CURRICULUM

FOR THE TRADE OF

ELECTRICIAN

UNDER

APPRENTICESHIP TRAINING SCHEME (ATS)

सत्यमेव जयते
Government of India

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

CONTENTS

1. 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.

2. RATIONALE

(Need for Apprenticeship in ELECTRICIAN 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. A large number of skilled workers coming out of technical institutes do not possess the required skills and are not readily employable. The industries have to spend time and money on their training. It has been observed that most of the existing Industrial Training Institutes run by the government and private sector do not have on the job training facilities.

It is therefore needed to interact with the industry 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.

3. JOB ROLES: Reference NOS & NCO

Electrician, General installs, maintains and repairs electrical machinery equipment and fittings in factories, workshops power house, business and residential premises etc., Studies drawings and other specifications to determine electrical circuit, installation details, etc. Positions and installs electrical motors, transformers, switchgears. Switchboards, Microphones, loud-speakers and other electrical equipment, fittings and lighting fixtures. Makes connections and solders terminals. Test electrical installations and equipment and locates faults using megger, test lamps etc. Repairs or replaces defective wiring, burnt out fuses and defective parts and keeps fittings and fixtures in working order. May do armature winding, draw wires and cables and do simple cable jointing. May operate, attend and maintain electrical motors, pumps etc.

Electrical Electrician fits and assembles electrical machinery and equipment such as motors, transformers, generators, switchgears, fans etc., Studies drawings and wiring diagrams of fittings, wiring and assemblies to be made. Collects prefabricated electrical and mechanical components according to drawing and wiring diagrams and Check them with gauges, megger etc, to ensure proper function and accuracy. Fits mechanical components, resistance, insulators, etc., as per specifications, doing supplementary tooling where necessary. Follows wiring diagrams, makes electrical connections and solders points as specified. Check for continuity, resistance, circuit shorting, leakage, earthing, etc, at each stage of assembly using megger, ammeter, voltmeter and other appliances and ensures stipulated performance of both mechanical and electrical components filled in assembly. Erects various equipments such as bus bars, panel boards, electrical posts, fuse boxes switch gears, meters, relays etc, using non-conductors, insulation hoisting equipment as necessary for receipt and distribution of electrical current to feeder lines. Installs motors, generators, transformer etc, as per drawings using lifting and hoisting equipment as necessary, does prescribed electrical wiring, and connects to supply line. Locates faults in case of breakdown and replaces blown out fuse, burnt coils, switches, conductors etc, as required. Check, dismantles, repairs and overhauls electrical units periodically or as required according to scheduled procedure. May test coils. May specialise in repairs of particular equipment manufacturing, installation or power house work and be designated accordingly.

Reference NCO & NOS:

i)NCO-2004: 7137.10
ii) NCO-2004: 7241.20

Plan and organize assigned work and detect & resolve issues during execution. Demonstrate possible solutions and agree tasks within the team. Communicate with required clarity, understand and implement technical English. Sensitive to environment, self-learning and productivity.

4. LEARNING OUTCOMES

A. GENERIC OUTCOME

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Work in a team, understand and practice soft skills, technical English to communicate with required clarity.
3. Explain the concepts and principles of basic arithmetic, algebraic, trigonometric and apply knowledge of specific areas to perform practical operations which requires well developed skills
4. Understand and explain basic electrical and material sciences and apply the knowledge.
5. Read and apply engineering drawing for different application in the field of work.
6. Understand and explain the concept in productivity, quality tools, labour & welfare legislation and apply such in day to day work to improve productivity and quality.
7. Explain the general concept and process of energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
8. Explain personnel finance management, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
9. Apply the general concept of basic computer, basic operating system and uses of internet services to take benefit of IT developments in the industry.

B. TRADE SPECIFIC

Block-I

10. Understand & explain basic concept of electricity, its applications & safety.
11. Select & apply basic method to prepare electrical joints & soldering.
12. Analyze, demonstrate and test basic electrical circuits and calculate the parameters.
13. Prepare & make a job selecting appropriate tool with accuracy as per drawing.
14. Test, service, recharge & install batteries.
15. Electrical Earthing system: Install, Measure & Improve earth resistance.
16. Trouble shoot, repair & Assemble electronic control circuit.
17. Install and test wiring system.
18. Install, test & commission DC machines.
19. Test and maintenance of transformer.
20. Measure electrical/ electronic parameters.

Block-II

21. Install, test and commission AC motors.
22. Operate & maintain Generator set.
23. Install & test electrical lighting system.
24. Plan the layout, assemble and wire electrical control panels for AC motors.
25. Troubleshoot, repair & service domestic Appliances.
26. Understand & monitor the power plant and power lines

5. NSQF LEVEL COMPLIANCE

NSQF level for ELECTRICIAN trade under ATS: **Level 5**

As per notification issued by Govt. of India dated- 27.12.2013 on National Skill Qualification Framework total 10 (Ten) Levels are defined.
Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.
Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are:

a. Process
b. professional knowledge,
c. professional skill,
d. core skill and
e. Responsibility.

The Broad Learning outcome of ELECTRICIAN trade under ATS mostly matches with the Level descriptor at Level- 5

. The NSQF level- 5 descriptors is given below:

LEVEL	Process required	Professional Knowledge	Professional skill	Core skill	Responsibility
Level 5	Job that requires well developed skill, with clear choice of procedures in familiar context	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information	Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication .	Responsibility for own work and Learning and some responsibility for other's works and learning

6. General Information

1. **Name of the Trade** **: ELECTRICIAN**

2. **N.C.O. / N. O. S. Code No.** : NCO-2004: 7137.10, 7241.20

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

4. **Duration of Basic Training**: -

   a) Block –I : 3 months

   b) Block – II : 3 months

Total duration of Basic Training: 6 months

5. **Duration of Practical Training (On -job Training): -**

   a) Block–I: 9 months

   b) Block–II : 9 months

Total duration of Practical Training: 18 months

6. **Entry Qualification** : Passed 10th Class with Science and Mathematicsunder10+2 system of Education or its equivalent

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

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.

