WIREMAN

COMPETENCY BASED CURRICULUM
(Duration: 2 Yrs.)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 5

SECTOR – ELECTRICAL (INCLUDING NEW AND RENEWABLE ENERGY)

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

WIREMAN

(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 5

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
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2. Eveready Industries (I) Ltd. Kolkata
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Co-ordinator for the course: Sh. L. K. Mukherjeeds, DDT, CSTARI- Kolkata

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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:

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- 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.

2.1 GENERAL

Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under aegis of National Council of Vocational Training (NCVT). Craftsman Training Scheme (CTS) and Apprenticeship Training Scheme (ATS) are two pioneer programmes of NCVT for propagating vocational training.

Wireman trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of two years (02 Blocks) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional - skills and knowledge, while Core area - Workshop Calculation and science, Engineering Drawing and Employability Skills imparts requisite core skills & knowledge and life skills. After passing out the training programme, the trainee is being awarded National Apprenticeship Certificate (NAC) by NCVT having worldwide recognition.

Broadly candidates need to demonstrate that they are able to:

- Read & interpret technical parameters/document, plan and organize work processes, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional skill, knowledge, core skills & employability skills while performing jobs and solve problem during execution.
- Check the job/assembly as per drawing for functioning, identify and rectify errors in job/assembly.
- Document the technical parameters related to the task undertaken.

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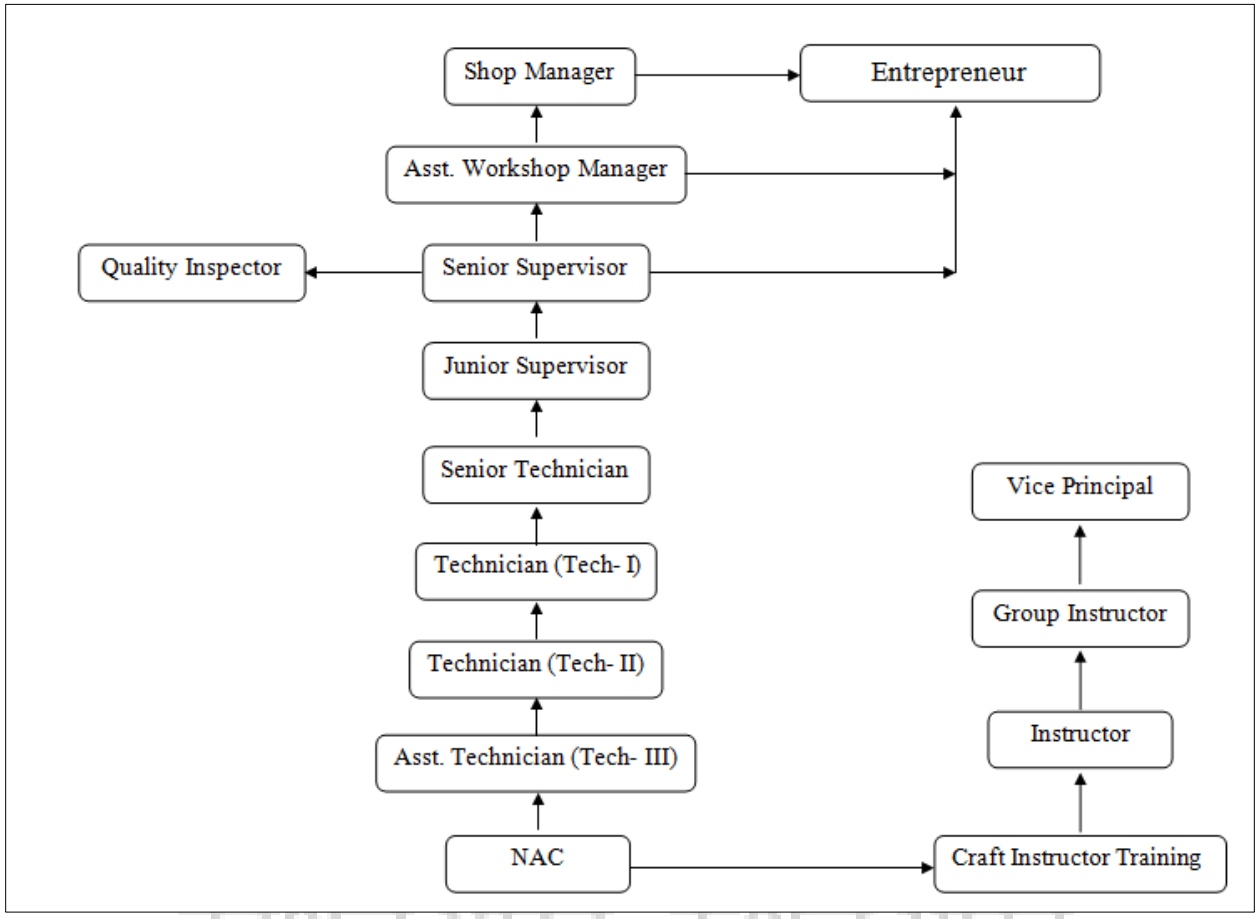
2.2 CAREER PROGRESSION PATHWAYS:

- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.
- Indicative pathways for vertical mobility.



2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two years (*Basic Training and On-Job Training*): -

Total 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**

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A. Basic Training

For 02 yrs. course (Engg.):- (**Total 06 months:** 03 months in 1st yr. + 03 months in 2nd yr.)
For 01 yr. course (Engg.) :- (**Total 03 months:** 03 months in 1st yr.)

