SWITCH BOARD ATTENDANT

COMPETENCY BASED CURRICULUM

(Duration: 2 Yrs.)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 5

SECTOR – Electrical
(Including New and Renewable Energy)

सत्यमेव जयते

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

Directorate General of Training

Skill India
कौशल भारत-कुशल भारत

SWITCH BOARD ATTENDANT

(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 5

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
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Kolkata – 700 091

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2. ...G.S.E.C.L,Ukai Power Station .....
3. …BEST,Mumbai….

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Co-ordinator for the course: Sh. B.N.Sridhar,Dy.Director,FTI,Bangalore.

Sl. No.	Name & Designation Sh./Mr./Ms.	Organization	Expert Group Designation
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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. TRAINING SYSTEM

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.

SWITCH BOARD ATTENDANT 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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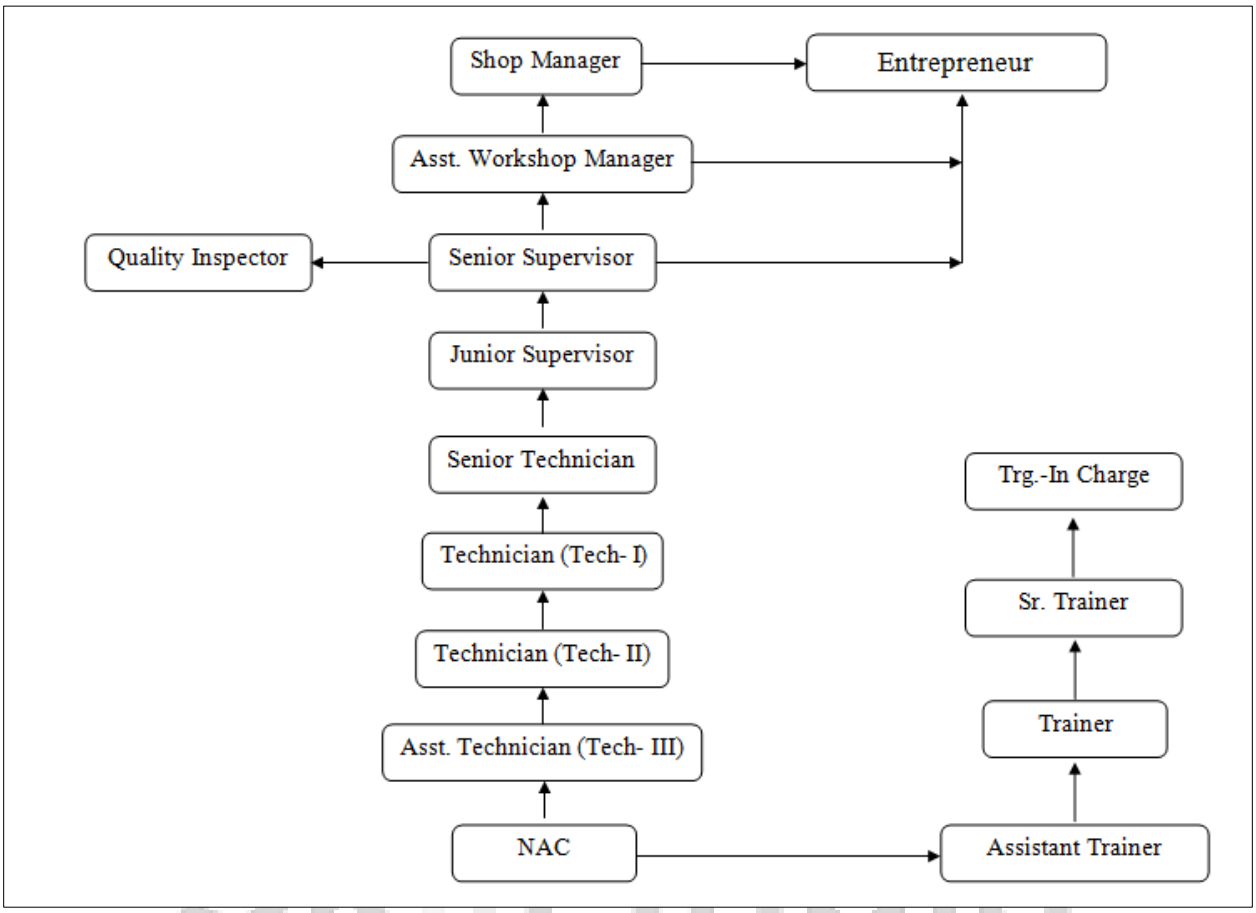
2.2 CAREER PROGRESSION PATHWAYS:

- 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.)

