CURRICULUM

FOR THE TRADE OF

ELECTRICAL WINDER

UNDER

APPRENTICESHIP TRAINING SCHEME

सत्यमेव जयते
Government of India

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

CONTENTS

1. ACKNOWLEDGEMENT

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2. Naval Dockyard Apprentice Mumbai
3. Torrent Power, Ahmedabad
4. Kirloskar Electric co. ltd. Bangalore

Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

Co-ordinator for the course:BN Sridhar, Dy Director, FTI, Bangalore

Sl. No.	Name & Designation Sh./Mr./Ms.	Organization	Expert Group Designation
1.	BN Sridhar, Dy Director	FTI, Bangalore	Expert Member
2.	Ketan Patel, Dy Director	RDAT, Mumbai	Expert Member
3.	Shreeshail. P. Trg Officer	FTI, Bangalore	Expert member

2. BACKGROUND

1.1 Apprenticeship Training Scheme under Apprentice Act 1961

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

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

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

1.2 Changes in Industrial Scenario

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

1.3 Reformation

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

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

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

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

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

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

3.RATIONALE

(Need for Apprenticeship in **ELECTRICAL WINDER** 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.

Electrical machine consist of conductors wound in specified configurations onto armatures, rotors, stators, and field coils.Winding is most important part of a Motor/Generator/Transformer. The performance of an electrical machine depends mainly on the condition of Winding. The coil is a vital part of any electrical machine; if it breaks the motor will not work.Apart from the quality of insulating material used in the Winding, the skill of the winder contributes a great extent in the trouble free functioning of the electrical motor / generator / transformer. "Winding" is aimportant and special skill required for an Electrician. The curriculum and training provided in the general "Electrician trade" does not meet this special requirement. Moreover, it is not possible for the Industrial Training Institutes to have the necessary infrastructure required for training an ELECTRICAL WINDER. Hence, there is a definite need for Apprenticeship Training in the industry.

Qualified ELECTRICAL WINDER is able to perform winding or re-winding of a DC/AC motor, generator and transformer with the necessary skill.

4. JOB ROLES: REFERENCE NCO

Brief description of Job roles:

- Carry out winding of armature
- Carry out winding of field poles
- Carry out Stator winding of AC motor
- Carry out winding of wound rotors
- Carry out transformer winding
- Testing of stator and Rotor windings
- Assemble & disassemble the motor
- Testing of motor and transformers
- Carry out impregnation
- Perform Soldering, brazing and simple welding.
- Perform mica under cut
- Carry out rotor balancing
-

Reference NCO & NOS:

i) NCO-2004: 7241.40(859.50)

5. GENERAL INFORMATION

1. **Name of the Trade** **: ELECTRICAL WINDER**

2. **N.C.O. Code No. (**NCO-2004) :7241.40

3. **Duration of Apprenticeship Training (Basic Training + Practical Training):**2years

3.1 **For Freshers**: **Duration of Basic Training**: -

a) Block –I : 3 months

b) Block – II : 3 months

Total duration of Basic Training: 6 months

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

a) Block–I: 9 months

b) Block–II : 9 months

Total duration of Practical Training: 18 months

3.2 For ITI Passed: Duration of Basic Training: - NIL

Duration of Practical Training (On-job Training): 12 Months

4. **Entry Qualification** : Passed in 10^{th} class examination under 10+2 system of education with science as one of the subject or its equivalent.

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

6. Rebate for ITI passed trainees:-Electrician : One year

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.

6. COURSE STRUCTURE

Training duration details: -

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

Components of Training	Duration of Training in Months ➡																							
⬇	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Basic Training Block - I																								
Practical Training Block - I																								
Basic Training Block - II																								
Practical Training Block - II																								

7. SYLLABUS

7.1 BASIC TRAINING
(BLOCK – I &II)
DURATION: 06 MONTHS

GENERAL INFORMATION

1) **Name of the Trade** :**ELECTRICAL WINDER**
2) **Hours of Instruction** : 1000 Hrs. (500 hrs. in each block)
3) **Batch size** : 20 nos.
4) **Power Norms** : 5.2 KW for Workshop
5) **Space Norms** : 98 Sq.m.(For basic Training of Block-I & II)
6) **Examination** : The internal assessment will beheld on completion of each Block.
7) **Instructor Qualification** :

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

OR

ii) NTC/NAC in the trade of Electrician/ELECTRICAL WINDERwith three year post qualificationexperience in the relevant field.