7. 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																								

8. ASSESSABLE OUTCOME/ LEARNING OUTCOME WITH ASSESSMENT CRITERIA

Competencies after completion of 2 years ELECTRICIAN trade:

GENERIC ASSESSABLE OUTCOME

ASSESSABLE OUTCOMES	REF. SYLLABI	ASSESSMENT CRITERIA
1. Recognize & comply safe working practices, environment regulation and housekeeping.	BLOCK-I (BT-Wk. No.1 & OJT-Wk.No.1,2)	1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements and according to site policy.
		1.2 Recognize and report all unsafe situations according to site policy.
		1.3 Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
		1.4 Identify, handle and store / dispose off dangerous goods and substances according to site policy and procedures following safety regulations and requirements.
		1.5 Identify and observe site policies and procedures in regard to illness or accident.
		1.6 Identify safety alarms accurately.
		1.7 Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.
		1.8 Identify and observe site evacuation procedures according to site policy.
		1.9 Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
		1.10 Identify basic first aid and use them under different circumstances.
		1.11 Identify different fire extinguisher and use the same as per requirement.
		1.12 Identify environmental pollution & contribute to the avoidance of instances of environmental pollution.
		1.13 Deploy environmental protection legislation & regulations
		1.14 Take opportunities to use energy and materials in an environmentally friendly manner
		1.15 Avoid waste and dispose waste as per procedure
		1.16 Recognize different components of 5S and apply the same in the working environment.
2. Work in a team, understand and practice soft skills, technical English to communicate with required clarity.	BLOCK-I, OJT-Wk. No.2 & Item No. 9.1.3.1 Block –I	2.1 Obtain sources of information and recognize information.
		2.2Use and draw up technical drawings and documents.
		2.3 Use documents and technical regulations and occupationally related provisions.
		2.4 Conduct appropriate and target oriented discussions with higher authority and within the team.
		2.5 Present facts and circumstances, possible solutions &use

		English special terminology.
		2.6 Resolve disputes within the team
		2.7 Conduct written communication.
3. Explain the concepts and principles of basic arithmetic, algebraic, trigonometric and apply knowledge of specific areas to perform practical operations which requires well developed skills	Item No. 9.1.1 Block – I & II	3.1 Terminal examination to test basic skills on arithmetic, algebra, trigonometry and statistics.
		3.2Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.
4. Understand and explain basic electrical and material sciences and apply the knowledge.	Item No. 9.1.1 Block – I & II	4.1 Terminal examination to test basic skills on science in the field of study including basic electrical and hydraulics & pneumatics.
		4.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.
5. Read and apply engineering drawing for different application in the field of work.	Item No. 9.1.1 Block – I & II	5.1 Terminal examination to test basic skills on engineering drawing.
		5.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.
6. Understand and explain the concept in productivity, quality tools, labour & welfare legislation and apply such in day to day work to improve productivity and quality.	Item No. 9.1.3.1 Block –II	6.1 Terminal examination to test the concept in productivity, quality tools and labour welfare legislation.
		6.2 Their applications will also be assessed during execution of assessable outcome.
7. Explain the general concept and process of energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	Item No. 9.1.3.1 Block –II	7.1 Terminal examination to test knowledge on energy conservation, global warming and pollution.
		7.2 Their applications will also be assessed during execution of assessable outcome.
8. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	Item No. 9.1.3.1 Block –II	8.1 Terminal examination to test knowledge on personnel finance, entrepreneurship.
		8.2 Their applications will also be assessed during execution of assessable outcome.
9. Apply the general concept of basic computer, basic operating system and uses of internet services to take benefit of IT developments in the industry.	Item No. 9.1.3.1 Block –I	9.1 Terminal examination to test knowledge on basic computer working, basic operating system and uses internet services.
		9.2 Their applications will also be assessed during execution of assessable outcome.

Specific Assessable outcome:

Block-I

ASSESSABLE OUTCOMES	REF. SYLLABI	ASSESSMENT CRITERIA
10. Understand & explain basic concept of electricity, its applications & safety.	Block –I Basic Training Wk No. 1,2 Block –I On the job Training Wk No. 1,2	10.1 Identify the availability of supply Both AC & DC.
		10.2 Demonstrate the use of line tester & test lamp.
		10.3 Distinguish 1phase, 3 phase supply & identify the terminals in a 3 phase 4 wire systems.
		10.4 Identify & explain the electrical symbols.
		10.5 Demonstrate First Aid in case of electric shock.
11. Select & apply basic method to prepare electrical joints & soldering.	Block –I Basic Training Wk No. 3 Block –I On the job Training Wk No. 3 to 7	11.1 Observe safety/ precaution during joints & soldering.
		11.2 Make simple straight, twist and rat-tail joints in single strand conductors by selecting proper tools.
		11.3 Make married and 'T' (Tee) joint in stranded conductors.
		11.4 Make a Britannia straight and 'T' (Tee) joint in bare conductors by selecting proper tools.
		11.5 Make western union joint in bare conductor by selecting proper tools.
		11.6 Solder the finished copper conductor joints with appropriate tools & precaution.
		11.7 Make termination of cable lugs by using hand crimping tool.
12. Analyze, demonstrate and test basic electrical circuits and calculate the parameters.	Block –I Basic Training Wk No. 4 Block –I On the job Training Wk No.8,9	12.1 Identify types of wires, cables and verify their specifications.
		12.2 Verify the characteristics of series, parallel and its combination circuit.
		12.3 Determine the power factor by direct and indirect methods in an AC single phase R, L, C parallel circuit.
		12.4 Identify the phase sequence of a 3 ø supply using different methods.
		12.5Prepare / connect a lamp load in star and delta and determine relationship between line and phase values with precaution.
		12.6 Connect balanced and unbalanced loads in 3 phase star system and measure the power of 3 phase loads with safety/ precaution.
13. Prepare & make a job selecting appropriate tool with accuracy as per drawing.	Block –I Basic Training Wk No. 5 Block –I On the job Training Wk No.10 to 11	13.1 Identify the trade hand tools; practice their uses with safety, care & maintenance.
		13.2 Prepare a simple half lap joint using selecting appropriate tool with accuracy as per drawing
		13.3 Practice on connecting of electrical accessories selecting appropriate tool.
		13.4 Make and wire up of a test board selecting appropriate tool and test it.
14. Test, service, recharge & install batteries.	Block –I Basic Training Wk No. 6 Block –I	14.1 Identify the parts of a battery charger and test for its operation.
		14.2 Practice on charging of battery by choosing appropriate method and test for its condition with safety/ precaution.