S 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 (section-2.4.2). 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 (section-2.4.2) 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:

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:

- Safety practice, Fire safety, Electrical Hazards, Layout of lab, Read and interpret the blue print reading (Electrical layout Drawing as per BIS specification & standards).
- Practice basic job work in fitting carpentry and welding.
- Use of electrical instrument(analog/digital) like voltmeter, Ammeter, Wattmeter, Energy Meter, Wheatstone bridge, oscilloscope, Earth tester, Tong tester, Megger etc to measure to different electrical quantities.
- Carry out Wiring & Earthling System.
- Carryout Installation, maintenance & repair works of Electrical AC/ DC machinery, lighting circuits and equipments used in industries.
- Carried out break down, over hauling, routine & preventive maintenance of Boilers.
- Carried out break down, over hauling, routine & preventive maintenance of Turbines.
- Carried out break down, over hauling, routine & preventive maintenance of electrical Switch Board Controls.
- Operate, maintain and test the switch gears, circuit breakers, relays and transformer.
- Identify and maintain the Transmission and distribution system protecting devices.
- Work on various sources of power generation & Control room.

Reference NCO 2015: 3131.0600-Electrical Switch Board Operator

4. NSQF LEVEL COMPLIANCE

NSQF level for SWITCH BOARD ATTENDANT 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 SWITCH BOARD ATTENDANT 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	SWITCH BOARD ATTENDANT
NCO Code	73131.0600
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	Passed 10th Class with Science and Mathematics under 10+2 system of Education or its equivalent
Selection of Apprentices	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 for 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	NIL
CTS trades eligible for SWITCH BOARD ATTENDANT Apprenticeship	Switch Board Attendant

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 syllabusmust 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

6.1GENERIC LEARNING OUTCOME

The following are minimum broad Common Occupational Skills/ Generic Learning Outcome after completion of the SWITCH BOARD ATTENDANT 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 including basic electrical. *[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]*
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Sectional views, Estimation of material, Electrical & electronic symbol]*
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. Knowledge of safety in all mechanical & electrical works. Practice providing First Aid.
2. Identify, use, care & maintenance of fitting, Drilling, tapping & Reaming hand tools/ machines. Practice to use of precision instruments.
3. Identify, use, care & maintenance of electrical hand tools.
4. Perform wire joints & providing cable glands. Soldering practice.

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5. Connect & measure voltage, current, resistance power & energy in DC & AC (1ph & 3ph) circuits.
   Maintenance of log sheets for instrument reading.
6. Electrical wiring: Repair / replace switches, sockets, light points, provide new points, etc.
7. Charging & maintenance of Batteries. Checking specific gravity, voltage etc.
8. Use of thermometers and pressure gauges, vacuum gauges, steam and water flow meters, pyrometers, fuel meters, CO2 indicators and meters recorder, smoke density meter.
9. Working and management of steam boilers, economizers and air heater. Correct use of various types of cocks, mounting and fittings used in boilers. Operation of fans, blowers, feed pumps including starting and stopping.
10. Operate fuel preparation equipment fuel feeding and burning devices for proper combustion and ash discharge disposal system in boiler. Water level, steam pressure and steam flow control in boiler.
11. Perform starting and commissioning of Boilers, banking and shutting down. Periodical cleaning and inspection of boilers.
12. Prepare boiler for testing, inspection, hydraulic and steam test. Carry out Preventive maintenance of Boiler for safe operation Boiler.
13. Operation of different types of steam turbines and steam engines. Use of steam table and charts. Procedure of safe operation of steam turbine. Care of turbine while running.
14. Operate & adjust steam turbine governor such as synchronizing governor, emergency governor, speed limit governor etc. Use of various valves.
15. Turbine troubles, abnormalities during operation and remedial measures. Importance of maintenance of daily log sheets and records use of steam table and charts.