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

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

7.1.1 DETAILSYLLABUS OF CORE SKILL

A. Block– I
Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
1	**Engineering Drawing: Introduction and its importance** - Viewing of engineering drawing sheets. Method of Folding of printed Drawing Sheet as per BIS SP:46-2003 **Drawing Instruments** : their Standard and uses - Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.	**30**	**Unit**: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units.	**20**
2	**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		**Fractions & Simplification**: Fractions, Decimal fraction, Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems Simplification using BODMAS.	
3	**Drawing of Geometrical Figures**: Definition, nomenclature and practice of - - Angle: Measurement and its types, method of bisecting.		**Square Root** : Square and Square Root, method of finding out square roots, Simple problem using calculator	

	- Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.			
4	**Lettering and Numbering** as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case.		**Ratio &Proportion:** Simple calculation on related problems.	
5	**Free Hand sketch:** Hand tools and measuring instrumentsused **in Electrician / Power electrician trade.**		**Percentage:** Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	
6	**Free hand drawing :** - Lines, polygons, ellipse, etc. - geometrical figures and blocks with dimension . - Transferring measurement from the given object to the free hand sketches.		**Material Science** : properties -Physical & Mechanical, Types –Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals, introduction of Iron, Cast Iron, Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous metals, Non-Ferrous Alloys.	

B. Block- II
Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
		30		20
1	**Symbolic Representation** (as per BIS SP:46-2003) of : - Fastener (Rivets, Bolts and Nuts) - Bars and profile sections - Weld, brazed and soldered joints. - Electrical and electronics element - Piping joints and fittings		**Mass ,Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals	
2	**Construction of Scales and diagonal scale**		**Work, Power and Energy**: work, unit of work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy.	
3	**Three phase Induction motor** Free hand sketching of Slip-ring and Squirrel cage Induction motor. Typical wiring diagram for drum controller operation of A.C. wound rotor motor.			
4	Drawing the schematic diagram of Autotransformer starter, DOL starter and Star Delta Starter. Drawing the schematic diagram of A.C. motor speed control by SCR /AC Drive.		**Algebra:** Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	
5	**Distribution of Power** Types of insulator used in over head line. (Half sectional views) Different type of distribution systems and methods of connections. Layout diagram of a substation. Single line diagram of substation feeders.		**Mensuration :**Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle. Volume of solids – cube, cuboid, cylinder and Sphere. Surface area of solids – cube, cuboid, cylinder and Sphere.	
			Trigonometry: Trigonometrical ratios, measurement of angles. Trigonometric tables. Finding height and distance by trigonometry.	

DETAIL SYLLABUS OF PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

A. Block –I
Basic Training

Week No.	Professional Skills	Professional Knowledge
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. **Occupational Safety & Health.** **Importance of housekeeping & good shop floor practices.** Health, Safety and Environment guidelines, legislations & regulations as applicable. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Basic safety introduction, Personal protective Equipment(PPE):- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents. Use of Fire extinguishers.	**Occupational Safety & Health** Basic safety introduction, Personal protection:- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Use of Fire extinguishers. Visit & observation of sections. Various safety measures involved in the Industry. Elementary first Aid. Concept of Standard **Soft Skills**: its importance and Job area after completion of training. Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept & its application. Response to emergencies eg; power failure, fire, and system failure.
2	Demonstration of trade hand tools. Use, care & maintenance of various hand tools. **Practice on Earthing**- different methods of earthing. Measurement of Earth resistance by earth tester. Testing of Earth Leakage by ELCB and relay. Familiarization with signs and symbols of Electrical accessories. Practice on installation and overhauling common electrical accessories as per simple Electrical circuit / Layout. Make test board.	Identification of Trade-Hand tools-Specifications **Earthing**- Principle of different methods of earthing& selection. i.e. Pipe, Plate, etc Importance of Earthing. Improving of earth resistance Earth Leakage circuit breaker (ELCB). Common Electrical Accessories, their specifications in line with NEC 2011-Explanation of switches lamp holders,