	On the job Training Wk No.12	14.3 Installation and maintenance of batteries with precaution.
		14.4 Maintain, service and trouble shoot a battery charger.
		14.5 Calculate the load that can be connected to the batteries & calculate the back-up time.
15. Electrical Earthing system: Install, Measure & improve earth resistance.	Block –I Basic Training Wk No. 7 Block –I On the job Training Wk No.13	15.1 Install the pipe earthing by selecting proper tools, instruments and method without any assistant and test it.
		15.2 Install the plate earthing by selecting proper tools, instruments and method without any assistant and test it.
		15.3 Measure the earth electrode resistance using earth tester.
		15.4 Carry out earth resistance improvement.
16. Trouble shoot, repair & Assemble electronic control circuit.	Block –I Basic Training Wk No. 8 Block –I On the job Training Wk No. 25 to 27	16.1 Practice on soldering components on lug board selecting proper tool with safety.
		16.2 Identify the passive /active components by visual appearance, Code number and test for their condition.
		16.3 Identify the control and functional switches in CRO and measure & calculate D.C. / A.C voltage, frequency and time period.
		16.4 Construct and test half & full wave rectifiers with and without filter circuits.
		16.5 Use of transistor as a switch.
		16.6 Demonstrate handling of Electronic PCBs safely.
		16.7 Operation and maintenance of inverter selecting proper tools & equipment with safety.
		16.8 Troubleshoot, service and maintain a voltage stabilizer selecting proper tools & equipment with safety.
		16.9 Identify the parts, trace the connection and test the DC regulated power supply with safety.
		16.10 Troubleshoot and service a DC regulated power supply selecting proper tools & equipment with safety.
		16.11 Carryout the maintenance of UPS selecting proper tools with safety..
17. Install and test wiring system.	Block –I Basic Training Wk No. 9 Block –I On the job Training Wk No. 10 to 11 and 20	17.1 Comply with safety & IE rules when performing the wiring.
		17.2 Prepare and mount the energy meter board.
		17.3 Draw and wire up the consumer's main board with ICDP switch and distribution fuse box.
		17.4 Draw and wire up a bank/hostel/jail in PVC conduit & casing/capping.
		17.5 Identify the types of fuses their ratings and applications.
		17.6 Identify the parts of a relay, MCB, & ELCB and check its operation.
		17.7 Estimate the cost of material for wiring in PVC channel for an office room having 2 lamps, 1 Fan, one 6A socket outlet and wire up.
		17.8 Estimate the requirement for metal conduit wiring (3 phase) and wireup.
		17.9 Estimate the materials and wireup the lighting circuit for a

		tunnel – Metal circuit.
		17.10 Estimate the materials and wireup a lighting circuit for a corridor in metal conduit.
		17.11 Test a domestic wiring installation by using Megger.
18. Install, test and commission DC machines.	Block –I Basic Training Wk No. 10,11 Block –I On the job Training Wk No. 33 to 34	18 .1 Plan & work in compliance with standard safety norms related with DC machines.
		18.2 Determine load test on a DC generator and calculate regulation & efficiency.
		18.3 Test a DC machine for continuity and insulation resistance selecting appropriate tool & equipment.
		18.4 Connect, start, run and reverse D.O.R of DC motor by selecting proper starter.
		18.5 Maintain, service and trouble shoot the DC motor starter selecting appropriate tool & equipment..
		18.6 Conduct the load performances test on DC motor and calculate the efficiency.
		18.7 Control the speed of a DC motor by selecting different method.
		18.8 Control the speed of DC motor by using DC drive.
		18.9 Maintenance, troubleshooting & servicing of DC machines selecting appropriate tool & equipment..
		11.10 Overhaul a DC machine.
19. Test and maintenance of transformer.	Block –I Basic Training Wk No. 12 Block –I On the job Training Wk No. 21 to 24	19.1 Plan work in compliance with standard safety norms related with transformer.
		19.1 Identify the types of transformers and their specifications.
		19.2 Identify the terminals; verify the transformation ratio & polarity of a transformer.
		19.3 Connect and test a single phase auto- transformer.
		19.4 Measure the current and voltage using CT and PT.
		19.5 Test the transformer oil with oil testing kit.
		19.6 Check oil level & top up. Check & replace silica gel. Monitor winding & oil temperature.
		19.7 Determine the load performance of transformer and calculate the losses & efficiency.
20. Measure electrical/ electronic parameters.	Block –I Basic Training Wk No. 13 Block –I On the job Training Wk No. 8 to 9	20.1 Identify the type of electrical instruments.
		20.2 Measure the power and energy in a single & three phase circuit using different method and selecting proper instrument.
		20.3 Measure the value of resistance, voltage and current using digital & analog multimeter.
		20.4 Measure the power factor in poly-phase circuit
		20.5 Measure phase sequence in a 3 phase circuit
		20.6 Measure the frequency.
		20.7 Extend the range of Voltmeter, Ammeter and Wattmeter and measure the quantities.

