.
14.	Checking voltage, condition of container scaling terminals etc. of batteries.
15.	Determination of specific gravity of electrolyte with hydrometer to confirm further serviceability.
16.	Battery defects like leakage, cracks, over charging, short circuit of plates.
17.	Recharging batteries on bench charger by use of fast charger
18.	Overhauling of Batteries complete procedure by removing acid, removing scaling pitch with gas torch, cutting connecting rods of cell& removal of plates from container, checking all parts, cleaning, changing defective parts & reassembling.
19.	Types of plates used in shortage battery cell-Faure plate, plante plate.
20.	Measurement of internal resistance & capacity of cell.
21.	Measurement of Electric Characteristic of storage batteries.
22.	Symptom of fully charged cell.
23.	Dismantling of Ni-Cd Batteries & Assembling of the same.
24.	Maintenance procedure, overhauling of different storage batteries.
25.	Commissioning of Batteries, Charging & Discharging of Batteries, Use of HRDT(High rate

	discharge tester)
26.	Connecting power and control wiring of Diesel Generating set. Operation, operating switch gears, trouble shooting& basic maintenance
27.	Practice connections & testing in manual/automatic power supply changeover switches of single/three phase supply.
28.	Operation & maintenance of Solar cells and Non conventional energy generation system.

1. ASSESSMENT STANDARD

8.1 Assessment Guideline:

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking assessment. Due consideration to be given while assessing for team work, avoidance/reduction of scrape/wastage and disposal of scarp/wastage as per procedure, behavioral attitude and regularity in training.

The following marking pattern to be adopted while assessing:

a) Weightage in the range of 60-75% to be allotted during assessment under following performance level:

For this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.

In this work there is evidence of:

- good skill levels in the use of hand tools, machine tools and workshop equipment
- Many tolerances while undertaking different work are in line with those demanded by the component/job.
- a fairly good level of neatness and consistency in the finish
- Occasional support in completing the project/job.

b) Weightage in the range of above75%- 90% to be allotted during assessment under following performance level:

For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.

In this work there is evidence of:

- good skill levels in the use of hand tools, machine tools and workshop equipment
- The majority of tolerances while undertaking different work are in line with those demanded by the component/job.
- a good level of neatness and consistency in the finish
- little support in completing the project/job

c)Weightage in the range of above 90% to be allotted during assessment under following performance level:

For performance in this grade, the candidate, with minimal or no support in organization and

execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.

In this work there is evidence of:

- high skill levels in the use of hand tools, machine tools and workshop equipment
- tolerances while undertaking different work being substantially in line with those demanded by the component/job.
- a high level of neatness and consistency in the finish.
- minimal or no support in completing the project

8.2FINAL ASSESSMENT- ALL INDIA TRADE TEST (SUMMATIVE ASSESSMENT)

SUBJECTS	Marks	Sessional Marks	Full Marks	Pass Marks	Duration of Exam.
Practical	**300**	**100**	**400**	**240**	**08 hrs.**
Trade Theory	100	20	120	48	3 hrs.
Workshop Cal. & Sc.	50	10	60	24	3 hrs.
Engineering Drawing	50	20	70	28	4 hrs.
Employability Skill	50		50	17	2 hrs.
Grand Total	**550**	**150**	**700**		

Note: - The candidate pass in each subject conducted under all India trade test.

2. FURTHER LEARNING PATHWAYS

Employment opportunities:

On successful completion of this course, the candidates shall be gainfullyemployed in the following industries:

1. Production & Manufacturing industries.
2. Automobile and allied industries
3. Self employment .
4. Set up own entrepreneur.

