

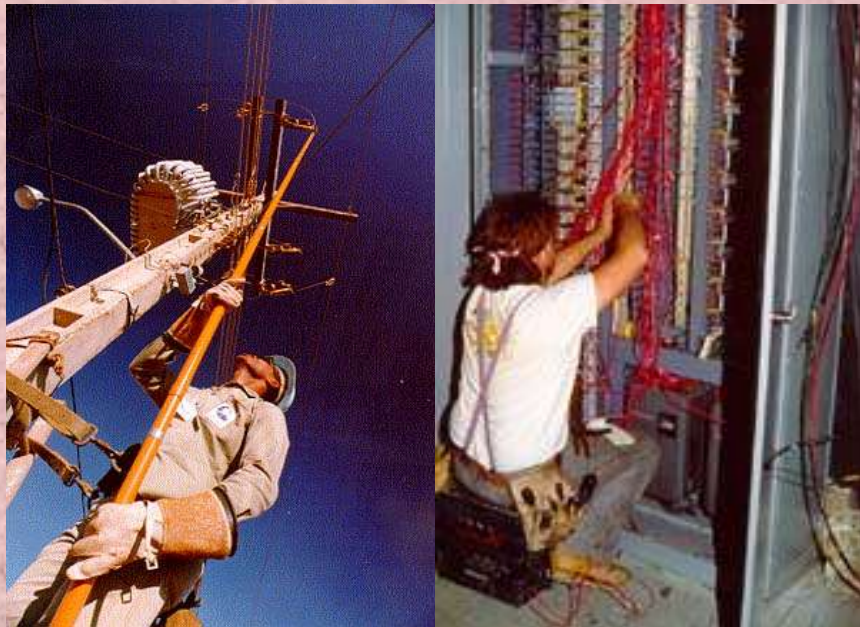
**Course Curricula**

**for**

**Short Term Courses based on**  
**Modular Employable Skills (MES)**

**in**

**ELECTRICAL Sector**



**DIRECTORATE GENERAL OF EMPLOYMENT AND TRAINING**  
**MINISTRY OF LABOUR & EMPLOYMENT**  
**GOVERNMENT OF INDIA**

**Course Curricula for Short Term Courses based on Modular  
Employable Skills (MES) in the Electrical Sector**

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## **Skill Development based on Modular Employable Skills (MES)**

### **Background**

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The need for giving emphasis on the Skill Development, especially for the less educated, poor and out of school youth has been highlighted in various forums. The skill level and educational attainment of the work force determines the productivity, income levels as well as the adaptability of the working class in changing environment. Large percentage of population in India is living below poverty line. One of the important causes is lower percentage of skilled persons in the workforce

The skill development at present is taking place mostly in the informal way, i.e. persons acquire skill at the work-place when they help their parents, relatives and employers etc. Such persons do not have a formal certificate and thus earn lower wages and are exploited by employers. They have come through informal system due to socio-economic circumstances of the family and the compulsions of earning a livelihood rather than attending a formal course. While their productivity is low, their contribution to the national GDP cannot be ignored. If the country can create a system of certification which not only recognizes their skills but also provides education and training in a mode that suits their economic compulsions, it will not only benefit the workforce to earn a decent living but also contribute to the national economy by better productivity of this workforce.

Another related problem to be tackled is large number of students drop outs (About 63% of the school students drop out at different stages before reaching Class-X).

### **Frame work for Skill Development based on 'Modular Employable Skills (MES)'**

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Very few opportunities for skill development are available for the above referred groups (out of school youth & existing workers especially in the informal sector). Most of the existing Skill Development programmes are long term in nature. Poor and less educated persons can not afford long term training programmes due to higher entry qualifications, opportunity cost etc. Therefore, a new frame work for Skill Development for the Informal Sector has been evolved by the DGET to address to the above mentioned problems. The **key features of the new frame work for skill development** are:

- ◆ Demand driven Short term training courses based on modular employable skills decided in consultation with Industry
- ◆ Flexible delivery mechanism (part time, weekends, full time)
- ◆ Different levels of programmes (Foundation level as well as skill upgradation) to meet demands of various target groups
- ◆ Central Government will facilitate and promote training while Vocational Training (VT) Providers under the Govt. and Private Sector will provide training
- ◆ Optimum utilisation of existing infrastructure to make training cost effective.
- ◆ Testing of skills of trainees by independent assessing bodies who would not be involved in conduct of the training programme, to ensure that it is done impartially.
- ◆ Testing & certification of prior learning (skills of persons acquired informally)

The Short Term courses would be based on 'Modular Employable Skills (MES)'.