Block-II

ASSESSABLE OUTCOMES	REF. SYLLABI	ASSESSMENT CRITERIA
21. Install, test and commission AC motors.	Block –II Basic Training Wk No. 1,2,3 Block –II On the job Training Wk No.1, 13,14 and 25 to 31	21.1 Plan work in compliance with standard safety norms related with AC motors.
		21.2 Draw circuit diagram and connect a 3 phase squirrel cage induction motor to run in forward & reverse direction.
		21.3 Start, run and reverse an AC 3 phase squirrel cage induction motor by selecting different type of starters.
		21.4 Conduct the load performances test on AC 3 phase motor and calculate the efficiency.
		21.5 Control the speed of induction motor by using AC drive.
		21.6 Connect, start and run a 3 phase synchronous motor.
		21.7 Connect start, run and reverse the DOR of different type of single phase motors.
		21.8 Maintain, service and trouble shoot the single phase motor selecting appropriate tool & equipment..
		21.9 Install a single phase motor.
		21.10 Overhauling of AC motors.
22. Operate & maintain Generator set	Block –I Basic Training Wk No. 4,5 Block –II On the job Training Wk No. 9,10	22.1 Plan work in compliance with standard safety norms related with generator set.
		22.2 Connect start and run a generator and build up the voltage.
		22.3 Maintain, service and trouble shoot a generator selecting appropriate tool & equipment..
		22.4 Parallel operation of an alternator and load sharing , a. Bright lamp method c. Dark lamp method b. Bright and dark lamp method d. Synchronoscope
		22.5 Installation of alternator.
23. Install & test electrical lighting system	Block –I Basic Training Wk No. 6,7 Block –II On the job Training Wk No. 15,16	23.1 Install light fitting with reflectors for direct and indirect lighting.
		23.2 Assemble and connect a single & twin tube F.L.
		23.3 Connect, install and test the H.P.M.V & H.P.S.V. lamp with accessories.
		23.4 Assemble and test a decorative serial lamp set for 240 V using 6V bulb and flasher.
		23.5 Assemble and install solar photo voltaic light.
		23.6 Install light fitting for show case window lighting and estimate it cost.
24. Plan the layout, assemble and wire electrical control	Block –I Basic Training Wk No. 8,9 Block –II	24.1 Draw the layout diagram of 3 phase AC motor control cabinet.
		24.2 Mount the control elements & wiring accessories on the control panel as per plan & drawing.

panels for AC motors.	On the job Training Wk No.2 to 5 and 22 to 24 and 28 to 30	24.3 Practice wiring the control cabinet for local and remote control of induction motor selecting appropriate tool.
		24.4 Draw & wire up the control panel for forward/ reverse operation of induction motor.
		24.5 Practice wiring the Automatic star delta starter selecting appropriate tool.
		24.6 Trouble shoot the control panel wiring.
25. Troubleshoot, Repair & service domestic Appliances.	Block –I Basic Training Wk No. 10,11 Block –II On the job Training Wk No. 6 to 8 and 32 to 33	25.1Plan work in compliance with standard safety norms related with domestic appliances.
		25.2 Service and Repair of calling bell/ buzzer/ Alarm.
		25.3Service and repair an automatic iron selecting appropriate tool.
		25.4 Repair and service an oven & furnace having multi-range heat control selecting appropriate tool.
		25.5 Replace the heating element in a kettle and test.
		25.6 Service and repair an automatic toaster selecting appropriate tool.
		25.7 Service and repair a geyser selecting appropriate tool.
		25.8 Service and repair a mixer selecting appropriate tool.
		25.9 Service and repair of washing machine selecting appropriate tool.
		25.10 Install a pump set.
		25.11 Service and repair a table fan selecting appropriate tool.
		25.12 Service, repair and install a ceiling fan selecting appropriate tool.
		25.13 Service, repair and install a Solar Cell and Bio Gas Energy System.
26. Understand & monitor the power plant and power lines.	Block –I Basic Training Wk No. 12,13 Block –II On the job Training Wk No. 17 to 21	26.1 Prepare layout plan, single line diagram of different type of power plant and project report of all equipment's and machineries of the visited plant.
		26.2 Draw the schematic of a overhead and domestic service line.
		26.3 Erect an overhead service line pole for single phase 240v distribution system.
		26.4 Prepare the jumper for Over Head line extension on the pole and fix it.
		26.5 Test the underground cables for open, short circuit & ground fault and also check insulation resistance.
		26.6 Prepare layout plan and single line diagram of transmission /Distribution system.
		26.7 Trouble shooting and servicing of LT circuit breaker.

9. SYLLABUS

9.1 Basic Training
(Block – I & II)
Duration: 06 Months

GENERAL INFORMATION

1) Name of the Trade : ELECTRICIAN
2) Hours of Instruction : 1040 Hrs. (40 hrs./week X 26 weeks)
3) Batch size : 20
4) Power Norms : 5.2 KW for Workshop
5) Space Norms : 98 Sq. meters.