Block – II

16. Observe & practice safety in all electrical works. Practice providing First Aid.
17. Locate and rectify faults in electrical circuits.
18. Dismantle, clean, re-assemble and test fans, regulators, motors and starters.
19. Connect DC/AC motors and generators to starters, field regulators and switch boards.
20. Perform starting of power plant equipment such as fans, pumps, compressor, etc.
21. Control room operation – such as operation of switch gear, control or turbo-alternators load, excitations etc.
22. Care and maintenance of generators for high voltage generation.
23. Building up of voltage and synchronizing an alternator with operation of field regulator voltage, governor control synchroscope.
24. Method of loading an alternator, megavar power factor control machines running in parallel.

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25. Checking and operation of MG sets, rectifiers, reserve exciter and converting machines.
26. Source of electrical supplies to units from station transformer and method changing over supplies. Checking of level of transformer oil.
27. Checking of indoor and outdoor testing sub-station circuit breakers, transformers and reactors.
28. Isolation of transmission line, distribution feeders, transformers etc.
29. Preventive maintenance of electrical controls, switch gears, transformers, motors and alternators.
30. Use of log sheets, method of maintenance of records and interpreting the various values recorded.

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.
2. Understand, explain different mathematical calculation & science in the field of study including	2.1 Explain concept of basic science related to the field such as Material science, Mass, weight, density, speed, velocity, heat & temperature, force, motion, pressure, heat treatment, centre of gravity, friction.

basic electrical and	
apply in day to day work.*[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]*	2.2 Measure dimensions as per drawing
	2.3 Use scale/ tapes to measure for fitting to specification.
	2.4 Comply given tolerance.
	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.
	2.7 Explain basic electricity, insulation &earthing.
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Sectional views, Estimation of material, Electrical & electronic symbol]*	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.
4. Select and ascertain measuring instrument and measure dimension of components and record data.	4.1 Select appropriate measuring instruments such as micrometers, vernier calipers, dial gauge, bevel protector and height gauge (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	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.

improve productivity & quality.	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 (Section:10)	
*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 Skillsand 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.	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 to 3	Demonstration of Fitting, Drilling, Tapping & Reaming hand Tools & Machines. Use, care & maintenance of various hand tools. Simple measuring tools such as steel-rule, micrometer, vernier calipers, Bevel Protector etc. methods of using Drills, taps, dies & reamers, gauges and Methods of marking objects tools.	Identification of Fitting, Drilling, Tapping & Reaming hand Tools & Machines.- Specifications Simple physical properties and uses of following ; Iron ore, pig iron, cast iron, carbon steel, tin, copper, zinc, lead, Aluminum, brass, etc. Heat treatment of metals and alloys its necessities. Equipment used for heat treatment. Care and maintenance.

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4	Demonstration of hand tools for electrical work. 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. Different type of welding joints.	Identification of hand tools for electrical work - Specifications Soldering, brazing and tinning technique. Welding joints & metrology.
5	Familiarization with signs and symbols of Electrical accessories.	Fundamental of electricity: Fundamental terms- Current, Voltage definitions, AC, DC, Phase, Neutral, Earth. Units & effects of electric current.
6-7	Verification of Ohm's Law. measurement of unknown resistance. Verification of laws of series and parallel circuits. Making simple electrical wiring on wooden board. Fluorescent tube light wiring. 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. Simple electrical wiring & accessories Fluorescent tube light wiring. 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 & its improvement. Concept three-phase Star and Delta connection. Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load.
9	Identification of parts of battery. Practice on Battery Charging, Preparation of battery charging, Testing of cells, Charging of batteries by different methods. Routine care & maintenance of Batteries	Chemical effect of electric current-Principle of electrolysis. Faraday's Law of electrolysis Primary & Secondary cell description & construction Charging & Discharging of Cell