Sl. No.	Course Element	Total Notional Training Hours	
		For 02 Yrs. course	**For 01 Yr. course**
1.	Professional Skill (Trade Practical)	550	275
2.	Professional Knowledge (Trade Theory)	240	120
3.	Workshop Calculation & Science	40	20
4.	Engineering Drawing	60	30
5.	Employability Skills	110	55
	Total (Including internal assessment)	**1000**	**500**

B. On-Job Training:-

For 02 yrs. Course (Engg.) :-(**Total 18 months:** 09 months in 1st yr. + 09 months in 2nd yr.)

Notional Training Hours for On-Job Training: 3120 Hrs.

For 01 yr. course (Engg.) :-(**Total 12 months**)

Notional Training Hours for On-Job Training: 2080 Hrs.

C. Total training hours:-

Duration	Basic Training	On-Job Training	Total
For 02 yrs. course (Engg.)	1000 hrs.	3120 hrs.	4120 hrs.
For 01 yr. course (Engg.)	500 hrs.	2080 hrs.	2580 hrs.

2.4 ASSESSMENT & CERTIFICATION:

The trainee will be tested for his skill, knowledge and attitude during the period of course and at the end of the training programme as notified by Govt of India from time to time. The Employability skills will be tested in first two semesters only.

a) The **Internal assessment** during the period of training will be done by **Formative assessment method** by testing for assessment criteria listed against learning outcomes. The training institute have to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the template (Annexure – II).

b) The final assessment will be in the form of summative assessment method. The All India Trade Test for awarding NAC will be conducted by NCVT on completion of course as per guideline of Govt of India. The pattern and marking structure is being notified by govt of India from time to time. **The learning outcome and assessment criteria will be basis for setting question papers for final assessment. The examiner during final examination will also check** individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

The minimum pass percent for Practical is 60% & minimum pass percent for Theory subjects 40%. The candidate pass in each subject conducted under all India trade test.

2.4.2 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 should be given while assessing for team work, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitivity to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work

Evidences of internal assessments are to be preserved until forthcoming semester examination for audit and verification by examination body. The following marking pattern to be adopted while assessing:

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Performance Level	Evidence
(a) Weightage in the range of 60 -75% to be allotted during assessment	
For performance in 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.	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment • Below 70% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • 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	
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.	• Good skill levels in the use of hand tools, machine tools and workshop equipment • 70-80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • 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	
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.	• High skill levels in the use of hand tools, machine tools and workshop equipment • Above 80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Brief description of Job roles:

Install different measuring instruments like Voltmeter, Ampere Meeter, Power/Power factor/Energy meter, etc. Mark according to a given sketch, file a given job with an accuracy of ± 0.25 mm, drill and Tap a hole. Carryout simple chipping, filing, grinding, hack sawing, fitting & carpentry jobs. Carry out simple domestic wiring circuits and provide earthing. Install Fluorescent, Sodium Vapour Lamp, Neon Sign, Decorative Lights, CFL Lamps, LED Lamps etc. Carryout wiring for lighting and power as per I.E. rules and test in residential buildings and Workshops. Connect, run, test and rectify the faults of electrical Wiring Installations. Carryout commercial lighting for decoration etc. Test the wiring installation, locate fault and rectify them. Wire up commercial & industrial installations as per I.E. rules. Carryout UPS / INVERTER wiring. Carryout Video /audio cabling. Do computer / LAN cabling & networking. Troubleshooting and maintenance of commercial / industrial wiring. Plan & estimate for commercial / industrial installations. Test, connect and run small DG set and repair faults in any wiring system. Wire up power and control wiring of motors up to 5 HP as per standards. Operate and maintain 3 phase supply systems. Operate and maintain 3 phase supply changeover switch. Wire up power and control wiring of submersible AC motors. Install and connect Supply Transformers and carry out basic maintenance Charge, discharge & maintain battery. Wire up-control panel board with all indicating, controlling and protection devices.

Reference NCO:

i) **NCO 2015:** 7411.0301

4. NSQF LEVEL COMPLIANCE

NSQF level for Wireman 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 Wireman trade under ATS mostly matches with the Level descriptor at Level- 5.

The NSQF level-5 descriptor 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 problem 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.

5. GENERAL INFORMATION

Name of the Trade	WIREMAN
NCO - 2015	7411.0301
NSQF Level	Level – 5
Duration of Apprenticeship Training (Basic Training + On-Job Training)	Two years (02 Blocks each of one year duration).
Duration of Basic Training	a) Block –I : 3 months b) Block – II : 3 months **Total duration of Basic Training: 6 months**
Duration of On-Job Training	a) Block–I: 9 months b) Block–II : 9 months **Total duration of Practical Training: 18 months**
Entry Qualification	8th Class under 10+2 System of Education
Selection of Apprenticeship	The apprentices will be selected as per Apprenticeship Act amended time to time.
Instructors Qualification for Basic Training	As per ITI instructors qualifications as amended time to time for the specific trade.
Infrastructure for Basic Training	As per related trade of ITI
Examination	The internal examination/ assessment will be held on completion of each block. Final examination for all subjects will be held at the end of course and same will be conducted by NCVT.
Rebate to Ex-ITI Trainees	01 year
CTS trades eligible for Wireman Apprenticeship	1. Wireman 2. Electrician

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.*
- *For imparting Basic Training the industry to tie-up with ITIs having such specific trade and affiliated to NCVT.*

6. LEARNING OUTCOME

6.1 GENERIC LEARNING OUTCOME

The following are minimum broad Common Occupational Skills/Generic Learning Outcome after completion of the Wireman course of 02 years duration under ATS.