6) Examination : The internal examination/ assessment will be held on completion of each Block.

7) Instructor Qualification :

a) BE/B Tech in Electrical Engineering from a recognized university/Board With one year post qualification experience in the relevant field.

OR

b) Diploma in Electrical Engineering from a recognized university/Board With two years post qualification experience in the relevant field

OR

c) NTC/NAC in the trade of Electrician with three year post qualification experience 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

9.1.1 DETAIL SYLLABUS of CORE SKILL

Block– I
Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
		30		20
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.		Unit: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units.	
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. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.		Square Root : Square and Square Root, method of finding out square roots, Simple problem using calculator	

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 instruments used in electronics mechanics trades		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.	

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.	

C. EMPLOYABILITY SKILLS

GENERAL INFORMATION

1) Name of the subject	:	EMPLOYABILITY SKILLS
2) Applicability	:	ATS- Mandatory for fresher only
3) Hours of Instruction	:	110 Hrs.
4) Examination	:	The examination will be held at the end of Block I & II of Basic Training.
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.

9.1.3.1 Syllabus of Employability Skills

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	

Block– II
Basic Training

Topic No.	Topic	Duration (in hours)
	Entrepreneurship skill	10
1	Concept of Entrepreneurship Entrepreneurship- Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. Management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs 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	10
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 and safety 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	5
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	
	Leadership and Team Building skills.	5
	Leadership Discipline and Morale Team Work Case Study/ Exercise	
	Meet the Mentor Role - play as a Supervisor	5
	Organizing and Planning.	5

	Time Management Group Dynamics Case Study/ Exercise	

9.1.2 Detail Syllabus of Professional Skills & Professional Knowledge

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	Familiarization with signs and symbols of Electrical accessories.	Fundamental of electricity: Electron theory- free electron, Fundamental terms- Current, Voltage definitions, AC, DC, Phase, Neutral, Earth. Units & effects of electric current.
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	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

	of types of cables. Demonstration & practice on using standard wire gauge & micrometer.	
4	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.	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.
5	Demonstration of trade hand tools. Use, care & maintenance of various hand tools. Practice on installation and overhauling common electrical accessories as per simple Electrical circuit / Layout. Make test board.	Identification of Trade-Hand tools-Specifications 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, Two way switch .Security surveillance, Fire alarm, MCB, ELCB, MCCB. Series –parallel testing board & use.
6	Identification of 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	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, Different types of lead acid cells. Sealed Maintenance free Batteries, Solar battery. Load & back up time calculation
7	Practice on Earthing- different methods of earthing. Measurement of Earth resistance by earth tester. Testing of Earth Leakage by ELCB and relay.	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).

8	Diodes-symbol - Tests - Construct & Test Half wave rectifier ckt. Full wave rectifier ckt. Bridge 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 D.C. 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.
9	Practice in casing, Capping and Conduit wiring . Testing of wiring installation by meggar. -Fixing of calling bells/buzzers. Identification & demonstration on conduits and accessories & their uses, cutting , threading & laying Installation, Testing, Maintenance and Repairing of wiring. Application of fuses, relay, MCB, ELCB.	Electric wirings, I.E. rules. Types & selection of wirings both domestic and industrial. Specifications for wiring. Grading of cables and current ratings. Principle of laying out in domestic wiring. Estimate the cost of wiring system Voltage drop concept. Wiring system - P.V.C., concealed system. Specifications, standards for conduits and accessories - Power Wiring - Control Wiring - Information Communication - Entertainment Wiring. Testing of wiring installation by meggar Study of Fuses, Relays, Miniature circuit breakers (MCB), ELCB, etc.
10-11	Identification of the parts of a D.C. machine. No load & Load performance of a different type of DC generator. Calculation of regulation & efficiency. Connect, start, run and reverse a different type of DC motor. load performance test on different type of DC motor& calculation of efficiency. speed of a DC motor by different method. Maintenance, troubleshooting & servicing of DC machines.	D.C. Machines - General concept of Electrical Machines. Principle of D.C. generator. Use of Armature, Field Coil, Polarity, Yoke, Cooling Fan, Commutator, slip ring Brushes, Laminated core. Explanation of D.C. Generators-types, parts-Practical uses. Description of series, shunt and compound generators and their selection. 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.

	Overhaul a DC machine.	
12	Identification of types of transformers. Connection of transformers, Transformation ratio, testing of transformer, calculate 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.
13	Identify & select different type of Instruments. Use of -PMMC , 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.
	Assessment/Examination 03days	

Block –II

Basic Training

Week No.	Professional Skills	Professional Knowledge
1-3	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. Connect, start and run a 3 phase synchronous 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. SYNCHRONOUS MOTOR - Working principle, effect of change of excitation and load. Power factor correction of industrial load 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.
4-5	Identification of parts and terminals of Alternator. Connection, starting, running of Alternator. Practice on alternators, voltage Building,, Parallel operation & load sharing. Practice on installation, running and maintenance of Alternators.	Alternator Explanation of alternator, working principle, voltage build-up, loading, Regulation. Types of prime mover, phase sequence, Parallel operation & load sharing. Specification of alternators
6-7	Installation of - Mercury & Sodium vapour lamps (H.P. & L.P.) Halogen Lamps Single FL tube and twin FL tube. Practice on decoration lighting Principle of layout of lighting installation and estimate it cost. Practice on photo cells.	Illumination, Laws of Illuminations, terminology used , Illumination factors, intensity of light. Types of illumination Type of lamps -Neon sign Halogen, Mercury vapour, sodium vapour, Fluorescent tube, CFL, LED, Solar lamp & photo cell applications, Decoration lighting, Drum Switches
8-9	Machine control cabinet /Control Panel Layout, Assembly & Wiring: Practice Layout drawing of	Machine control cabinet /Control Panel Layout, Assembly & Wiring: Layout of Control cabinet & control panel Study & Understand Layout drawing of control