The **concept for the MES** is :

- Identification of 'minimum skills set' which is sufficient to get an employment in the labour market.
- It allows skills upgradation, multiskilling, multi entry and exit, vertical mobility and life long learning opportunities in a flexible manner.
- It also allows recognition of prior learning (certification of skills acquired informally) effectively.
- The modules in a sector when grouped together could lead to a qualification equivalent to National Trade Certificate or higher.
- Courses could be available from level 1 to level 3 in different vocations depending upon the need of the employer organisations.
- MES would benefit different target groups like :
  - Workers seeking certification of their skills acquired informally
  - workers seeking skill upgradation
  - early school drop-outs and unemployed
  - previously child labour and their family

### **Age of participants**

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The minimum age limit for persons to take part in the scheme is 14 years but there is no upper age limit.

### **Curriculum Development Process**

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Following procedure is used for developing course curricula

- Identification of Employable Skills set in a sector based on division of work in the labour market.
- Development of training modules corresponding to skills set identified so as to provide training for specific & fit for purpose
- Organization of modules in to a Course Matrix indicating vertical and horizontal mobility. The course matrix depicts pictorially relation among various modules, pre requisites for higher level modules and how one can progress from one level to another.
- Development of detailed curriculum and vetting by a trade committee and by the NCVT

(Close involvement of Employers Organizations, State Governments, experts, vocational training providers and other stake holders is ensured at each stages).

### **Development of Core Competencies**

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Possession of proper attitudes is one of the most important attribute of a competent person. Without proper attitudes, the performance of a person gets adversely affected. Hence, systematic efforts will be made to develop attitudes during the training programme.

The trainees deal with men, materials and machines. They handle sophisticated tools and instruments. Positive attitudes have to be developed in the trainees by properly guiding

them and setting up examples of good attitudes by demonstrated behaviors and by the environment provided during training.

Some important core competencies to be developed are:

1. Safety consciousness and safe working practices
2. Care of equipment and tools
3. Punctuality, discipline and honesty
4. Concern for quality
5. Respect for rules and regulations
6. Concern for health and hygiene
7. Cordial relationship and Cooperation with co-workers and team Work
8. Positive attitude and behavior
9. Responsibility and accountability
10. Learn continuously
11. Communication Skills
12. Concern for environment and waste disposal

Following competencies should also be developed during level-II and higher courses:

1. Ability for planning, organizing and coordinating
2. Creative thinking, problem solving and decision making
3. Leadership
4. Ability to bear stress
5. Negotiation

### **Duration of the Programmes**

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Time taken to gain the qualification will vary according to the pathway taken and will be kept very flexible for persons with different backgrounds and experience. Duration has been prescribed in hours in the curriculum of individual module, which are based on the content and requirements of a MES Module. However, some persons may take more time than the prescribed time. They should be provided reasonable time to complete the course.

### **Pathways to acquire Qualification:**

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**Access to** the qualification could be through:

- An approved training programme; **Or**
- A combination of an approved training programme plus recognition of prior learning including credit transfer; **Or**
- The recognition of prior learning that provides evidence of the achievement of the competencies for the qualification.

## **Methodology**

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The training methods to be used should be appropriate to the development of competencies. The focus of the programme is on “performing” and not on “Knowing”. Lecturing will be restricted to the minimum necessary and emphasis to be given for ‘hands on training’.

The training methods will be individual centered to make each person a competent one. Opportunities for individual work will be provided. The learning process will be continuously monitored and feedback will be provided on individual basis.

Demonstrations using different models, audio visual aids and equipment will be used intensively.

## **Instructional Media Packages**

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In order to maintain quality of training uniformly all over the country, instructional media packages (IMPs) will be developed by the National Instructional Media Institute (NIMI), Chennai.