ANNEXURE – I

TOOLS & EQUIPMENT FOR BASIC TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TRADE: Battery Repairer

LIST OF TOOLS & EQUIPMENTS FOR 16 APPRENTICES

A : TRAINEES TOOL KIT:-

Sl. No	Name of the items	Qty.
1	Steel rule 300mm	16 Nos
2	Screw Driver 200mm	16 Nos
3	Screw Driver 100mm	16 Nos
4	Terminal screw Driver 75 mm (Connector)	16 Nos
5	Knife Electrician D.B.	16 Nos
6	Hammer Ball peen. 0.25 Kg	16 Nos
7	Combination pliers insulated 200 mm	16 Nos
8	Neon tester pencil bit type 500 volt	16 Nos
9	Try square 200 mm	16 Nos
10	Wire stripper 1-6 sq.mm	16 Nos
11	Wire crimping tool1-6 sq.mm	16 Nos
12	Spanner set DE Set of 6 from 6x7 to 16x7	16 Nos
13	Screw driver set (set of 5) 100-300 mm	16 Nos
14	File half round 2nd cut 250 mm	16 Nos
15	File round 2nd cut 150 mm	16 Nos
16	Soldering iron 35W/230 V	16 Nos
17	Neon tester 230 v	16 Nos
18	Digital Multimeter	16 Nos
19	Spanner set	16 Nos

B :TOOLS INSTRUMENTS AND GENERAL SHOP OUTFITS

Sl. No.	Name of the items	Quantity (Indicative)
1	C- clamp, 100mm, 150mm, 200mm	2 Nos. Each
2	Adjustable spanner, 150mm, 300mm	2 Nos. Each
3	Blow lamp, 0.5 ltr	1
4	Melting pot	1
5	Ladel	1
6	Chisel cold firmer, 25mm x 200 mm	2
7	Chisel 25mm & 6 mm	2 Nos. Each
8	Hand drill machine	2
9	Portable electric drill machine, 12 mm capacity	1

10	Pillar Electric Drill machine, 12 mm capacity	1
11	Allen key set metric	2 sets
12	Oil can 0.12 ltr	1
13	Grease gun	1
14	Out sideMicrometer	2
15	Motorised Bench grinder	1
16	Rawl plug tool & bit	2 sets
17	Pulley puller	2
18	Bearing puller	2
19	Pipe vice	2
20	Thermo meter 0-100 deg C	1
21	Scissors blade 150mm	2
22	Crimping tool (29djustable)	2 sets
23	Crimping tool for telephone/LAN cable	2
24	Wire stripper 20 Cm	2
25	Chissel cold flat 12mm	2
26	Mallet hard wood 0.5Kg	2
27	Mallet hard wood 1 Kg	2
28	Hammer extractor type, 0.4 Kg	2
29	Hacksaw frame, 200mm & 300mm adjustable	2 each
30	Try square, 150 mm blade	2
31	Outside & inside divider calliper	2 each
32	Pliers flat nose 150mm	4
33	Pliers round nose, 100 mm	4
34	Tweezers, 100mm	4
35	Snip straight & bent, 150mm	2 each
36	Double ended spanner set metric	2 sets
37	HSS drill bit set(2-12mm)	4 sets
38	Plane, smoothing cutters 50mm	2
39	Gauge, wire imperial	2
40	File, flat 200mm 2^{nd} cut	8
41	File half round 200 mm 2^{nd} cut	4
42	File round 200mm 2^{nd} cut	4
43	File flat 150mm rough	4
44	File flat 250mm bastard	4
45	File flat 250mm smooth	4
46	File Rasp half round 200 mm bastard	4
47	Soldering iron, 25 W, 65 W	2 each
48	Copper bit soldering iron 0.25 kg	2
49	De-soldering gun	4
50	Hand vice 50mm jaw	4
51	Bench vice 100mm jaw	6
52	Pipe cutter to cut pipes upto 5cm dia	2
53	Stock & die set for 20mm to 50 mm GI pipe	1
54	Stock & dies conduit	1
55	Ohm meter; series & shunt type	2 each
56	Multimeter (analog), 0-1000 M ohm, 2.5 to 500V	2
57	Digital Multimeter	4