	control cabinet , panel, power & control circuits Preparing control cabinet / panel assembly & wiring for 1. Local & Remote control of Induction motor(DOL) 2. Forward & Reverse operation of Induction motor 3. Automatic Star Delta Starter Trouble shoot the control panel wiring	cabinet, panel, power & control circuits. Control Elements: Isolator, pushbutton switches, Indicating lamps, MCB, Fuse, Contactor, Relays, Overload Relay, Timers, Rectifier, Limit switches, control transformers. Wiring Accessories: Race ways/ cable channel, DIN Rail, Terminal Connectors, Thimbles, Lugs, Ferrules, cable binding strap & buttons, nylon cable ties, sleeves, Gromats & clips
10-11	Repair & Test of Calling Bell, Buzzer, Alarms, Electric Iron, Heater, Light. Maintenance and repair of domestic equipment – Electric Kettle, Heater / Immersion Heater, Hot Plate, Oven, Geyser, Cooking range, Mixer, Washing machine, , Motor Pump set, etc.	Domestic Appliances: Working principles and circuits of common domestic equipment and appliances. – Calling Bell, Buzzer, Alarms, Electric Iron, Heater, Light Electric Kettle, Heater / Immersion Heater, Hot Plate, Oven, Geyser, Cooking range, Mixer, Washing machine, , Motor Pump set, etc. Concept of Neutral and Earth.
12-13	Prepare layout plan, single line diagram of different type of power plant and project report of all equipment's and machineries of the visited plant. Schematic of a overhead and domestic service line. Erect an overhead service line pole for single phase 240v distribution system. Test the underground cables for open, short circuit & ground fault and also check insulation resistance. Prepare layout plan and single line diagram of transmission /Distribution system. Trouble shooting and servicing of LT circuit breaker. Connect feeder cable/ service line to the bus bar.	POWER GENERATION : Generation sources of energy, Comparison of energy resources. Types of fuels. Advantages of liquid fuel & solid fuel. Various ways of electrical power generation. • Thermal • Hydro electric • Nuclear • Non-Conventional Overhead Lines: Main components of overhead lines-Types of power line Low voltage line medium Voltage line & high voltage line Voltage standard Conductor materials, line supports, Insulators, types of Insulators Under Ground Cable : Construction of cables. Types of cable faults and their location. DISTRIBUTION OF POWER Function and equipment used in substation. Classification of distribution system-AC distribution, Overhead v/s underground distribution system. Essential features of switchgears. Isolator, Switch gear equipments, bus-bar arrangement, Short circuit, faults in power system. Circuit breakers – Introduction & Classification of circuit breakers
	Assessment/Examination 03days	

9.2 Practical Training (On-Job Training)
(Block – I & II)
Duration: 18 Months

GENERAL INFORMATION

1) Name of the Trade : Electrician
2) Duration of On-Job Training : As per Apprentices Act amended time to time.
3) Batch size : 20
4) Examination : i) The assessment/examination will be held on completion of each block
   ii) NCVT exam will be conducted at the end of 2nd year.
5) Instructor Qualification :

d) BE/B Tech in Electrical Engineering from a recognized university/Board With one year post qualification experience in the relevant field.

OR

e) Diploma in Electrical Engineering from a recognized university/Board With two years post qualification experience in the relevant field

OR

f) NTC/NAC in the trade of Electrician with three year post qualification experience in the relevant field.
Preference will be given to a candidate with Craft Instructor Certificate (CIC)

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

9.2.1 Detail SYLLABUS of Professional Skill& Professional Knowledge

Block – I
On-Job Training

Week No.	Professional Skills	Professional Knowledge
1-2	Observe & practice safety in all electrical works. Practice providing First Aid	Importance of safety & First Aid
3	Identify & use all hand tools	Types of hand tools & their proper use
4-5	Check the gauges of wire & select suitable wires for the required current rating. Practice wire joints & providing cable glands. Soldering practice.	Specifications of wires. Color code, current carrying capacity in open & inside conduit etc.
6-7	Carryout fitting & carpentry jobs	Need of allied trade skills in electrical works
8-9	Connect & measure voltage, current, resistance power & energy in DC & AC(1ph & 3ph) circuits	KW, KVA, KVAR, Max Demand, Power factor, contract demand ,billing demand,
10-11	Electrical wiring: Repair / replace switches, sockets, light points. Provide new points in PVC casing capping & PVC conduits.	Type of wiring system, wires, accessories, fittings suitable for specific applications
12	Charging & maintenance of Batteries. Checking specific gravity, voltage etc.	Procedure for preparing electrolyte. Safety to be observed in handling batteries.
13	Install pipe & plate earth stations Measure earth resistance, improve the same & maintain earth stations.	Importance of earthing. Methods of improving earth resistance. Maintaining earth stations.
14-16	Providing power supply to motors, equipments& appliances. Crimping the lugs, providing cable glands & connections.	Wires / cables. Their current carrying capacity. Selecting suitable wires / cables
17-19	Attending to minor faults in machines, their controls & appliances.	Systematic & step by step approach to trouble shooting & maintenance
20	Replacing the bulbs, tubes, trouble shooting, repair & maintenance. Wire up in PVC casing & capping.	Safety to be observes in replacing bulb, tube and repair.
21-24	Assisting in operation & maintenance of Transformer substation, circuit breakers, batteries etc	IE Act & IE rules. Safety aspects related to power generation, transmission, distribution & utilization of electric power.
25-27	Trouble shooting rectifiers, filters, power supplies, voltage stabilizers, controlled rectifiers. Identifying faulty thyristors in circuits, replacing them	Significance & importance of power supply in a system. Power supplies, UPS & Inverter circuits.