## **Assessment**

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DGE&T will appoint assessing bodies to assess the competencies of the trained persons. The assessing body will be an independent agency, which will not be involved in conducting the training programmes. This, in turn, will ensure quality of training and credibility of the scheme. Keeping in view the target of providing training/testing of one million persons through out the country and to avoid monopoly, more than one assessing bodies will be appointed for a sector or an area.

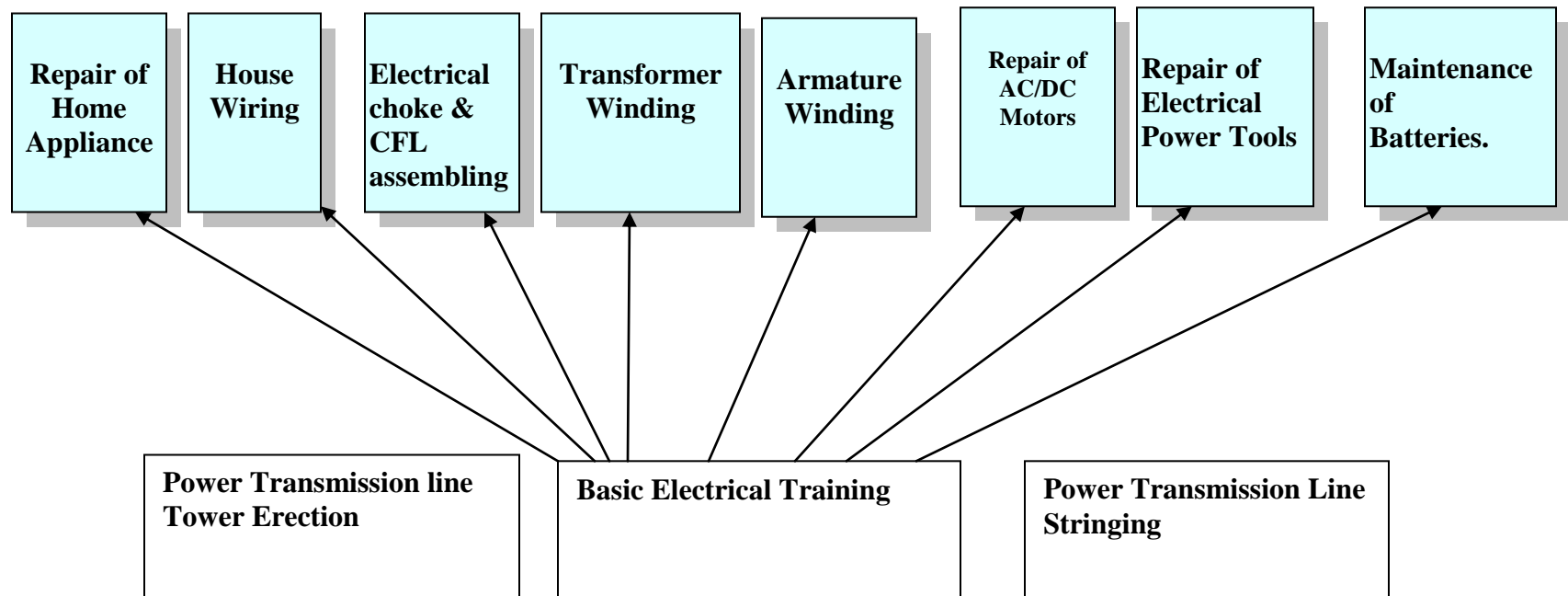
## **Certificate**

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Successful persons will be awarded certificates issued by National Council for Vocational Training (NCVT).

# Course Matrix in Electrical Trades

## Proposed Course Outline/ Pathway



## MODULES

### Basic Electrical Training

**Name** : Basic Electrical Training  
**Sector** : Electrical  
**Code** : ELE101  
**Entry Qualification** : 5th Standard & 14 years and Above  
**Duration** : 120 Hrs

**Terminal competency: The participant will be able to**

- State what is an accident, the probable causes and safe attitude
- Rescue a person who is in contact with a live wire
- Understand the general safety of Tools and Equipments
- Describe electricity, conductor, insulator, voltage, current, resistance, P.D., and inter relation between Voltage, Current, and Resistance etc.
- Connect volt meter, watt meter, ammeter, energy meter, multimeter, materials in simple electric circuits and measure the units.
- Do various connections like series, parallel etc.
- Explain the difference between AC & DC
- Describe the purpose of Earthing and Types of Earthing.