Block I & II:-

1. Recognize & comply safe working practices, environment regulation and housekeeping.

2. Understand and explain different mathematical calculation & science in the field of study. *[Different mathematical calculation & science – Conversion of Units, Percentage, & Mensuration-Area & Volume of different surfaces and solids, and Properties of materials, Ferrous & non-ferrous metals, Mass, weight, Density, Specific Gravity etc.]*

3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical figures like Triangles, Square, Rectangle, Rhombus, Parallelogram, Circle etc., Lettering & Numbering, Freehand sketching of Hand tools used for Wireman/Electrician/Lineman trade & wire joints, Signs & symbols for Electrical components used in electrical circuits and AC/DC systems,Electrical wiring diagram of different lamps, Schematic diagram of plate and pipe earthing, insulators used in over head line, Layout diagram of a substation, Single line Diagram of Electrical substation feeders.]*

4. Select and ascertain measuring instrument and measure dimension of components and record data.

5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.

6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.

7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.

8. Plan and organize the work related to the occupation.

6.2 SPECIFIC LEARNING OUTCOME

Block – I

1. Practice and understand precautions to be followed while working in electrical jobs.

2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Removing of insulation from assorted wires and cables. Check& select the gauges of wire. Practice wire joints & Soldering, crimping thimbles of various size.
4. Practice chipping, filing, grinding, hack sawing, fitting & carpentry jobs. Drill and tap hole. Cutting and riveting practice. Making single and double rectangular boards.
5. Connecting & measuring voltage, current, resistance power & energy in DC &AC(1ph & 3ph) circuits.
6. Practice Wiring: Repair / replace switches, sockets, light points. Providing new points in PVC casing capping & PVC conduits. Testing and replacement of various types of fuses.
7. Replacing the bulbs, tubes, trouble shooting, repair & maintenance. Wiring in PVC casing & capping.
8. Testing of different wiring installations by Meggar. Practice in wiring/repairing of domestic appliances. Attending to minor faults in machines, their controls in appliances.
9. Charging & maintenance of Batteries. Checking specific gravity, voltage etc.
10. Installing pipe & plate earth stations. Measuring earth resistance, improve the same & maintaining earth stations.
11. Identification of insulating materials. Identification of size of cable & provides power supply to machines & equipment, providing earth connections.
12. Providing power supply to motors, equipment & appliances. Crimping the lugs,providing cable glands & connections.
13. Practice connections & testing in manual/automatic power supply changeover switches of single/three phase supply.
14. Trouble shooting rectifiers, filters, power supplies, voltage stabilizers, controlled rectifiers. Identifying faulty thyristors in circuits and replacing them.
15. Practice and maintaining staircase wiring. Practice of multi-storeyed building wiringlayout. Providing light/socket points, for various equipments and appliances.
16. Practicein servicing fans & regulators.
17. Assisting in operation & maintenance of Substation Transformer, circuit breakers,batteries etc. Insulation testing of motors.

Block – II

18. Practice of cutting and threading of conduit/PVC and fitting conduit frames using coupling, bends, tees and junction boxes to correct dimensions. Practiceconduit wiring.
19. Measuring of voltage and current in single/three phase AC circuits, star and delta connections.
20. Installation and connection of different types power and energy meters.
21. Measuring of AC power and energy in single/three phase circuits.

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22. Installation and connection of different types of motor starters; DOL & Star/Delta.
23. Identification and testing of AC single/three phase induction motor terminals.
24. Connecting and running induction motor with different types of starters.
25. Preparing layout of motor control panel. Connection and Testing of multi-rangeswitches and rotary switches. Control panel: Assembling the control elements & accessories, control & power wiring, testing, bunching. Troubleshooting problems in control & repair them.
26. Domestic appliances: Connecting, testing, repairing & maintaining.
27. Connecting power and control wiring of Diesel Generating set, operating switch gears, trouble shooting & basic maintenance.
28. Testing of underground cables, trouble shooting, Locating faults, open circuit, short circuit & leakage in cables, performing cable joints
29. Identification of different types of cable jointing kits. Practice of Underground cable joining LT.
30. Connecting, testing and running the underground submersible pump set.
31. Installation and connection of Lightning and surge arrester in multi-storeyBuilding and substation.
32. Operation&maintenance of substation transformer & equipment like circuitbreakers,batteries etc.
33. Operation& maintenance of the power distribution system Factorimprovementpanel.
34. Operation& maintenance of Air compressor, AC plant, cranes, lifts, hoists, etc.
35. Checking power input & output in AC/DC drives. Replacing of faulty components.
36. Operation & maintenance of Solar cells and Non conventional energy generationsystem.

NOTE: Learning outcomes are reflection of total competencies of a trainee and assessment will be carried out as per assessment criteria.

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING OUTCOME	
LEARNING OUTCOMES	**ASSESSMENT CRITERIA**
1. Recognize & comply safe working practices, environment regulation and housekeeping.	1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements.
	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/unsalvageable 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 avoidance of same.
	1.13 Take opportunities to use energy and materials in an environmentally friendly manner
	1.14 Avoid waste and dispose waste as per procedure
	1.15 Recognize different components of 5S and apply the same in the working environment.