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10-11	Schematic Diagram of different types of boilers. Line diagram of parts of boilers. Boiler safety precautions.	*<u>BOILERS</u>* Boiler safety rules, knowledge of boiler rules and safety precautions. Industrial fuels- solid, liquids, gaseous, properties of coals, coal preparation & cleaning. Principle constituents & classification of coals and furnace oil, volatile matter, moisture & ash contents. Principle steam generation elementary idea of heat temperature, volume & pressure, Boyles`s and Charles law. The conversation of water to steam, boiling point of liquid, effect of pressure of the boiling point of the liquid, sensible heat a and total of heat. Meaning of saturated steam and super-heated steam, dry steam, dryness fraction, importance of dry steam. *<u>STEAM GENERATORS;</u>* Boilers, internal pressure versus stressseses, elementary knowledge of boiler drum construction, types of boilers, fire tube boilers, water tube boilers(bent tubes),waste heat, electrical Boilers .Feed water temperature, elementary furnace design, water circulation. I.S.I : (1) 9404 – 1972 (2) 8596 – 1977 (3) 8595 – 1977
12-13	Schematic Diagram of different types of turbine. Line diagram of parts of turbine.	*<u>TURBINES:</u>* Fundamental principle, Impulse and reaction, their meaning, conversion of heat energy in a stream turbine, mixed pressure, back pressure and pressure mechanism, compounding pressure, compounding velocity compounding. Different types of steam turbine: parts of turbine & construction circulating water pumps, extraction pumps, vacuum pumps, atmospheric relief valves, air ejectors-steam jet and hydraulic ejectors. Air cooler, drain coolers feed heaters, stream trap and evaporators-function types and construction. Principles of governing mechanism, different types of governors, their construction and method of working. Lubrication, Turbine plant operation, Elementary idea of turbine troubles and

		remedies. Principle and function of various instruments and their uses. Breakdowns- Power failure, steam failure, equipment failure. Emergency stopping of turbine, **Turbine section, electrical safety.** Alarm and safety devices. ISI SPECIFICATION to be understood and followed. (i) Acceptance test on stationery steam generators of the power station type code for 8753 – 1977. (ii) Earthing …… 3043 -1966
	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)
1-2	Identification of the parts of a D.C. machine. No load & Load performance of a different type of DC generator. Connect, start, run and reverse a different type of DC motor. Load performance test on different type of DC motor. Speed control of a DC motor by different method. Maintenance, troubleshooting & servicing of DC machines. Overhaul a DC machine.	*D.C. Machines* -General concept of Electrical Machines. Principle of D.C. generator & its parts.Types of DC generator. Generators in series and parallel, load sharing. Type of DC motors and their application to industry. Speed control of DC motors. Care & maintenance of DC machines.
3-4	Identification of parts and terminals of single & three phase AC motors. Connection of single phase motor, identification, testing, running and reversing. Connection, starting, running of three phase AC motors using Starters. Maintain, service and trouble shoot the single & three phase motor. Overhauling of AC motors.	*A.C. Motors* -General concept of single & three phase motors & its parts.Types of AC single & three phase motors. Starting methods of AC three phase motors. Care & maintenance of AC motors.
5	Identification of parts and terminals of alternator. Connect, start and run a 3 phase alternator. Maintain service and trouble shoot of alternator.	*Alternator* – Working principal, construction and its parts. Synchronising , parallel operation, power load sharing Care & maintenance of Alternator.
6	Identification of parts and terminals of synchronous motor. Connect, start and run a synchronous motor.	*Synchronous motors* - Working principal, construction and its parts. Method of starting & its protection. Use for power factor correction.
7	Identification of types, Parts and function of single and three phase transformer. Connection of transformers, Transformation ratio, Testing of single phase and Three Phase Transformers -	*Transformer* Working principle of Transformer, Construction, Single phase and Poly phase. Auto Transformer(Variac), classification C.T. & P.T. Instrument Transformers connecting with meter,

	Cleaning, maintenance, testing and changing of oil. Use of Current Transformer (C.T.) and Potential Transformer (P.T.)	relays & Protective devices. Transformer oil testing.
8	Identification of parts and terminals of Rotary convertors. Connect, start and run Rotary convertors.	Rotary convertors – working principal , construction, types & its starting methods.
9	Prepare layout plan, single line diagram of different type of power plant.	*POWER GENERATION* **:** Various ways of electrical power generation. • Thermal • Gas • Hydro electric • Nuclear • Non-Conventional Schematic arrangement & Comparison of above Power Plants.
10	Schematic diagram of a different type of Circuit Breakers. Practice on Earthing- different methods of earthing. Measurement of Earth resistance by earth tester.	Power plant auxiliaries and their protection. Type & use of Circuit breakers, Switches, Switch boards, regulating & protective relays, voltage, frequency & power factor control, earthing, lighting arresters, isolated earthed neutrals.
11	Schematic diagram of a Sub – station with auxiliaries.	Sub-station equipment, Layout and auxiliaries, typical control scheme for circuit breakers, isolators, bus bar arrangements, bus zone protection, load sharing between two or more station in a grid, load sheading and equipments.
12	Prepare layout plan and single line diagram of transmission. Test /Check different type of protection relay.	Transmission – methods of voltage control and power factor correction, current limiting reactors, Knowledge of protective devices, over current under voltage, reverse power
13	Prepare layout plan and single line diagram of Distribution system. Replacement of fuse element.	Distribution – Simple AC & DC systems, Type of cable. Type of fuses & its application. Indian Electricity Acts & Rules.
	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.)**	**EngineeringDrawing (Duration : - 30 hrs.)**
1.	**Unit**: 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 & Simplification**: Fractions, Decimal fraction, Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems Simplification using BODMAS.	**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.	**Square Root** : Square and Square Root, method of finding out square roots, Simple problem using calculator	**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.	**Ratio &Proportion:** Simple calculation on related problems.	**Lettering and Numbering** as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case.