		plugs and sockets. Developments of domestic circuits, Alarm & switches, with individual switches, MCB, ELCB, MCCB. Series –parallel testing board & use.
3	Skinning the cables Demonstration & Practice on bare conductors joints--such as rat tail, Britannia, straight, Tee, Western union Joints Practice in soldering & brazing Practice on crimping thimbles, Lugs. Demonstration and identification of types of cables. Demonstration & practice on using standard wire gauge & micrometer.	Solders, flux and soldering technique. Resistors types of resistors & properties of resistors. Introduction of National Electrical Code. Explanation, Definition and properties of conductors, insulators and semi-conductors. Types of wires & cables, standard wire gauge. Specification of wires & Cables-insulation & voltage grades- Low , medium & high voltage
4-5	Verification of Ohm's Law, Measuring unknown resistance Verification of laws of series and parallel circuits. 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. Practice on three phase four wire system for understanding phase and line voltage & current.	Fundamental of electricity: Fundamental terms- Current, Voltage definitions, AC, DC, Phase, Neutral, Earth. Units & effects of electric current. Ohm's Law - Simple electrical circuits and problems. Reading of simple Electrical Layout. **Resistors -**Law of Resistance. Series and parallel circuits & related calculation. **Alternating Current -**Comparison and Advantages D.C and A.C. Related terms Frequency, Instantaneous value, R.M.S. value Average value, Peak factor, form factor, sine wave, phase and phase difference. Inductive and Capacitive reactance, Impedance (Z), power factor (p.f). Active and Reactive power. Single Phase and three-phase system etc. Power consumption in series and parallel, P.F. etc. Concept three-phase Star and Delta connection. Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load. Three phase four wire system

6	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.
7	Identify basic Hand Tools for filing, chiseling, cutting, drilling, etc. Chipping practice and practice in grinding harding and tempering of chisels. Filing practice, filing true to line. Marking, sawing and drilling practice in hand drilling & power drilling machine. Practice in using taps and dies, threading hexagonal and square nuts etc. Cutting external threads on stud and on pipes and riveting practices. Practice in using sand paper and polishing.	Introduction to fitting trade. Descriptions , General Care & Maintenance of Hammer, Chisels, Try Square, etc Descriptions, General Care & Maintenance of different type of files. Descriptions, General Care & Maintenance of hacksaw, drilling machine, etc Description of taps and dies, types of rivets and riveted joints. Finishing and polishing materials and their process.
8-9	**DC Generator:** Identification of the parts of a D.C. generator. Connection, running and voltage build-up of DC generator. Load test. **DC Motor**: Connect, start, run and reverse direction of rotation of different type of DC motor. Speed control of DC motor by different method. Maintenance, troubleshooting & servicing of DC machines. Overhaul a DC machine.	**D.C. Machines -** General concept of Electrical Machines. **D.C. generator.** Parts: Armature, Field Coil, Polarity, Yoke, Cooling Fan, Commutator, Brushes, Laminated core. series, shunt and compound generators. Voltage build-up, loading. **Types of D.C.Motor.** Starters used in D.C. motors Types of speed control of DC motors in industry. Application of D.C. motors. Care, Routine & preventive maintenance.

10	**AC Generator:** Identification of parts and terminals of Alternator. Connection, starting, running of Alternator. Practice on alternators, voltage Building,, loading,	**AC Generator:** Explanation of alternator, working principle, voltage build-up, loading, Regulation. Efficiency. Types of prime mover, phase sequence, Specification of alternators
11	**Transformers.. 1ph and 3 ph:** Identification of types of transformers. Connection of transformers, Transformation ratio, testing of transformer, 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.	**Transformers 1ph and 3ph:** Working principle of **Transformer**. 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.
12-13	**Three phase Induction motor** Identification of parts and terminals of AC motors. Connection, starting, running of AC motors using Starters. Load test & efficiency calculation. Rotor resistance starter, etc Speed control of Induction motors by various methods. Practical application of A.C. motors. **Single phase induction motor-** Connection of single phase motor, identification, testing, running and reversing. Maintain, service and trouble shoot the single phase motor. Install a single phase motor. Overhauling of AC motors.	**Three phase Induction motor** – Working principle –Production of rotating magnetic field, Squirrel Cage Induction motor, Slip-ring induction motor. Control & Power circuit of starters D.O.L Starter, Forward /Reverse starter, Star /Delta starter, Autotransformer starter, Rotor resistance starter, etc Single phasing preventer. Application of Induction Motor Care, Routine & preventive maintenance. **Single phase induction motor-** Working principle, different method of starting and running (capacitor start, permanent capacitor, capacitor start & run, shaded pole technique). FHP motors, Repulsion motor, stepper motor, Application of single phase motor.
	Assessment/Examination 03days	