#### Course contents:

Underpinning Knowledge (Theory)	Practical Competencies
<ul style="list-style-type: none"> <li>• Safety practice –               <ul style="list-style-type: none"> <li>○ Lifting and handling loads.</li> <li>○ Heavy Equipments</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Safety practices – lifting and handling.</li> </ul>
<ul style="list-style-type: none"> <li>• Safety practice –               <ul style="list-style-type: none"> <li>○ Fire extinguishers</li> <li>○ Types of fire extinguishers</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Safety practices – Fire fighting</li> </ul>
<ul style="list-style-type: none"> <li>• General safety of tools and equipments</li> </ul>	<ul style="list-style-type: none"> <li>• Nature of working of tools and equipments.</li> </ul>
<ul style="list-style-type: none"> <li>• Electrical safety               <ul style="list-style-type: none"> <li>○ Rescue a person who is in contact with live wire.</li> <li>○ Treat a person for electric shock/injury.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Electrical safety practice               <ul style="list-style-type: none"> <li>○ Rescue a person who is in contact with live wire.</li> <li>○ Treat a person for electric shock/injury.</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• Introduction to Electricity</li> <li>• Conductors and types of conductors</li> <li>• Insulators and types of insulators</li> <li>• Crimping &amp; crimping tool</li> <li>• Soldering</li> </ul>	<ul style="list-style-type: none"> <li>• Prepare Terminations               <ul style="list-style-type: none"> <li>○ Skinning Different types of cable ends</li> <li>○ Make various joints in cable</li> <li>○ Crimping cable ends.</li> <li>○ Soldering the cable lugs</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• Define simple electrical terms like voltage, current, resistance and their units.</li> </ul>	<ul style="list-style-type: none"> <li>• Simple electrical connections using resistance, voltmeter, and ammeter, multimeter</li> </ul>
<ul style="list-style-type: none"> <li>• Simple series and parallel circuits</li> </ul>	<ul style="list-style-type: none"> <li>• Connecting number of lamps in series connection.</li> <li>• Connecting number of lamps in parallel connection.</li> </ul>
<ul style="list-style-type: none"> <li>• Direct current and testing the polarity</li> <li>• Alternating current and identifying phase, neutral and earth terminals</li> </ul>	<ul style="list-style-type: none"> <li>• Testing the polarity of DC supply.</li> <li>• Identification of phase and neutral in single phase supply</li> </ul>
<ul style="list-style-type: none"> <li>• Purpose of Earthing</li> <li>• Types of Earthing.               <ul style="list-style-type: none"> <li>○ Pipe Earthing</li> <li>○ Plate Earthing</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Carry out of pipe earthing</li> <li>• Carry out of plate earthing</li> </ul>
<ul style="list-style-type: none"> <li>• Simple house wiring circuit.</li> </ul>	<ul style="list-style-type: none"> <li>• Repairing of house wiring faults.</li> </ul>

### **Tools and Equipments:**

1. Connector, 6"
2. Screw Driver 8", 10", 12"
3. Cutting Pliers 6", 8"
4. Neon Tester
5. Heavy Duty Screw Driver 10", 12"
6. Nose Pliers 6"
7. Crimping tool
8. Volt meter 0-600 V (MC Type)
9. Volt meter 0-600 V (MI Type)
10. Ammeter 0-5 (MC Type)
11. Ammeter 0-5 (MI Type)
12. Watt meter 0-2.5KW
13. Energy meter 0-10A, 240V
14. Multimeter
15. Megger 500V
16. Line Tester
17. Types of fire extinguishers
18. Common tools used in electrical field.
19. Soldering iron 25W, 250V

## Repair of Home Appliance

**Name** : Repair of Home Appliance  
**Sector** : Electrical  
**Code** : ELE202  
**Entry Qualification** : 8<sup>th</sup> Standard 14 years and Above  
 MES Modules on Basic Electrical Training

**Duration** : 120 Hrs

**Terminal competency** : The participant will be able to

1. Observe the safety precautions while working
2. Test line cord for continuity with test lamp/multimeter
3. Prepare a heating element for a heater as required specification.
4. Replace the old element for heater, kettle, non –automatic electronic iron, room heaters etc., with a new one
5. Dismantle and reassemble an electric iron, heater, kettle, room heater, toaster, hair dryer, mixie etc.
6. Install a ceiling fan and the regulator.
7. Check a fluorescent lamp chock, starter and install it.