28-29	Provide light/socket points, for various equipments and appliances	Wire sizes, gauges & current carrying capacity. Importance of earth connection
30-32	Decides the size of cable & provides power supply to machines & equipments, provide earth connections.	Types & sizes of cables, current carrying capacity. Importance of earthing & improving earth resistance
33-34	Tesing the condition of DC motor Checking power input & output in DC drives. Replacing faulty components	Connecting, programming, testing & Functioning of DC drive. Understanding the alarm & fault indications.
35-36	Project Work	
37-38	REVISION	
39	Assessment/ Examination	

Block – II
On-Job Training

Week No.	Professional Skills	Professional Knowledge
1	Observe & practice safety in all electrical works. Practice providing First Aid	Importance of safety & First Aid
2-5	Control panel: Assembling the control elements & accessories, control & power wiring, testing, bunching. Trouble shoot problems in control & repair them.	Purpose of control panel, its layout, reading the layout drawing, understanding wiring diagram, and application of control panel. Maintaining controlled temp in panel. Maintenance.
6-8	Domestic appliances: Connecting, testing, repairing & maintaining	Safety aspects related to domestic appliances.
9-10	Diesel Generating set: Operation, operating switch gears, trouble shooting & maintenance	Checklist for maintenance of DG set.
11-12	Testing of underground cables, trouble shooting, Locating faults, open circuit, short circuit & leakage in cables, performing cable joints	Types of cables, LT, HT, size, capacity, current ratings,
13-14	Checking power input & output in AC drives. Replacing faulty components	Connecting, programming, testing & Functioning of AC drive. Understanding the alarm & fault indications.
15-16	Lighting system: Trouble shooting, repair & maintenance	Type of Illumination system for various applications like interior, office, decorative, exterior, yard lighting, etc
17-18	Operates & maintains transformer substation & equipments like circuit breakers, batteries etc	Safety to be observed in substation. Maintenance schedule.
19-20	Operates & maintains the power distribution system. Maintenance of power factor	Importance of power factor & its improvement.
21	Underground cable joining, HT/LT	Cable joining techniques.
22-24	Operates & maintain Air compressor, AC plant, cranes, lifts, hoists	Safety to be observed in working with cranes, hoists. Working of AC plant
25-27	Trouble shoot & repair machine tools	Step by step approach to breakdown maintenance
28-30	Preventive & corrective maintenance of all machine tools	Preventive Maintenance schedule. Advantages of preventive maintenance

31	Checking power input & output in AC/DC drives. Replacing faulty components	Connecting, programming, testing & Functioning of AC & DC drive. Understanding the alarm & fault indications.
32-33	Operation & maintenance of Solar cells and Non conventional energy generation system.	Checklist for maintenance of Solar Energy and Non conventional energy generation system.
34-36	Project Work	
37	REVISION	
38-39	Examination	

10. ASSESSMENT STANDARD

10.1 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 scrap/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

10.2 INTERNAL ASSESSMENTS (FORMATIVE ASSESSMENT)

Asses. No.	Assessable Outcome	INTERNAL Marks
	GENERIC outcome (Applicable to each Block)	
1	Recognize & comply safe working practices, environment regulation and housekeeping.	
2	Work in a team, understand and practice soft skills, technical English to communicate with required clarity.	
3	Demonstrate knowledge of concept and principles of basic arithmetic, algebraic, trigonometric, statistics and apply knowledge of specific area to perform practical operations.	
4	Understand and explain basic science in the field of study including basic electrical, and hydraulics & pneumatics.	
5	Read and apply engineering drawing for different application in the field of work.	
6	Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	
7	Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	
8	Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	
9	Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.	
	SPECIFIC OUTCOME	
10	Understand & explain basic concept of electricity, its applications & safety	
11	Select & apply basic method to prepare electrical joints & soldering.	
12	Analyze, demonstrate and test basic electrical circuits and calculate the parameters.	
13	Prepare & make a job selecting appropriate tool with accuracy as per drawing.	
14	Test, service, recharge & install batteries.	
15	Electrical Earthing system: Install, Measure & improve earth resistance.	
16	Trouble shoot, repair & Assemble electronic control circuit.	
17	Install and test wiring system.	
18	Install, test & commission DC machines.	
19	Test and maintain of transformer.	
20	Measure electrical/ electronic parameters .	
	Sub total for block I	250
21	Install, test and set up AC motors.	
22	Operate & maintain Generator set.	
23	Install & test electrical lighting system.	
24	Plan the layout, assemble and wire electrical control panels for AC motors.	
25	Troubleshoot, repair & service domestic Appliances.	
26	Understand & monitor the power plant and power lines.	
	sub total for block II	250
	total internal marks	500

10.3 FINAL ASSESSMENT- All india trade test (SUMMATIVE ASSESSMENT)

	SUBJECTS	Marks	Internal assessment based on competency	Full Marks	Pass Marks	Duration of Exam.
Block – I	Basic Training		250	250	150	
Block – II	Basic Training		250	250	150	
Block – I & II (on the job training)	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.
TOTAL for Block – I & II	On the job training	500				
	Grand Total	500	500	1000	550	

Marks Distribution TOTAL: 1000 marks for I & II Blocks, Pass marks: 550

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

11. Further learning pathways

On successful completion of the course,

- The trainees will be employed in reputed Industries / Organizations.
- The trainee may be given lateral entry to Diploma course
- They can also undergo CITS course in the relevant trade to become instructor in the ITI's

Employment opportunities:

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

1. Various Electrical Equipment Manufacturing Industries.
2. Process industries.
3. Industries manufacturing Solar power based inverters.
4. Power distribution Companies.
5. Service industries Home appliances manufacturing company.
6. Electric Power Generation Plant.
7. Central & State Govt. and public sector industries and private industries in India & abroad. Petrochemical industries.
8. Self employment.