B. Block –II
Basic Training

Week No.	Professional Skills	Professional Knowledge
1	Introduction to the completes product shop floor observation of fully completed products with special emphasis on assembly and disassembly of machines with part identification thereof. Procedure of job order filling forms, entry of name plate details. Recording the findings of visual and test inspection, Dismantling and recording winding data.	**Job documentation procedure:** Job order procedure for rewinding the machine, recording of name plate details, history of failure, visual inspection, and assessment of fault, initial tests, ***IR values, Dimension of Shaft &commutator, core damage &flash,Cmmutator riser width less*** dismantling and collecting winding data.
2-3	**Electro-Mechanical assembly:** Shop floor instruction in the manufacture of electro-mechanical assemblies of ***AC & DC*** rotating electrical machines and transformers with special emphasis on the following: 1 Safety precautions 2 Layout for good handling and storing 3 Various equipment used as hydraulic press, armor press,***TIG*** welding equipment shrunk fit procedures. 4 Manufacture of special jigs and fixtures. 5 Commutator and skinning under cutting. 6 Reconditioning/replacing of the defective parts. Testing of magnetic core.	**Electro-Mechanical assemblies:** (1) Complete component identification. Knowledge of various mechanical and magnetic parts such as stampings, housings, keys, shafts, commutators, slipring assemblies, cooling fans, poles, etc. (2) Job instruction on handling and storing of the assemblies. (3) Concept of Jigs and fixtures as applicable in the winding job. (4) Details of shrink fit, welding as applicable in the winding job. ***(5) Reconditioning/replacing of defective parts, Testing of Magnetic core loss***
4-5	**Coil and insulation preparation** (1) Preparation of the core before winding. (2) Manufacture of formers. (3) Preparation of coils on different types of coil winding machines as applied. (4) Cutting operations on various types of insulating materials used for slot liner, layer Separators, slot wedge, phase, separator etc. and shaping and binding of overhangs **Winding** Extensive shop floor practice on actual winding, consisting of the following	**Coil winding and insulation preparation:** (1) Insulating materials: Solid, Liquid and gaseous insulating materials ***H Class,kaptontape,Nomexpaper,Tetroflourethelenetape, Fibre glass tape, mica tape, silicon tape,*** thermal classification, properties, typical schemes of insulation used in the windings. Methods of test of insulating materials. Reference to relevant Indian/International standards. (2) Conductors: Conductors materials such as copper, aluminium, brass etc. their shape, size and current carrying capacity. Insulation used on winding wires, their types, size, voltage and temperature ratings. End connection lead cables. Specification of relevant to Indian / international standard. (3) Windings: Different types of windings used in

	operations. 1 Insertion of insulating materials in the slots. 2 Insertion of coils and folding over the insulation and wedges driving. 3 End connection inclusive of commutator if involved 4 Soldering / brazing of coil ends of the winding wire and lead cables and core. 5 Overhang banding with cord, steel wire or semicured polyester glass tape. Carrying out the inspection test equipment. **NOTE:** The above winding practice should also covers the use of various types of small hand tools and shop made accessories such as cutters,mallets,wedges,driving tool, overhang support,knives,tongs etc.	AC/DC rotating machines and Transformers .***winding terminology, Finding Armature winding data i.ecalculateSpeed, Pole, Pole pitch, coil pitch, parallel paths, Prepare winding Diagrams as per data given (LAP & WAVE) winding, AC & DC Machines winding.*** (4) Calculations for making forrmers for different types of windings
6-7	Study the parts of armature. Check and test the armature. Preparation of winding data for given Motor ,Prepare the winding former and the coils Method of stripping the old winding and preparing the winding former and the coils. Method of inserting coil in the slots. Procedure followed for re-winding of all kind of electric DC motor's armature winding. Method of dismantling the burnt winding wire. Strip the old winding from the armature. Prepare the armature for rewinding. Preparation of winding data for given armature. Wind the coils by hand insulate them. Connection of armature leads on raiser. Preparation of winding table, connection diagram, winding diagram	**D.C. m/c Winding—** Introduction to armature winding, Winding terms - pole pitch, coil pitch, back pitch, front pitch , Types of winding - Lap & Wave winding , Progressive and retrogressive winding. Winding materials, winding hand tools, coil winding machine, winding calculations and tables. Conditions to be fulfilled for Lap & Wave winding. Growler –construction details & testing of armature rewinding by growler. Impregnation / varnish & baking High voltage test & Insulation resistance test