### Course contents:

<b>Underpinning Knowledge (Theory)</b>	<b>Practical Competencies</b>
Safety precaution	<ul style="list-style-type: none"> <li>• Safety precaution</li> </ul>
Install, service and repair all kinds of electrical home appliances	<ul style="list-style-type: none"> <li>• General repair of heating iron, kettle, ceiling fan, table fan, washing machine etc.,</li> <li>• Test the fan capacitors.</li> <li>• Clean and lubricate the bearing of ceiling and table fan, and check the speed.</li> <li>• Regulator of both fan.</li> </ul>
Repair and rectification of an automatic electric iron, servicing and repairing of mixer, ceiling and table fan.	<ul style="list-style-type: none"> <li>• Measure the insulation resistance between the terminals and body of the appliance</li> <li>• Check the oscillator mechanisms of table fan</li> </ul>
Assemble and install a fluorescent6 lamp.	<ul style="list-style-type: none"> <li>• Select the fuse size according to the load of circuit</li> </ul>
Thermostat heat controls of Automatic electric iron, steam iron, spray irons. Understand home appliances like heater, iron, kettle ceiling fan, table fan, washing machine etc.	<ul style="list-style-type: none"> <li>• Dismantle and reassemble automatic iron, ceiling fn table fan cooking range, storage heater, washing machines, and wet grinders etc.</li> </ul>
Maintenance of decorative serial lamp for a required supply voltage	<ul style="list-style-type: none"> <li>• Determine the number of lamps to be connected in series for particular supply voltage for making decorative serial lamp.</li> </ul>
Assemble, connect and install a twin fluorescent lamp with accessories	<ul style="list-style-type: none"> <li>• Check the internal connections of cooking range selector switch and circuits. connections in different temperature arrangements</li> </ul>
Repair and service technique of cooking range, storage water heater, washing machines, wet grinders. Replace the heating element in a soldering.	<ul style="list-style-type: none"> <li>• Check the simple mechanical timer, small water pump of washing machines and regular service and faults.</li> <li>• Repair of house wiring.</li> </ul>

## **Tools and Equipments:**

1. Electric Heater
2. Electric Iron
3. Electric Kettle
4. Ceiling Fan
5. Table Fan
6. Washing Machine
7. Automatic Iron
8. Cooking Range
9. Storage Heater
10. Wet Grinder
11. Connector, 6"
12. Screw Driver 8", 10", 12"
13. Cutting Pliers 6", 8"
14. Neon Tester
15. Heavy Duty Screw Driver 10", 12"
16. Nose Pliers 6"
17. Soldering iron
18. Multimeter

## House wiring

**Name** : **House wiring**  
**Sector** : **Electrical**  
**Code** : **ELE203**  
**Entry Qualification** : **8<sup>th</sup> Standard 14 years and Above**  
**MES Modules on Basic Electrical Training**  
**Duration** : **120 hrs**

**Terminal competency:** The participant will be able to
 

1. Observe the safety precautions while working
2. List of necessary hand tools and their uses
3. Cater and maintenance of wiring tools
4. Draw and describe simple electrical circuits.
5. Understand the different system of wiring used for domestic installation.
6. Understand the necessity of good earthing in an electrical installation.
7. Do the domestic installation testing before energizing a domestic installation.