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5.	**Percentage:** Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	**Free Hand sketch:** Hand tools and measuring instruments used in Electrician / Switch board attendant trades
6.	**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.	**Free hand drawing :** - Lines, polygons, ellipse, etc. - geometrical figures and blocks with dimension . - Transferring measurement from the given object to the free hand sketches.

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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	**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
2.	**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.	**Construction of Scales and diagonal scale**
3.	**Algebra:** Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	**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.	**Mensuration :** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle. Volume of solids – cube, cuboid, cylinder and Sphere. Surface area of solids – cube, cuboid, cylinder and Sphere.	Drawing 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.
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.

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	

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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.

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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-JOBTRAINING)

Block – I

1. Knowledge of safety in all mechanical & electrical works. Practice providing First Aid.
2. Identify, use, care & maintenance of fitting, Drilling, tapping & Reaming hand tools/ machines. Practice to use of precision instruments.
3. Identify, use, care & maintenance of electrical hand tools.
4. Perform wire joints & providing cable glands. Soldering practice.
5. Connect & measure voltage, current, resistance power & energy in DC & AC (1ph & 3ph) circuits. Maintenance of log sheets for instrument reading.
6. Electrical wiring: Repair / replace switches, sockets, light points, provide new points, etc.
7. Charging & maintenance of Batteries. Checking specific gravity, voltage etc.
8. Use of thermometers and pressure gauges, vacuum gauges, steam and water flow meters, pyrometers, fuel meters, CO2 indicators and meters recorder, smoke density meter.
9. Working and management of steam boilers, economizers and air heater.
   Correct use of various types of cocks, mounting and fittings used in boilers.
   Operation of fans, blowers, feed pumps including starting and stopping.
10. Operate fuel preparation equipment fuel feeding and burning devices for proper combustion and ash discharge disposal system in boiler.
    Water level, steam pressure and steam flow control in boiler.
11. Perform starting and commissioning of Boilers, banking and shutting down. Periodical cleaning and inspection of boilers.
12. Prepare boiler for testing, inspection, hydraulic and steam test.
    Carry out Preventive maintenance of Boiler for safe operation Boiler.
13. Operation of different types of steam turbines and steam engines. Use of steam table and charts. Procedure of safe operation of steam turbine. Care of turbine while running.
14. Operate & adjust steam turbine governor such as synchronizing governor, emergency governor, speed limit governor etc. Practice to use of various valves.
15. Turbine troubles, abnormalities during operation and remedial measures. Importance of maintenance of daily log sheets and records use of steam table and charts

Block – II

16. Observe & practice safety in all electrical works. Practice providing First Aid.
17. Locate and rectify faults in electrical circuits.
18. Dismantle, clean, re-assemble and test fans, regulators, motors and starters.
19. Connect of DC/AC motors and generators to starters, field regulators and switch boards.
20. Perform starting of power plant equipment such as fans, pumps, compressor, etc.

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21. Control room operation – such as operation of switch gear, control or turbo-alternators load, excitations etc.
22. Care and maintenance of generators for high voltage generation.
23. Building up of voltage and synchronizing an alternator with operation of field regulator voltage, governor control synchroscope.
24. Method of loading an alternator, megavar power factor control machines running in parallel.
25. Checking and operation of MG sets, rectifiers, reserve exciter and converting machines.
26. Source of electrical supplies to units from station transformer and method changing over supplies. Checking of level of transformer oil.
27. Checking of indoor and outdoor testing sub-station circuit breakers, transformers and reactors.
28. Isolation of transmission line, distribution feeders, transformers etc.
29. Preventive maintenance of electrical controls, switch gears, transformers, motors and alternators.
30. Use of log sheets, method of maintenance of records and interpreting the various values recorded.