	for given armature. End connection, distinguishing start and finish ends of each. Impregnation methods of armature after rewinding and testing. Varnish the armature winding High voltage test & Insulation resistance test	
8-9	Prepare the winding former and the coils. Method of stripping the old winding and preparing the winding former and the coils. Preparation of winding data for given Motor. Method of inserting coil in the slots. Procedure followed for re-winding of all kind of electric motors like 3 phase & single phase A./C. motors, pump motors, ceiling fan motors, table fan motors, washing machine motors etc. Various methods used for inserting coil into the slots. Making end connections Impregnation & Testing the motor after rewinding. Method of dismantling the burnt winding wire. Study the parts of armature. Check and test the armature. Strip the old winding from the armature Record the winding data AC/DC armature winding. Prepare the armature for rewinding. Preparation of winding data for given armature. Wind the coils by hand insulate them. Connection of armature leads on raiser. Preparation of winding table, connection diagram, winding diagram for given armature. Understand end connection, distinguishing start and finish ends of each. Impregnation methods of armature after rewinding.	**REWINDING OF AC MOTOR-** **A.C. m/c Winding -** Introduction to stator winding, Terminology used in single phase and three phase winding like pole pitch, coil pitch etc., rules for end connection of 3Ø & single phase motors. Winding materials, winding tools, coil winding machine, winding calculations and tables, Testing the motor before declaring for rewinding. Principle of different winding techniques / methods Impregnation methods of armature after rewinding. Varnish the armature winding Testing the motor after rewinding. Insulation Resistance & High voltage test.

	Varnish the armature winding Testing after rewinding	
10	**Impregnation:** Shop floor practice of different types of impregnating systems such as dip impregnation, flood impregnation, vacuum impregnation with full details of the process cycle involving preheating, impregnation and baking. Information on the working of the equipment involved. **Balancing:** Practice of balancing the rotor by static and dynamic on dynamic balancing machine, by addition of balance weights and or scooping out materials. Full information on the working of the dynamic balancing machine	**Impregnation:** Theoretical knowledge with reference to the process of ***preheating of armature, Vacuum Pressure impregnating plant***and baking. Types of impregnating varnishes, thinners and solvents used. Types of air drying varnishes, details of equipment used. **Balancing:** Principle of static and dynamic balancing. Description of machine used.
11	**Final assembly and rewinding:** Assembling of the final product by collecting together all sub-assemblies and loose components and doing final connections. Use of inspection and equipment to ensure that this product passes all necessary inspection and performance requirements.	***Final assembly test to be conducted after rewinding armature No load test, observe humming, commutator flashing, On load test(Hopkins test),IR value, HV test, High speed test, Temperature test.*** Procedure of repairs of common electrical machines such as 3-phase and single phase motors, Alternators, welding generators, and transformers DC machines
12-13	**Transformer Winding:** Assembly for a round section and fit with yoke plates, core bolts,earthing the core. Winding L V coils (length and number of turns as per design) with oil circulating ducts. Winding HV coil over LV coil so that the terminations are diagonally opposite LV and HV coils insertion Completing Core Assembly. Star –delta formations. Oven drying, tanking and wiring. Oil filling. Testing	**Transformer Winding:** CRGO silicon steel strips, Amorphous core. Shell or core type core assembly. Core weights for different transformer capacities.Assembly for a round section and fit with yoke plates, core bolts,earthing the core. Winding machines, forming LVcoils (length and number of turns as per design) with oil circulating ducts. winding HV coil over LV coil so that the terminations are diagonally opposite. Number of turns for correct transformation ratio Active part formation with removing top yoke plates, coils insertion for (Checking transformation ratio. Star &Delta formations of LV &HV coils. Oven drying Tanking and wiring. Oil filtering for enhancing BDV of oil. Oil filling to 30 degree levels of conservator ,testing for insulation resistance, ratio, open circuit and short circuit results name plate fixing etc.
	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**	**:**	**110 Hrs. (55 hrs. in each block)**
4)	**Examination**	**:**	The examination will be held at the end of two years 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 DGET 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 DGET Institute.

7.1.3.1 SYLLABUS OF EMPLOYABILITY SKILLS

A. Block – I
Basic Training

Topic No.	Topic	Duration (in hours)
	English Literacy	**15**
1	**Pronunciation :** Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)	
2	**Functional Grammar** Transformation of sentences, Voice change, Change of tense, Spellings.	
3	**Reading** Reading and understanding simple sentences about self, work and environment	
4	**Writing** Construction of simple sentences Writing simple English	
5	**Speaking / Spoken English** Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.	
	I.T. Literacy	**15**
1	**Basics of Computer** Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.	
2	**Computer Operating System** Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.	
3	**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	
4	**Computer Networking and INTERNET** Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication.	

	Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.	
	Communication Skill	**25**
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 -characteristics, components-Para-language Body - language Barriers to communication and dealing with barriers. Handling nervousness/ discomfort. Case study/Exercise	
2	**Listening Skills** Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening. Triple- A Listening - Attitude, Attention & Adjustment. Active Listening Skills.	
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. Case study/Exercise	
4	**Facing Interviews** Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview	
5	**Behavioral Skills** Organizational Behavior Problem Solving Confidence Building Attitude Decision making Case study/Exercise	

B. Block–II
Basic Training

Topic No.	Topic	Duration (in hours)
	Entrepreneurship skill	**15**
1	**Concept of Entrepreneurship** **Entrepreneurship**- Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. Management, Entrepreneurial motivation. Performance & Record, Role & Function ofentrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.	
2	**Project Preparation & Marketing analysis** Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of Product Life Cycle (PLC), Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.	
3	**Institutions Support** Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes& procedure & the available scheme.	
4	**Investment Procurement** Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.	
	Productivity	**10**
1	**Productivity** Definition, Necessity, Meaning of GDP.	
2	**Affecting Factors** Skills, Working Aids, Automation, Environment, Motivation How improves or slows down.	
3	**Comparison with developed countries** Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.	
4	**Personal Finance Management** Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.	
	Occupational Safety, Health & Environment Education	**15**
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	
5	**Basic Provisions** Idea of basic provision legislation of India. of safety, health, welfare under legislation of India.	
6	**Ecosystem** Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.	
7	**Pollution** Pollution and pollutants including liquid, gaseous, solid and hazardous waste.	
8	**Energy Conservation** Conservation of Energy, re-use and recycle.	
9	**Global warming** Global warming, climate change and Ozone layer depletion.	
10	**Ground Water** Hydrological cycle, ground and surface water, Conservation and Harvesting of water	
11	**Environment** Right attitude towards environment, Maintenance of in -house environment	
	Labour Welfare Legislation	**5**
1	**Welfare Acts** Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act.	
	Quality Tools	**10**
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	**Quality Management System :** Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.	
4	**House Keeping :** Purpose of Housekeeping, Practice of good Housekeeping.	
5	**Quality Tools** Basic quality tools with a few examples	

7.2 PRACTICAL TRAINING (ON-JOB TRAINING)
(BLOCK – I&II)
DURATION: 18 MONTHS (9 months in each block)

GENERAL INFORMATION

1) **Name of the Trade** :**ELECTRICAL WINDER**
2) **Duration of On-Job Training** : As per Apprenticeship Act amended time to time.
3) **Batch size** : 20
4) **Examination** : i) The internal assessment will be held on completion of each block
   ii) NCVT exam will be conducted at the end of 2nd year.
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 Electrician/ ELECTRICAL WINDER 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 (09 months)

Week No.	Professional Skills
1	Observe & practice safety in all electrical works. Practice providing First Aid.
2	Identify & use all hand tools
3	Check the gauges of wire & select suitable wires for the required current rating. Practice wire joints & providing cable glands. Soldering practice.
4	Carryout fitting and drilling jobs
5	Connect & measure voltage, current, resistance power & energy in DC & AC(1ph & 3ph) circuits
6	Electrical wiring: Repair / replace switches, sockets, light points. Provide new points in PVC casing capping & PVC conduits. Make a test board.
7	Install pipe & plate earth stations. Measure earth resistance, improve the same & maintain earth stations.
8	Providing power supply to motors, equipments& appliances. Crimping the lugs, providing cable glands & connections. Provide earthing.
9	Connecting a DC generator, voltage building and loading
10	Connecting a DC Motor, running, changing of direction speed control and loading
11	Connecting a AC generator, voltage building and loading
12	Identifying the parts of 3 phase motor, connecting through starters, starting, running, changing the direction of rotation, speed control and loading.
13	Single phase motors: connections and running
14	Assembling and dis-assembling of motors and generators. Trouble shooting and overhauling.
15	Checking the polarity and ratio of transformers and instrument transformers. Connections
16	Testing of transformers, cleaning, changing of oil and maintenance
	Project Work
	REVISION
	Examination

B. BLOCK – II (09 months)

Week No.	Professional Skills
1	Observe & practice safety in all electrical works. Practice providing First Aid
2	Dis-assembling,Dismantling and stripping the old winding
3	Preparation of core, coil and insulation for winding
4	Insertion of insulating materials in the slots
5	Insertion of coils and folding over the insulation and wedges driving
6	End connections inclusive of commutator if involved
7	Soldering / brazing of coil ends of the winding wire and lead cables
8	Overhang banding with cord, steel wire or semi cured polyester glass tape
9	Impregnation of wound stator /rotor
10	Carrying out the inspection and testing of winding
11	Balancing the rotor
12	Final assembling of motor or generator
13	Transformer core assembly
14	Transformer LV and HV winding and Inserting in to the core
15	Finishing core assembly, connections, terminations
16	Oven drying, tanking and wiring.Oil filling.Testing
	Project Work
	REVISION
	Examination