### Course Contents:

<b>Underpinning Knowledge (Theory)</b>	<b>Practical Competencies</b>
Safety precaution	<ul style="list-style-type: none"> <li>• Safety precaution</li> </ul>
Safety equipments that should be available with an electrician working on line electrical installation.	<ul style="list-style-type: none"> <li>• Common hand tools, their uses, care and maintenance.</li> </ul>
ISI rules related to wiring (General)	<ul style="list-style-type: none"> <li>• Identify the wiring accessories as per symbols.</li> </ul>
Introduction to electricity Conductor & Insulator. Joints in Electrical Conductor	<ul style="list-style-type: none"> <li>• Make simple twist joints</li> <li>• Make married joint in stranded conductors.</li> <li>• Make tee joint in stranded conductor.</li> </ul>
Diagram and systems used in domestic wiring installation	<ul style="list-style-type: none"> <li>• Prepare T.W Board for fixing Flush type accessories.</li> <li>• Make the wiring layout for a bed room of a house with 6 points.</li> <li>• Carryout the wiring in PVC casing and capping as per layout.</li> </ul>
Earthing – Types. Earthing domestic installation I E rule for Energy meter Installation.	<ul style="list-style-type: none"> <li>• Carryout pipe earthing pipe earthing as per I E rule.</li> <li>• Prepare are mount energy meter board</li> <li>• Carryout domestic installation testing</li> </ul>

## **Tools & Equipemnts:**

1. Screw Driver 8", 10", 12"
2. Combination Pliers 6", 8"
3. Neon Tester
4. Round Nose Plier 15 cm
5. Electrician Knife 10 cm
6. Heavy Duty Screw Driver 10", 12"
7. Nose Pliers 6"
8. B.P. Hammer 1/2Kg, 1/4Kg
9. Cold Chisel 15 cm
10. Tri Square 30 cm
11. Fermer chisel 14cm, 20cm, 25cm
12. Pocker 15cm
13. Power drilling Machine 6 mm
14. Hacksaw 30 cm
15. Wire shipper 10 cm
16. Measuring tape 5 meters

## Electronic Choke & CFL assembling

**Name** : **Electronic Choke & CFL assembling**

**Sector** : **Electrical**

**Code** : **ELE204**

**Entry Qualification** : **8<sup>th</sup> Standard 14 years and Above**  
**MES Modules on Basic Electrical Training**

**Duration** : **120 hrs**

**Terminal Competency** The participant will be able to

1. Observe the safety precautions while working
2. Tell the resistance value by seeing the colour coded resistor and verify with the multimeter
3. List the names of the Electronic components used in the circuit.
4. Insert the components as per layout of PCB
5. Solder the components.
6. Taking the input and output leads.
7. Test the assembled circuit.

### **Course Contents:**

<b>Underpinning Knowledge (Theory)</b>	<b>Practical Competencies</b>
Safety Precaution	Safety Precaution
Colour code of carbon resistors	Practicing the color coded resistor value then verifying with the multimeter.
Familiarization with different Electronic components used like capacitor, transistor, diode, choke coil etc.,	Testing of different types of Electronic components.
Study the components symbol as per diagram	Practicing the symbol components as per diagram/circuit/
Interpret the components as per circuit and laying the components on PCB	Lay the components as per layout then soldering on PCB
Testing of assembled PCB	Trouble shooting if any on assembled circuit

### **Tools & Equipment:**

- 1 Soldering iron 25W, 230V
- 2 Neon tester
- 3 Multimeter
- 4 Combination Plier.
- 5 Nose plier
- 6 Wire stripper
- 7 Electrician Knife.

## Transformer Winding

**Name** : Transformer Winding  
**Sector** : Electrical  
**Code** : ELE205  
**Entry Qualification** : 8th Standard 14 years and Above  
**Duration** : 120 hrs  
**Terminal competency** : MES Modules on Basic Electrical Training

**The Participant will be able to**

1. Dismantle the transformer cores
2. Measure and also determine the size of winding wire for primary and secondary
3. Take the dimensions of a bobbin and prepare the bobbin from suitable materials
4. Wind the primary and secondary winding layer by layer.
5. Stack the cores and fasten them
6. Test the transformer for insulation, transformation ratio and performance