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

SWITCH BOARD ATTENDANT			
LIST OF TOOLS AND EQUIPMENT for Basic Training (For 20 Apprentices)			
A. TRAINEES TOOL KIT (For each additional unit trainees tool kit Sl. 1-18 is required additionally)			
Sl. no.	**Name of the Tool &Equipments**	**Specification**	**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			
1	C- clamp	100mm, 150mm, 200mm	2 Nos. each

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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	Outside Micrometer	0-25 , 25-50, METRIC	2
15	Motorized 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	Chisel 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, adjustable	200mm & 300mm	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 2nd cut	200mm	8
40	File half round 2nd cut	200 mm	4
41	File round 2nd cut	200mm	4
42	File flat rough	150mm	4
43	File flat bastard	250mm	4
44	File flat smooth	250mm	4
45	File Rasp half round bastard	200 mm	4
46	Soldering iron,	25 W, 65 W	2 each
47	Copper bit soldering iron	0.25 kg	2
48	De-soldering 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 GI pipe	20mm to 50 mm	1
53	Stock & dies conduit	20mm to 50 mm	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	DC power supply	0-30V, 2 Amp	2
67	Rheostats	0-1 ohm 5A, 0-10 ohm 5A, 0-25 ohm 1A, 0-300 ohm 1A	1 each
68	Digital Tachometer		1
69	Growler		1
70	Tong tester / clamp meter	0-100 A AC	1
71	Meggar	500V	1
72	Thermometer		1

73	Fire Extinguisher with fire bucket		1
74	Hydro meter		1
75	Current transformer,	415 V, 50 Hz , CT Ratio 10/5A,	1
76	Potential Transformer,	415/110 V	1
77	Wood Saw,	250 mm	1
78	Tenon Saw	250 mm	1
79	Guarded Test Lamp		1
80	Wheat stone bridge complete with galvanometer & battery		1
81	Transformer Oil Test Kit		1
82	Battery Charger unit		1
C : GENERAL MACHINERY INSTALLATIONS			
1	3 point & Four Point D C Motor Starters		1 each
2	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
3	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
4	Used DC generators –	series, shunt & compound type, (for overhauling practice)	1 each
5	Single phase Transformer,	core type, air cooled, 1 KVA, 240/415 V, 50Hz	3
6	3 phase transformer,	shell type, oil cooled with all mounting, 3 KVA, 415/240V, 50 Hz (Delta /Star)	2
7	Starters for 2 to 5 HP AC motors	Resistance type starter. b. Direct on line starter. c. Star delta starter –	1 each

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		Manual, semi-automatic & Automatic. d. Auto Transformer type starter	
8	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
9	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
10	AC 3 ph wound slipring motor	with starter & switch, 5 HP, 400V, 50 Hz	1
11	Single phase capacitor motor	with starter switch, 1 HP, 230 V, 50 Hz	1
12	Universal motor	with starter / switch, 230 V, ¼ HP, 50 Hz	1
13	Shaded pole motor,		1
14	3 ph Synchronous motor,	3 HP, 415 V, 50 Hz, 4 pole, with accessories	1
15	Inverter,	1 KVA with 12 V battery, input 12 V DC, Output 220V AC	1
16	1 Ph variable Auto Transformer		1
17	Load bank,	5 KW. lamp / heater type	1
18	Cut model of Steam Boiler for demonstration		1
19	Cut model of steam Turbine for demonstration		1
20	Centrifugal Pump	3 phase 1HP/415V,50Hz	1

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

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: SWITCH BOARD ATTENDANT

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		20+1 set
2.	Set square celluloid	45^o (250 X 1.5 mm)	20+1 set
3.	Set square celluloid	30^o-60^o (250 X 1.5 mm)	20+1 set
4.	Mini drafter		20+1 set
5.	Drawing board	(700mm x500 mm) IS: 1444	20+1 set
B : Furniture Required			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
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

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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.		

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														