12. LIST OF EXPERT MEMBERS

Sl. No.	Name & Designation Sh/Mr./Ms.	Organization	Expert Group Designation
1.	Mr. Jayant Krishna Principal Consultant	M/S TATA Consultancy Service Ltd., Lucknow	Chairman
2.	Mr. T C Saravanabava, DDG (AT)	MSDE	Member
3.	Mrs. Sandhya Salwan, Director (AT)	MSDE	Member
4.	Mr. Sathya Shankar BP Director	Apex Hi-Tech, Bangalore	Member
5.	Mr. Padma Kumar Team Leader-HR	Saint Gobain India Pvt. Ltd. Chennai	Member
6.	Mr. Maruti Kumar B Junior Engineer (E)	CPWD, Electrical BCED-II, Kendriya Sadan Koramangala Bangalore-34	Member
7.	Mr. H S Balraj Manager Manufacturing Engineering	SAINT-GOBAIN Grindwell Norton Ltd. Bangalore - 49	Member
8.	Mr. Jinesh Kadaval Purayil Asst. Manager Training & Development	Bosch Ltd Bangalore – 27	Member
9.	Mr. B N Sridhar Dy. Director of Training	Foremen Training Institute Bangalore	Member
10.	Mr. B K Singha Dy. Director of Training	Central Staff Training & Research Institute, Kolkata	Member
11.	Mr. Ketan Patel Dy. Director of Training	RDAT, Mumbai	Member

Annexure – I

TOOLS & EQUIPMENT FOR BASIC TRAINING
Infrastructure for PROFESSIONAL skill & PROFESSIONAL knowledge
TRADE: ELECTRICIAN

LIST OF TOOLS & EQUIPMENTS FOR -20 APPRENTICES

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 : Instruments & General Shop Outfit

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	Oscilloscope dual trace, 30 MHz	1
74	Function Generator	1
75	Hygrometer	1
76	Lux meter	1
77	Hydro meter	1
78	Current transformer, 415 V, 50 Hz , CT Ratio 10/5A,	1
79	Potential Transformer, 415/110 V	1
80	Wood Saw, 250 mm	1
81	Tenon Saw	1
82	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
17	Single phase capacitor motor with starter switch, 1 HP, 230 V, 50 Hz	1
18	Universal motor with starter / switch, 230 V, ¼ HP, 50 Hz	1
19	Stepper Motor with digital controller,	1
20	Shaded pole motor,	1
21	3 ph Synchronous motor, 3 HP, 415 V, 50 Hz, 4 pole, with accessories	1
22	Domestic Appliacnes: Electric hot plate, 1500W	1
23	Electric kettle, 1500W	1
24	Electric Iron, 1500 W	1
25	Immersion heater, 1500 W	1
26	Ceiling fan	1
27	Geyser storage type, 15 lts min	1
28	Mixer & Grinder	1
29	Washing Machine	1
30	Inverter, 1 KVA with 12 V battery, input 12 V DC, Output 220V AC	1
31	Thyristor /IGBT controlled DC motor Drive, with tachogenerator feed back arrangement, 1 HP	1 set
32	Thyristor / IGBT controlled AC motor Drive with VVVF control, 3 ph, 2 HP,	1 set
33	Battery charger	1
34	1 Ph variable Auto Transformer	1
35	Load bank, 5 KW. lamp / heater type	1
36	Brake test arrangement with 2 spring balance, 0 to 25 Kg rating	1
37	Discreet component trainer	2
38	Oil testing kit	1

Infrastructure for workshop calculation & science and engineering drawing

TRADE: 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 □(250 X 1.5 mm)	20
3.	Set square celluloid 30 ±60 □(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: ELECTRICIAN

For Batch of 20 APPRENTICES

General Machinery Installations (DESIRABLE):–

Sl. No.	Name & Description of Machines	Quantity
1	Electrical Substation with Transformer & Switch gears-circuit breakers, Relays, Battery bank, capacitor load bank, etc with power distribution system	As required
2	Diesel generator (DG) set with Automatic Voltage Regulator(AVR) & Automatic- on-mains failure (AMF) panel	As required
3	Conventional machine tools like Lathes, Milling machines	As required
4	Power supplies / UPS/ Inverters /Stabilisers,	As required
5	Electrical Appliances- Refrigerator, Aircooler, Room Air conditioner, water heaters, Geyser, Hot plate, Kettle, etc	As required

aNNEXURE-III

guidelines for INSTRUCTORS AND paper setters

1. all the questions of theory paper for the trade will be in objective type format.
2. 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
3. Maximum utilization of latest form of training viz., audio visual aids, integration of IT, etc. may be adopted.
4. The total hours to be devoted against each topic may be decided with due diligence to safety & with prioritizing transfer of required skills.
5. Questions may be set based on following instructions:-

Sl. No.	Question on different aspect	Weightage in %age	Key Words may be like
1	Information received	25	What, Who, When
2	Knowledge	50	Define, Identify, Recall, State, Write, List & Name
3	Understanding	15	Describe, Distinguish, Explain, Interpret & Summarize
4	Application	10	Apply, Compare, Demonstrate, Examine, Solve & Use

6. Due weightage to be given to all the topics under the syllabus while setting the question paper.