8. 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

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

SUBJECTS	Marks	Internal assessment based on competency	Full Marks	Pass Marks	Duration of Exam.
Basic Training(Block-I)		**250**	**250**	**150**	
Professional Skill	250		250	150	**08 hrs.**
Professional Knowledge	100		100	40	3 hrs.
Workshop Cal. & Sc.	50		50	20	3 hrs.
Engineering Drawing	50		50	20	4 hrs.
Employability Skill	50		50	20	3 hrs.
Basic Training (Block-II)		**250**	**250**	**150**	
Grand Total	**500**	**500**	**1000**	**550**	

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

9. FURTHER LEARNING PATHWAYS

Employment opportunities:

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

1. Industries in India & abroad.
2. Self employment

ANNEXURE – I

TOOLS & EQUIPMENT FOR BASIC TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TRADE:ELECTRICAL WINDER

LIST OF TOOLS & EQUIPMENTS FOR 20APPRENTICES

A : TRAINEES TOOL KIT:-

Sl. No.	Name of the items	Quantity
1	Steel tape, 3 mt length	21 nos.
2	Plier insulated, 150mm	21 nos.
3	Plier side cutting 150mm	21 nos.
4	Nose plier, 150mm	21 nos.
5	Screw driver, 150 mm	21 nos.
6	Electrician connector screwdriver, insulated handle thin stem, 100mm	21 nos.
7	Heavy duty screwdriver, 200mm	21 nos.
8	Electrician Screwdriver, thin stem, insulated handle, 250mm	21 nos.
9	Punch centre, 150mmX9mm	21 nos.
10	Electrician knife, 50 mm blade	21 nos.
11	Neon tester	21 nos.
12	Steel rule, 300mm	21 nos.
13	Hammer, Cross peen with handle, 250 gm	21 nos.
14	Hammer, ball peen with handle, 750gm	21 nos.
15	Gimlet, 6mm	21 nos.
16	Bradawl, 150mm x 6mm	21 nos.
17	Pincer, 150 mm	21 nos.
18	Scriber (knurled centre position)	21 nos.
19	Digital multimeter	21 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	2 sets
12	Oil can 0.12 ltr	1
13	Grease gun	1
14	Out side Micrometer	2
15	Motorised Bench grinder	1
16	Rawl plug tool & bit	2 sets
17	Pulley puller	2
18	Bearing puller	2
19	Pipe vice	2
20	Thermo meter 0-100 deg C	1
21	Scissors blade 150mm	2
22	Crimping tool	2 sets
23	Wire stripper 20 Cm	2
24	Chissel cold flat 12mm	2
25	Mallet hard wood 0.5Kg	2
26	Mallet hard wood 1 Kg	2
27	Hammer extractor type, 0.4 Kg	2
28	Hacksaw frame, 200mm & 300mm adjustable	2 each
29	Try square, 150 mm blade	2
30	Outside & inside divider caliper	2 each
31	Pliers flat nose 150mm	4
32	Pliers round nose, 100 mm	4
33	Tweezers, 100mm	4
34	Snip straight & bent, 150mm	2 each
35	Double ended spanner set metric	2 sets
36	HSS drill bit set(2-12mm)	4 sets
37	Plane, smoothing cutters 50mm	2
38	Gauge, wire imperial	2
39	File, flat 200mm 2nd cut	8
40	File half round 200 mm 2nd cut	4

41	File round 200mm 2nd cut	4
42	File flat 150mm rough	4
43	File flat 250mm bastard	4
44	File flat 250mm smooth	4
45	File Rasp half round 200 mm bastard	4
46	Soldering iron, 25 W, 65 W	2 each
47	Copper bit soldering iron 0.25 kg	2
48	Desoldering gun	4
49	Hand vice 50mm jaw	4
50	Bench vice 100mm jaw	6
51	Pipe cutter to cut pipes upto 5cm dia	2
52	Stock & die set for 20mm to 50 mm GI pipe	1
53	Stock & dies conduit	1
54	Ohm meter; series & shunt type	2 each
55	Multimeter (analog), 0-1000 M ohm, 2.5 to 500V	2
56	Digital Multimeter	4
57	AC voltmeter MI 0-500V	2
58	Milli Voltmeter centre zero 100-0-100 mV	1
59	DC milli Ammeter 0-500 mA	1
60	Ammeter MC 0-5A, 0-25A	1 each
61	AC Ammeter MI 0-5A, 0-25A	1 each
62	KiloWatt meter 0-1-3 KW	1
63	AC Energy meter, single phase 5A, 3 ph 15 A	1 each
64	Power factor meter, single phase	1
65	Frequency meter	1
66	Flux meter	1
67	DC power supply 0-30V, 2 Amp	2
68	Rheostats 0-1 ohm 5A, 0-10 ohm 5A, 0-25 ohm 1A, 0-300 ohm 1A	1 each
69	Digital Tachometer	1
70	Growler	1
71	Tong tester / clamp meter 0-100 A AC	1
72	Meggar 500V	1
73	Hygrometer	1
74	Lux meter	1
75	Hydro meter	1
76	Current transformer, 415 V, 50 Hz , CT Ratio 10/5A,	1
77	Potential Transformer, 415/110 V	1
78	Wood Saw, 250 mm	1
79	Tenon Saw	1
80	Guarded Test Lamp	1