<b>Underpinning Knowledge (Theory)</b>	<b>Practical Competencies</b>
Safety precautions	<ul style="list-style-type: none"> <li>• Safety precautions</li> </ul>
Identification of phase and neutral in single-phase A/C. supply,	<ul style="list-style-type: none"> <li>• Testing the supply using test lamp with different wattage lamps.</li> </ul>
Test a single-phase transformer for its continuity and insulation.	<ul style="list-style-type: none"> <li>• Take the dimensions of a bobbin and prepare the bobbin from suitable materials</li> </ul>
Measuring a enameled winding wire with Std wire gauge.	<ul style="list-style-type: none"> <li>• Measure and also determine the size of winding wire for primary and secondary</li> </ul>
Wind/rewind a small transformer	<ul style="list-style-type: none"> <li>• Dismantle /reassemble the transformer cores</li> <li>• Wind the primary and secondary winding layer by layer.</li> </ul>
Use & Operation of hand operated and motorized coil winding machine.  Impregnation Varnish after testing the transformer – its advantages.	<ul style="list-style-type: none"> <li>• Familiarization and operation with the motorized coil winding machine – General maintenance to be done</li> <li>• Test the transformer for insulation, transformation ratio and performance</li> </ul>

**Tools and equipments:**

1. Screw Driver 8", 10", 12"
2. Cutting Plier 6", 8"
3. Neon Tester
4. Heavy Duty Screw Driver 10", 12"
5. Nose Plier 6"
6. Standard Wire Gauge
7. Motorized coil winding machine
8. Hand operated coil winding machine

## Armature winding

**Name** : Armature winding  
**Sector** : Electrical  
**Code** : ELE206  
**Entry Qualification** : 8th Standard 14 years and Above  
**MES Modules on Basic Electrical Training**  
**Duration** : 120 hrs

**Terminal Competency:** The participant will be able to

1. Observe the safety precautions while working
2. Check and test the armature.
3. Strip the old winding from the armature
4. Record the winding data
5. Prepare the armature for rewinding
6. Wind the coils by hand insulate them
7. Solder the leads to the commentator raisers.
8. Varnish the armature winding.
9. Understand end connection, electrical and distinguishing start and finish of each

<b>Underpinning Knowledge (Theory)</b>	<b>Practical Competencies</b>
Safety precautions	<ul style="list-style-type: none"> <li>• Safety precautions</li> </ul>
Type of winding like lap and wave winding Introduction to armature winding Method of dismantling the burnt winding wire.	<ul style="list-style-type: none"> <li>• Study the parts of armature.</li> <li>• Check and test the armature.</li> </ul> Strip the old winding from the armature
Terminology used in winding like pole pitch coid pitch back and front pitch progressive and retrogressive winding etc.	<ul style="list-style-type: none"> <li>• Record the winding data</li> </ul>
A/C/DC armature winding.	<ul style="list-style-type: none"> <li>• Prepare the armature for rewinding</li> </ul>
Preparation of winding data for given armature.	<ul style="list-style-type: none"> <li>• Wind the coils by hand insulate them</li> <li>• Connection of armature leads on raiser.</li> </ul>
Preparation of winding table , connection diagram, winding diagram for given armature.	<ul style="list-style-type: none"> <li>• Understand end connection, electrical and distinguishing start and finish of each</li> </ul>
Impregnation methods of armature after rewinding and testing.	<ul style="list-style-type: none"> <li>• Varnish the armature winding</li> </ul>

### **Tools and equipments:**

1. Screw Driver 8” 10”, 12”
2. Cutting Plier 6”, 8”
3. Neon Tester
4. Heavy Duty Screw Driver 10”, 12”
5. Nose Plier 6”
6. Standard Wire Gauge
7. Motorized coil winding machine
8. Hand operated coil winding machine
9. Grumbler
10. Multimeter

## Rewinding of AC/DC Motor

**Name** : Rewinding of AC/DC Motor  
**Sector** : Electrical  
**Code** : ELE207  
**Entry Qualification** : 8th Standard 14 years and Above  
**MES Modules on Basic Electrical Training**  
**Duration** : 120 hrs

### Terminal Competency

The participant will be able to

1. Observe the safety precautions while working
2. List the materials used for motor winding
3. Method of stripping the old winding and preparing the winding former and coils
4. Prepare the winding former and the coils
5. Wind the coils for starting and running winding
6. Method of inserting coil in the slots.