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2. Understand; explain different mathematical calculation & science in the field of studyapply in day to day work.*[Different mathematical calculation & science - Conversion of Units, Percentage, & Mensuration-Area & Volume of different surfaces and solids, and Properties of materials, Ferrous & non-ferrous metals, Mass, weight, Density, Specific Gravity etc.]*	2.1 Explain concept of basic science related to the field such as Material science - Properties of materials, Ferrous & non-ferrous metals, etc.
	2.2 Mass, weight, Density, Specific Gravity etc.
	2.3 Use scale/ tapes to measure as per specification.
	2.4 Calculate area / volume of the materials.
	2.5 Prepare list of appropriate materials by interpreting detail drawings and determine quantities of such materials.
	2.6 Ensure dimensional accuracy of assembly by using different instruments/gauges.
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing- Geometrical figures like Triangles, Square, Rectangle, Rhombus, Parallelogram, Circle etc., Lettering & Numbering, Freehand sketching of Hand tools used for Wireman / Electrician / Lineman trade & wire joints, Signs & symbols for Electrical components used in electrical circuits and AC/DC systems, Electrical wiring diagram of different lamps, Schematic diagram of plate and pipe earthing, insulators*	3.1 Read & interpret the information on drawings and apply in executing practical work.
	3.2 Read & analyse the specification to ascertain the material requirement, tools, and machining /assembly /maintenance parameters.
	3.3 Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
	3.4 Read & interpret the signs and symbols for electrical components and AC/DC systems.
	3.5 Encounter drawings with electrical circuit diagrams and layout diagrams.

used in over head line, Layout diagram of a substation, Single line Diagram of Electrical substation feeders.]	
4. Select and ascertain measuring instrument and measure dimension of components and record data.	4.1 Select appropriate measuring instruments such as Ammeter, voltmeter, meggar, earth tester etc. (as per tool list).
	4.2 Ascertain the functionality & correctness of the instrument.
	4.3 Measure dimension of the components & record data to analyse the with given drawing/measurement.
5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	5.1 Explain the concept of productivity and quality tools and apply during execution of job.
	5.2 Understand the basic concept of labour welfare legislation and adhere to responsibilities and remain sensitive towards such laws.
	5.3 Knows benefits guaranteed under various acts.
6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	6.1 Explain the concept of energy conservation, global warming, pollution and utilize the available recourses optimally & remain sensitive to avoid environment pollution.
	6.2 Dispose waste following standard procedure.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	7.1 Explain personnel finance and entrepreneurship.
	7.2 Explain 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.
	7.3 Prepare Project report to become an entrepreneur for submission to financial institutions.

8. Plan and organize the work related to the occupation.	8.1 Use documents, drawings and recognize hazards in the work site.
	8.2 Plan workplace/ assembly location with due consideration to operational stipulation
	8.3 Communicate effectively with others and plan project tasks
	8.4 Assign roles and responsibilities of the co-trainees for execution of the task effectively and monitor the same.

SPECIFIC OUTCOME

Block-I & II

*Assessment Criteria i.e. the standard of performance, for each specific learning outcome mentioned under **block – I & block – II** (section: 10) must ensure that the trainee achieves well developed skill with clear choice of procedure in familiar context. Assessment criteria should broadly cover the aspect of **Planning** (Identify, ascertain, estimate etc.); **Execution** (perform, illustration, demonstration etc. by applying 1) a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information 2) Knowledge of facts, principles, processes, and general concepts, in a field of work or study 3)Desired Mathematical Skills and some skill of collecting and organizing information, communication) and **Checking/ Testing** to ensure functionality during the assessment of each outcome. The assessments parameters must also ascertain that the candidate is responsible for own work and learning and some responsibility for other's work and learning.*

8. SYLLABUS

BASIC TRAINING (Block – I)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	1. Implementation of various safety measures in the shop floor. Visit to different sections of the Institute. 2. Demonstration of elementary first aid. Artificial Respiration. 3. Practice on use of fire extinguishers. 4. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Identification of safety signs for Danger, Warning and Caution. 5. Safe operational procedure for breakdown maintenance.	**Occupational Safety & Health-** Basic safety introduction, Personal protection:- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Use of Fire extinguishers. Visit & observation of sections. Various safety measures involved in the Industry. Elementary first Aid. Concept of Standard **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 e.g.; power failure, fire, and system failure. **Importance of housekeeping & good shop floor practices.** Introduction to 5S concept & its application.
2	6. 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	7. Demonstration of trade handtools. 8. Use, care & maintenance of various hand tools. 9. Practice on installation and overhauling common electrical accessories as per simple Electrical circuit / Layout. 10. 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.
4	11. Skinning the cables 12. Demonstration & Practice on bare conductors joints--such as rat tail, Britannia, straight, Tee, Western union Joints 13. Practice in soldering & brazing 14. Practice on crimping thimbles, Lugs. 15. 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
5-6	16. Verification of Ohm's Law. 17. Measuring unknown resistance 18. Verification of laws of series and parallel circuits. 19. 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. 20. Identification of parts of battery. Practice on Battery Charging, Preparation of battery charging, 21. Testing of cells, Installation of batteries, Charging of batteries by different methods. 22. Routine care & maintenance of Batteries	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. **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	23. **Practice on Earthing**- different methods	**Earthing**- Principle of different methods of

	of earthing. 24. Measurement of Earth resistance by earth tester. Testing of Earth Leakage by ELCB and relay.	earthing& selection. i.e. Pipe, Plate, etc Importance of Earthing. Improving of earth resistance Earth Leakage circuit breaker (ELCB).
8	25. **Diodes**-symbol - Tests - 26. Construct & Test half wave rectifier ckt. 27. Full wave rectifier ckt. 28. Bridge rectifier ckt. 29. Measurement & calculation of electrical parameters using C.R.O. 30. Different wave shapes of rectifiers and their values using C.R.O. 31. Identification of terminals, construction &Testing of transistor. 32. 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	33. Practice in casing, Capping and Conduit wiring. 34. Testing of wiring installation by meggar. 35. -Fixing of calling bells/buzzers. 36. Identification & demonstration on conduits and accessories & their uses, cutting , threading & laying 37. Installation, Testing, 38. Maintenance and Repairing of wiring. 39. 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	40. Trace the magnetic field. 41. Prepare Electromagnet. 42. Use of magnetic compass. 43. Assembly / winding of a simple electro magnet Identification of different types of Capacitors. Charging and discharging of capacitor, Testing of Capacitors using	**Magnetism -** classification of magnets, methods of magnetising, magnetic materials. Properties, care and maintenance, methods of magnetising magnetic materials. Para and Diamagnetism and Ferro magnetic materials. Principle of electro-magnetism, Maxwell's corkscrew rule, Fleming's left and