C :GENERAL MACHINERY INSTALLATIONS:-

Sl. No.	Name of the items	Quantity
1	Voltage Stabilizer, input 15-230 V AC, Output 220 V AC	1
2	3 point DC starter	1
3	4 point DC starter	1
4	Electrical Machine Trainer: suitable for demonstrating the construction & functioning of different types of DC machines & AC machines (single phase & 3 phase). Should be fitted with brake arrangement, Dynamometer, Instrument panel & power supply unit	1
5	Motor generator (AC to DC): consisting of : Squirrel cage induction motor with star delta starter & directly coupled to DC shunt generator & switch board mounted with regulator, air breaker, ammeter, voltmeter, knife blade switches & fuses, set complete with case iron & plate, fixing bolts, foundation bolts & flexible coupling. Induction motor rating: 5 KW, 400V, 50 Hz, 3 ph. DC shunt generator rating: 3.5 KW, 220V	1 set
6	Used DC generators – series, shunt & compound type, (for overhauling practice)	1 each
7	DC shunt motor 2 – 2.5 KW, 220V	1
8	DC series motor coupled with mechanical load, 2 KW, 220V	1
9	DC compound motor with starter & switch, 2.5 KW, 220V,	1
10	Single phase Transformer, core type, air cooled, 1 KVA, 240/415 V, 50Hz	3
11	3 phase transformer, shell type, oil cooled with all mounting, 3 KVA, 415/240V, 50 Hz (Delta /Star)	2
12	Starters for 2 to 5 HP AC motors. a. Resistance type starter. b. Direct on line starter. c. Star delta starter – Manual, semi-automatic & Automatic. d. Auto Transformer type starter	1 each
13	Motor generator (DC to AC) set consisting of Shunt motor with starting compensator & switch directly coupled to AC generator with exciter & switch board mounted with regulator, breaker, ammeter, voltmeter, frequency meter, knife blade switch & fuses etc. Set complete with cast iron bed plate, fixing bolts, foundation bolts & flexible coupling. Shunt motor Rating- 5KW, 220V. AC generator rating – 3 ph, 4 wire, 3.5 KVA, 400/230 V, 0.8 pf, 50 Hz	1 set
14	AC squirrel cage induction motor with star delta starter & triple pole Iron clad switch fuse. 2 to 3 HP, 3 ph, 400V, 50 Hz	1
15	AC 3 ph wound slipring motor with starter & switch, 5 HP, 400V, 50 Hz	1
16	Single phase capacitor motor with starter switch, 1 HP, 230 V, 50 Hz	1
17	Universal motor with starter / switch, 230 V, ¼ HP, 50 Hz	1
18	3 ph Synchronous motor, 3 HP, 415 V, 50 Hz, 4 pole, with accessories	1
19	Ceiling fan	1
20	Mixer & Grinder	1

21	1 Ph variable Auto Transformer	1
22	Load bank, 5 KW. lamp / heater type	1
23	Brake test arrangement with 2 spring balance, 0 to 25 Kg rating	1

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: POWER ELECTRICIAN

LIST OF TOOLS& EQUIPMENTS FOR 20 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	20
2.	Set square celluloid 45^0 (250 X 1.5 mm)	20
3.	Set square celluloid 30^0-60^0 (250 X 1.5 mm)	20
4.	Mini drafter	20
5.	Drawing board (700mm x500 mm) IS: 1444	20

B : FURNITURE REQUIRED

Sl. No.	Name of the items	Quantity (indicative)
1	Drawing Board	20
2	Models : Solid & cut section	as required
3	Drawing Table for trainees	as required
4	Stool for trainees	as required
5	Cupboard (big)	01
6	White Board (size: 8ft. x 4ft.)	01
7	Trainer's Table	01
8	Trainer's Chair	01

ANNEXURE – II

TOOLS & EQUIPMENT FOR ON-JOB TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

TRADE: ELECTRICAL WINDER

For Batch of 20APPRENTICES

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 (i.e. 9 months + 9 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.