58	AC voltmeter MI 0-500V	2
59	One pair of 8 inch side cutting pliers	1
60	DC milli Ammeter 0-500 mA	1
61	Ammeter MC 0-5A, 0-25A	1 each
62	DC Ammeter 0-5A, 0-25A	1 each
63	Rubber apron	02
64	Pair of rubber sleeve protectors	10
65	Battery turntable	1
66	Open-end wrench	1
67	Center punch	02
68	Hydrometer.	05
69	DC power supply 0-30V, 2 Amp	2
70	Rheostats 0-1 ohm 5A, 0-10 ohm 5A, 0-25 ohm 1A, 0-300 ohm 1A	1 each
71	Cans of asphaltum paint	1
72	D.C.Voltmeter	02
73	AVO Meter	01
74	Tong tester / clamp meter 0-100 A, AC	1
75	Meggar 500V	1
76	Rubber gloves 1000V	2 pairs
77	Oscilloscope dual trace, 30 MHz	1
78	Function Generator	1
79	Set of reamers	1
80	Wood Saw, 250 mm	1
81	Tenon Saw	1
82	Battery carrier	1
83	Set of hollow reamers	2
84	Lead lined box for storing separators	1
85	All types C.F.L. lamp sets 5W, 15W, 25W	2 each
86	Distilled Water	20 liter
87	Work Bench with vice	02
88	Iron racks	02
89	Bins for battery parts	10
90	Set of reamers	1
91	Wood Saw, 250 mm	1
92	Rubber Mets	As required

C : GENERAL MACHINERY INSTALLATIONS:-

1.	Wheat stone Bridge.	1
2.	Battery (different type) 12V, 75Ah	2 Each
3.	Battery Charger 15V,constant voltage	1
4.	Solar street light lamp set 12v , 18 / 24 watts	1 each
5.	lead welding outfit	1
6.	Transformer single phase 1 K.V.A. 250/110 v	2
7.	Transformer Three phase (oil cooled) 5 K.V.A. 440/220 v	1
8.	Autotransformer Single phase 0-300V 1kVA	2
9.	Autotransformer Three phase 0-500V 1kVA	1
10.	Current transformer 10/1, 20/1,30/1,50/5, 100/5 and 300/5A	1 each
11.	Potential transformer 220/110, 300/110, 440/110, 600/110	1 each
12.	Miniature circuit breaker(MCB) 220V/ 6 Amps	3
13.	Earth leakage circuit breaker (ELCB) 220V/25mA	2
14.	Braze Welding set	01
15.	Battery steamer	01
16.	Cadmium test set	01
17.	High rate discharge testers	01
18.	Battery Charge, constant Current controlled	01

Note: In case of basic training setup by the industry the tools, equipment and machinery available in the industry may also be used for imparting basic training.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: Battery Repairer

LIST OF TOOLS& EQUIPMENTS FOR 16 APPRENTICES

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

2) Infrastructure:

A : TRAINEES TOOL KIT:-

Sl. No.	Name of the items	Quantity (indicative)
1.	Draughtsman drawing instrument box	17
2.	Set square celluloid 45^o (250 X 1.5 mm)	17
3.	Set square celluloid 30^o-60^o (250 X 1.5 mm)	17
4.	Mini drafter	17
5.	Drawing board (700mm x500 mm) IS: 1444	17

B : FURNITURE REQUIRED

Sl. No.	Name of the items	Quantity (indicative)
1	Models : Solid & cut section	as required
2	Drawing Table for trainees	as required
3	Stool for trainees	as required
4	Cupboard (big)	01
5	White Board (size: 8ft. x 4ft.)	01
6	Trainer's Table	01
7	Trainer's Chair	01

ANNEXURE – II

TOOLS & EQUIPMENT FOR ON-JOB TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

TRADE: Battery Repairer

For Batch of 16 APPRENTICES

Actual training will depend on the existing facilities available in the establishments. However, the industry should ensure that the broad skills defined against On-Job Training part (12 months) are imparted. In case of any short fall the concern industry may impart the training in cluster mode/ any other industry/ at ITI.

ANNEXURE-III

GUIDELINES FOR INSTRUCTORS AND PAPER SETTERS

1.Due care to be taken for proper & inclusive delivery among the batch. Some of the following some method of delivery may be adopted:

A) LECTURE
B) LESSON
C) DEMONSTRATION
D) PRACTICE
E) GROUP DISCUSSION
F) DISCUSSION WITH PEER GROUP
G) PROJECT WORK
H) INDUSTRIAL VISIT

2. Maximum utilization of latest form of training viz., audio visual aids, integration of IT, etc. may be adopted.

3. The total hours to be devoted against each topic may be decided with due diligence to safety & with prioritizing transfer of required skills.