	DC voltage and lamp.	right hand rules, Magnetic field of current carrying conductors, loop and solenoid. MMF, Flux density, reluctance. B.H. curve, Hysteresis, Eddy current. Principle of electro-magnetic Induction, Faraday's Law, Lenz's Law. Electrostatics: Capacitor- Different types, functions and uses.
11-12	44. Determine the characteristics of R, XL and XC in A.C. Circuits both in series and parallel. Experiment on poly phase circuits. Current, voltage, power and power factor measurement in single & poly- phase circuits. Measurement of energy in single and poly-phase circuits. Use of phase sequence meter. 45. 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.	**Alternating Current -**Comparison and Advantages D.C and A.C. Related terms frequency Instantaneous value, R.M.S. value Average value, Peak factor, form factor. Generation of sine wave, phase and phase difference. Inductive and Capacitive reactance Impedance (Z), power factor ; Active and Reactive power, Simple problems on RLC A.C. circuits, Single phase and three-phase system etc. Problems on A.C. circuits. 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. 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	46. Identify & select different type of Instruments. 47. Use of **-P**MMC , MI meter, Multi-meter(Digital/Analog) , Wattmeter, P F meter, Energy meter, Frequency meter, 48. Phase sequence meter, Digital Instruments, etc 49. 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	

NOTE: -

More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.

BASIC TRAINING (Block – II)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	50. Installation of - Mercury & Sodium vapour lamps (H.P. & L.P.) Halogen Lamps Single FL tube and twin FL tube. Practice on decoration lighting.	**Illumination**, Laws of Illuminations, terminology used, Illumination factors, intensity of light. Types of illumination.
2	51. Principle of layout of lighting installation and estimate it cost. 52. Practice on photo cells.	Type of lamps -Neon sign Halogen, Mercury vapour, sodium vapour, Fluorescent tube, CFL, LED, Solar lamp & photo cell applications, Decoration lighting, Drum Switches
3	53. Repair & Test of Calling Bell, Buzzer, Alarms, Electric Iron, Heater, Light.	**Domestic Appliances:** Working principles and circuits of common domestic equipment and appliances. – Calling Bell, Buzzer, Alarms, Electric Iron, Heater, Lamps etc.
4	54. Maintenance and repair of domestic equipment – Electric Kettle, Heater / Immersion Heater, Hot Plate, Oven, Geyser, Cooking range, Mixer, Washing machine,, Motor Pump set, etc.	Working principles and circuits of Electric Kettle, Immersion Heater, Hot Plate, Oven, Geyser, Cooking range, Mixer, Washing machine, Motor Pump set, etc. Concept of Neutral and Earth.
5	55. Identification of parts and terminals of AC motors. 56. Connection, starting, running of AC motors using Starters. Load test & efficiency calculation.	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.
6-7	57. Rotor resistance starter, etc 58. Speed control of Induction motors by various methods. 59. Practical application of A.C. motors. 60. Connection of single phase motor, identification, testing, running and reversing.	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).

	61. Maintain service and trouble shoot the single phase motor. 62. Install a single phase motor. 63. Overhauling of AC motors.	FHP motors, Repulsion motor, stepper motor, Application of single phase motor.
8	64. Identification of parts and terminals of Alternator. 65. Connection, starting, running of Alternator.	Alternator Explanation of alternator, working principle, voltage build-up, loading, Regulation.
9	66. Practice on alternators, voltage Building, Parallel operation & load sharing. 67. Practice on installation, running and maintenance of Alternators.	Types of prime mover, phase sequence, Parallel operation & load sharing. Specification of alternators.
10-12	**Machine control cabinet /Control Panel Layout, Assembly & Wiring**: 68. Practice Layout drawing of control cabinet , panel, power & control circuits 69. Preparing control cabinet / panel assembly & wiring for ii) Local & Remote control of Induction motor(DOL) iii) Forward & Reverse operation of Induction motor iv) Automatic Star Delta Starter 70. Trouble shoot the control panel wiring. 71. Schematic of a overhead and domestic service line. 72. Erect an overhead service line pole for single phase 240v distribution system. 73. Test the underground cables for open, short circuit & ground fault and also check insulation resistance.	**Machine control cabinet /Control Panel Layout, Assembly & Wiring**: Layout of Control cabinet & control panel Study & Understand Layout drawing of control 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. **POWER GENERATION:** Various ways of electrical power generation. Thermal, Hydro electric, Nuclear, Non-Conventional.
13	74. Prepare layout plan and single line diagram of transmission /Distribution system. 75. Trouble shooting and servicing of LT circuit breaker. 76. Connect feeder cable/ service line to the bus bar.	**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

	77. Thermal classification of insulating materials. 78. Types of Enclosures as IP standards.	**Under Ground Cable:**Construction of cables. Types of cable faults and their location. **DISTRIBUTION OF POWER:**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	

NOTE: -

- *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

Block – I		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration: - 30 hrs.)**
1.	Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	**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.
2.	Fractions, Decimal fraction, L.C.M., H.C.F., Multiplication and Division of Fractions and Decimals	**Lines :** - Definition, types and applications in Drawing as per BIS SP:46-2003 - Classification of lines (Hidden, centre, construction, Extension, Dimension, Section) - Drawing lines of given length (Straight, curved) - Drawing of parallel lines, perpendicular line - Methods of Division of line segment
3.	**Percentage:** Introduction, Simple calculation.	**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
4.	**Material Science:** properties -Physical & Mechanical, Types –Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals.	**Lettering and Numbering** as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case.
5.	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.	Free Hand sketch of hand tools, measuring tools used in Electrician /wireman/ Lineman trade. Free hand sketch of wire joints.

Block – II		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration: - 30 hrs.)**
1.	**Mass ,Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals	**Signs & Symbols of AC/DC System** Symbols used in electrical circuits. Electrical components.
2.	Square Root: Square and square root, method of finding out square roots. Simple problem using calculation.	Electrical wiring diagram of different lamps, room (3/4 point), stair case. Schematic diagram of plate and pipe earthing
3.	**Mensuration :** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Surface area of solids – cube, cuboid, cylinder and Sphere.	Types of insulator used in over head line. (Half sectional views)
4.	Volume of solids – cube, cuboid, cylinder and Spheremeasurement of angles.	Layout diagram of a substation. Single line Diagram of Electrical substation feeders.

9.2 EMPLOYABILITY SKILLS

(DURATION: - 110 HRS.)

Block – I (Duration – 55 hrs.)	
1. English Literacy	Duration: 20 Hrs. Marks: 09
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
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.
2. I.T. Literacy	Duration: 20 Hrs. Marks : 09
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
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.
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.
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.
3. Communication Skills	Duration: 15 Hrs. Marks : 07
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.
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.
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.
Facing Interviews	Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview.
Behavioral Skills	Problem Solving Confidence Building Attitude
Block – II **Duration – 55 hrs.**	
4. Entrepreneurship Skills	Duration: 15 Hrs. Marks : 06
Concept of Entrepreneurship	Entrepreneur - 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.
Project Preparation & Marketing analysis	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
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.

Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.
5. Productivity	Duration: 10 Hrs. Marks : 05
Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation - How improves or slows down.
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.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
6. Occupational Safety, Health and Environment Education	Duration: 15 Hrs. Marks : 06
Safety & Health	Introduction to Occupational Safety and Health importance of safety and health at workplace.
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.
Accident & safety	Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.
First Aid	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person.
Basic Provisions	Idea of basic provision legislation of India. Safety, health, welfare under legislative of India.
Ecosystem	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
Energy Conservation	Conservation of Energy, re-use and recycle.
Global warming	Global warming, climate change and Ozone layer depletion.
Ground Water	Hydrological cycle, ground and surface water, Conservation and Harvesting of water.
Environment	Right attitude towards environment, Maintenance of in -house environment.
7. Labour Welfare Legislation	Duration: 05 Hrs. Marks : 03
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.	
8. Quality Tools		Duration: 10 Hrs. Marks : 05
Quality Consciousness	Meaning of quality, Quality characteristic.	
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.	
Quality Management System	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.	
House Keeping	Purpose of House-keeping, Practice of good Housekeeping.	
Quality Tools	Basic quality tools with a few examples.	

10. DETAILS OF COMPETENCIES (ON-JOB TRAINING)

The **competencies/ specific outcomes** on completion of On-Job Training are detailed below: -

Block – I

1. Practice and understand precautions to be followed while working in electrical jobs.
2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Removing of insulation from assorted wires and cables. Check & select the gauges of wire. Practice wire joints & Soldering, crimping thimbles of various size.
4. Practice chipping, filing, grinding, hack sawing, fitting & carpentry jobs. Drill and tap hole. Cutting and riveting practice. Making single and double rectangular boards.
5. Connecting & measuring voltage, current, resistance power & energy in DC &AC(1ph & 3ph) circuits.
6. Practice Wiring : Repair / replace switches, sockets, light points. Providing new points in PVC casing capping & PVC conduits. Testing and replacement of various types of fuses.
7. Replacing the bulbs, tubes, trouble shooting, repair & maintenance. Wiring in PVC casing & capping.
8. Testing of different wiring installations by Meggar. Practice in wiring/repairing of domestic appliances. Attending to minor faults in machines, their controls in appliances.
9. Charging & maintenance of Batteries. Checking specific gravity, voltage etc.
10. Installing pipe & plate earth stations. Measuring earth resistance, improve the same
11. & maintaining earth stations.
12. Identification of insulating materials. Identification of size of cable & provides power supply to machines & equipment, providing earth connections.
13. Providing power supply to motors, equipment & appliances. Crimping the lugs, providing cable glands & connections.
14. Practice connections & testing in manual/automatic power supply changeover switches of single/three phase supply.
15. Trouble shooting rectifiers, filters, power supplies, voltage stabilizers, controlled rectifiers. Identifying faulty thyristors in circuits and replacing them.
16. Practice and maintaining staircase wiring. Practice of multi-storeyed building wiring layout. Providing light/socket points, for various equipments and appliances.
17. Practice in servicing fans & regulators.
18. Assisting in operation & maintenance of Substation Transformer, circuit breakers, batteries etc. Insulation testing of motors.

Block – II

18. Practice of cutting and threading of conduit/PVC and fitting conduit frames using coupling, bends, tees and junction boxes to correct dimensions. Practice conduit wiring.
19. Measuring of voltage and current in single/three phase AC circuits, star and delta connections.
20. Installation and connection of different types power and energy meters.
21. Measuring of AC power and energy in single/three phase circuits.
22. Installation and connection of different types of motor starters; DOL & Star/Delta.
23. Identification and testing of AC single/three phase induction motor terminals.
24. Connecting and running induction motor with different types of starters.
25. Preparing layout of motor control panel. Connection and Testing of multi-range switches and rotary switches. Control panel: Assembling the control elements & accessories, control & power wiring, testing, bunching. Troubleshooting problems in control & repair them.
26. Domestic appliances: Connecting, testing, repairing & maintaining.
27. Connecting power and control wiring of Diesel Generating set, operating switch gears, trouble shooting & basic maintenance.
28. Testing of underground cables, trouble shooting, Locating faults, open circuit, short circuit & leakage in cables, performing cable joints
29. Identification of different types of cable jointing kits. Practice of Underground cable joining LT.
30. Connecting, testing and running the underground submersible pump set.
31. Installation and connection of Lightning and surge arrester in multistory Building and substation.
32. Operation & maintenance of substation transformer & equipment like circuit breakers, batteries etc.
33. Operation & maintenance of the power distribution system Factor improvement panel.
34. Operation & maintenance of Air compressor, AC plant, cranes, lifts, hoists, etc.
35. Checking power input & output in AC/DC drives. Replacing of faulty components.
36. Operation & maintenance of Solar cells and Non conventional energy generation system.
37. Accuracy testing of different machines such as electrical parameters.

(The practical for this component may demonstrated by video)

Note:

1. Industry must ensure that above mentioned competencies are achieved by the trainees during their on job training.
2. In addition to above competencies/ outcomes industry may impart additional training relevant to the specific industry.

ANNEXURE – I

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

WIREMAN			
LIST OF TOOLS AND EQUIPMENT for Basic Training (For 20 Apprentices)			
A. TRAINEES TOOL KIT			
Sl. no.	**Name of the Tool &Equipments**	**Specification**	**Quantity**
1.	Steel rule	300mm	21 Nos
2.	Screw Driver	200mm	21 Nos
3.	Screw Driver	100mm	21 Nos
4.	Terminal screw Driver	75 mm (Connector)	21 Nos
5.	Knife Electrician D.B.		21 Nos
6.	Hammer Ball peen.	0.25 Kg	21 Nos
7.	Combination pliers insulated	200 mm	21 Nos
8.	Neon tester pencil bit type	500 volt	21 Nos
9.	Try square	200 mm	21 Nos
10.	Wire stripper	1-6 sq.mm	21 Nos
11.	Wire crimping tool	1-6 sq.mm	21 Nos
12.	Spanner set DE	Set of 6 from 6x7 to 16x7	21 Nos
13.	Screw driver set	(set of 5) 100-300 mm	21 Nos
14.	File half round 2nd cut	250 mm	21 Nos
15.	File round 2nd cut	150 mm	21 Nos
16.	Soldering iron	35W/230 V	21 Nos
17.	Neon tester	230 v	21 Nos
18.	Digital Multimeter		21 Nos
B : INSTRUMENTS & GENERAL SHOP OUTFIT			
19.	C- clamp	100mm, 150mm, 200mm	2 Nos. each
20.	Adjustable spanner	150mm, 300mm	2 Nos. each
21.	Blow lamp	0.5 ltr	1
22.	Melting pot		1

23.	Ladel		1
24.	Chisel cold firmer	25mm x 200 mm	2
25.	Chisel	25mm & 6 mm	2 Nos. each
26.	Hand drill machine		2
27.	Portable electric drill machine	12 mm capacity	1
28.	Pillar Electric Drill machine	12 mm capacity	1
29.	Allen key set metric		2 sets
30.	Oil can	0.12 ltr	1
31.	Grease gun		1
32.	Out side Micrometer		2
33.	Motorised Bench grinder		1
34.	Rawl plug tool & bit		2 sets
35.	Pulley puller		2
36.	Bearing puller		2
37.	Pipe vice		2
38.	Thermo meter	0-100^0 C	1
39.	Scissors blade	150mm	2
40.	Crimping tool		2 sets
41.	Crimping tool for telephone/LAN cable		2
42.	Wire stripper	20 Cm	2
43.	Chissel cold flat	12mm	2
44.	Mallet hard wood	0.5Kg	2
45.	Mallet hard wood	1 Kg	2
46.	Hammer extractor type	0.4 Kg	2
47.	Hacksaw frame	200mm & 300mm adjustable	2 each
48.	Try square	150 mm blade	2
49.	Outside & inside divider caliper		2 each
50.	Pliers flat nose	150mm	4
51.	Pliers round nose	100 mm	4

52.	Tweezers	100mm	4
53.	Snip straight & bent	150mm	2 each
54.	Double ended spanner set metric		2 sets
55.	HSS drill bit set	(2-12mm)	4 sets
56.	Plane, smoothing cutters	50mm	2
57.	Gauge, wire imperial		2
58.	File, flat 2nd cut	200mm	8
59.	File half round 2nd cut	200 mm	4
60.	File round 2nd cut	200mm	4
61.	File flat rough	150mm	4
62.	File flat bastard	250mm	4
63.	File flat smooth	250mm	4
64.	File Rasp half round bastard	200 mm	4
65.	Soldering iron	25 W, 65 W	2 each
66.	Copper bit soldering iron	0.25 kg	2
67.	Desoldering gun		4
68.	Hand vice	50mm jaw	4
69.	Bench vice	100mm jaw	6
70.	Pipe cutter to cut pipes	upto 5cm dia	2
71.	Stock & die set	for 20mm to 50 mm GI pipe	1
72.	Stock & dies conduit		1
73.	Ohm meter; series & shunt type		2 each
74.	Multimeter (analog)	0-1000 M ohm, 2.5 to 500V	2
75.	Digital Multimeter		4
76.	AC voltmeter MI	0-500V	2
77.	Milli Voltmeter centre zero	100-0-100 mV	1
78.	DC milli Ammeter	0-500 mA	1
79.	Ammeter MC	0-5A, 0-25A	1 each
80.	AC Ammeter MI	0-5A, 0-25A	1 each

81.	KiloWatt meter	0-1-3 KW	1
82.	AC Energy meter, single phase	5A, 3 ph 15A	1 each
83.	Power factor meter, single phase		1
84.	Frequency meter		1
85.	Flux meter		1
86.	DC power supply	0-30V, 2 Amp	2
87.	Rheostats	0-1 ohm 5A, 0-10 ohm 5A, 0-25 ohm 1A, 0-300 ohm 1A	1 each
88.	Digital Tachometer Non contact type	0-6000 RPM	1
89.	Growler		1
90.	Tong tester / clamp meter	0-100 A AC	1
91.	Meggar	500V	1
92.	Rubber gloves	1000V	2 pairs
93.	Oscilloscope dual trace	30 MHz	1
94.	Function Generator		1
95.	Hygrometer		1
96.	Lux meter		1
97.	Hydro meter		1
98.	Wood Saw	250 mm	1
99.	Tenon Saw		1
100.	Guarded Test Lamp		1
101.	Wiring board on stand	3 meter x1 meter with 0.5 meter projection on the top	2
102.	LCD projector		1
103.	All types C.F.L. lamp sets	5W, 15W, 25W	2 each
104.	Safety belt with provision for keeping tools		5
105.	Conduit pipe cutting and threading machines adjustable		1
106.	Conduit pipe bending machine		1
C : GENERAL MACHINERY INSTALLATIONS			
107.	Capacitor motor	1/2 H.P. single phase 250 V	1

108.	Shaded pole motor	1/4 H.P. single phase 250 V	1
109.	Universal motor	1/2 H.P, AC/DC 250 V	1
110.	M.G. Set consisting of squirrel cage induction motor 5 H.P..	440 V,50hz with directly coupled compound generator 3K.W. 250 V with built in panel board consisting of suitable power, control and indicating elements	1set
111.	Squirrel cage induction	motor 3 H.P. 440 V with D.O.L. starter	1
112.	Squirrel cage induction	motor 5 H.P. 440 V with star delta starter	1
113.	Manual star Delta starter		1
114.	Semi-automatic star Delta starter		1
115.	Automatic star Delta starter		1
116.	Automatic Reverse Forward starter		1
117.	Single phasing preventer	415 V	3
118.	D.O.L starter		1
119.	Soft starter	1ph	1
120.	Lead Acid battery	12V, 75Ah	2
121.	Battery Charger	15V,Current controlled	1
122.	Solar street light lamp set	12v , 18 / 24 watts	1 each
123.	Hydraulic crimping tool for UG	20 sq mm to 250sq mm	1
124.	Transformer single phase	1 K.V.A. 250/110 v	2
125.	Transformer Three phase (oil cooled)	5 K.V.A. 440/220 v	1
126.	Transformer oil testing kit Automatic	60 kv	1
127.	Autotransformer Single phase	0-300V 1kVA	2
128.	Autotransformer Three phase	0-500V 1kVA	1
129.	Current transformer	10/1, 20/1,30/1,50/5, 100/5 and 300/5A	1 each
130.	Potential transformer	220/110, 300/110, 440/110, 600/110	1 each
131.	Miniature circuit breaker(MCB)	220V / 6 Amps	3

132.	Earth leakage circuit breaker (ELCB)	220V/25mA	2
133.	Moulded Case Circuit Breaker (MCCB)	440V/25A	1

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: WIREMAN

LIST OF TOOLS& EQUIPMENTS FOR -20APPRENTICES

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

A : TRAINEES TOOL KIT:-			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1.	Draughtsman drawing instrument box		21
2.	Set square celluloid 45^o	250 X 1.5 mm	21
3.	Set square celluloid 30^o-60^o	250 X 1.5 mm	21
4.	Mini drafter		21
5.	Drawing board IS: 1444	700mm x500 mm	21
B : Furniture Required			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1.	Models : Solid & cut section		as required
2.	Drawing Table for trainees		as required
3.	Stool for trainees		as required
4.	Cupboard (big)		01
5.	White Board	size: 8ft. x 4ft.	01
6.	Trainer's Table		01
7.	Trainer's Chair		01

TOOLS & EQUIPMENTS FOR EMPLOYABILITY SKILLS		
Sl. No.	**Name of the Equipment**	**Quantity**
1.	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 Nos.
2.	UPS - 500VA	10 Nos.
3.	Scanner cum Printer	1 No.
4.	Computer Tables	10 Nos.
5.	Computer Chairs	20 Nos.
6.	LCD Projector	1 No.
7.	White Board 1200mm x 900mm	1 No.
Note: - Above Tools & Equipments not required, if Computer LAB is available in the institute.		

ANNEXURE-II

FORMAT FOR INTERNAL ASSESSMENT

Name & Address of the Assessor :			**Year of Enrollment :**
Name & Address of ITI (Govt./Pvt.) :			**Date of Assessment :**
Name & Address of the Industry :			**Assessment location: Industry / ITI**
Trade Name :	**Semester:**		**Duration of the Trade/course:**
Learning Outcome:			

Sl. No	**Candidate Name**	**Father's/Mother's Name**	Safety consciousness	Workplace hygiene	Attendance/ Punctuality	Ability to follow Manuals/ Written instructions	Application of Knowledge	Skills to handle tools & equipment	Economical use of materials	Speed in doing work	Quality in workmanship	VIVA	**Total internal assessment Marks**	**Result (Y/N)**
Maximum Marks (Total 100 Marks)			**15**	**5**	**10**	**5**	**10**	**10**	**5**	**10**	**15**	**15**		
1														
2														