### Course contents:

Underpinning Knowledge (Theory)	Practical Competencies
Safety Precaution	<ul style="list-style-type: none"> <li>• <i>Safety Precaution</i></li> </ul>
knowledge about Single phase and 3-phase supply.	<ul style="list-style-type: none"> <li>• List the conducting and insulating materials used in motor winding</li> </ul>
Introduction to re-winding Insulating material used	<ul style="list-style-type: none"> <li>• Testing the motor before declaring for rewinding</li> </ul>
Terminology used in single phase and three phase winding like pole pitch coil pitch etc.,	<ul style="list-style-type: none"> <li>• Prepare the winding former and the coils</li> </ul>
Method of stripping the old winding and preparing the winding former and the coils.	Method of stripping the old winding and preparing the winding former and the coils
Preparation of winding data for given Motor.	Method of inserting coil in the slots.
Procedure followed for re-winding of all kind of electric motors like single phase A./C. motors, pump motors, ceiling fan motors, table fan motors, washing machine motors etc.	<ul style="list-style-type: none"> <li>• Making end connections</li> </ul>
Various methods used of inserting coil into the slots. Preparation of winding table , connection diagram, winding diagram for given Motor.	Testing the motor after rewinding
Test to be done after re-winding-impregnation methods of winding	<ul style="list-style-type: none"> <li>• Impregnation methods of winding</li> </ul>

### Tools & Equipment:

1. Screw Driver 8” 10”, 12”
2. Cutting Plier 6”, 8”
3. Neon Tester
4. Heavy Duty Screw Driver 10”, 12”
5. Nose Plier 6”
6. Standard Wire Gauge
7. Motorized coil winding machine
8. Hand operated coil winding machine

## Repair of Electrical Power Tools

**Name** : Repair of Electrical Power Tools  
**Sector:** : Electrical  
**Code** : ELE208  
**Entry Qualification** : 5th Standard 14 years and Above  
**MES Modules on Basic Electrical Training**

**Duration** : 120 Hrs.

**Terminal Competency:** Participants will be able to do

1. Observe the safety precautions while working
2. The maintenance and troubleshooting techniques of single – phase motors
3. General maintenance procedures and tests that should be conducted on the main parts.
4. Identify the motor leads that are tagged or color coded according to the standardized color code.
5. Trouble shoots capacitor motors and how to work safely with capacitors in order to avoid electrical shock.
6. Determine which of the specific parts to check when the motor fails to start.
7. Identify the symptoms of trouble in universal motors.
8. Repair of hand drilling machine, marble cutter, heavy duty mini grinder, sander/polishers, blower, heavy duty cutter and portable cutoff saw.
9. Dismantling and reassembling of single phase motor.
10. Use diagnostic table to help in troubleshooting motor in plant

### Course content:

<b>Underpinning Knowledge (Theory)</b>	<b>Practical Competencies</b>
Safety precautions	Safety precautions
Classification of single phase motors – parts, construction and working of single phase motors	<ul style="list-style-type: none"> <li>• Dismantling and reassembling of single phase motors like permanent capacitor, capacitor start induction run, capacitor start capacitor run, Universal motors.</li> </ul>
Classification of electrical power tools as per their application like hand drilling machine, angle grinder, rotary hammer, sander/polisher, blower, heavy duty cutter, portable cut off saw etc.,	<ul style="list-style-type: none"> <li>• Dismantling and reassembling of electrical power tools used like hand drilling machine, angle grinder, rotary hammer, marble cutter , heavy duty mini grinder, sander/polisher, blower , heavy duty cutter, portable cut off saw etc.,</li> </ul>
Trouble shooting technique in electrical power tools – like insulation testing armature defects, field winding, stator winding defects, noisy operation bearing problem, carbon brush changing, turning the commutator surface.	Trouble shooting in hand tools testing of insulation, armature defects, capacitor testing, carbon brush replacing after bedding – testing the protective devices.
Symptoms and causes of motor troubles – preventive and breakdown maintenance.	<ul style="list-style-type: none"> <li>• Preventive maintenance of hand tools, overhauling, changing defective parts etc.,</li> </ul>

### Tools and equipments:

1. Screw Driver 8", 10", 12"
2. Cutting Pliers 6", 8"
3. Neon Tester
4. Heavy Duty Screw Driver 10", 12"
5. Nose Pliers 6", 8"
6. DE Spanner Set 8 Nos.
7. Pipe Wrench 22mm
8. 13mm two speed driller
9. 100mm Heavy duty mini Grinder
10. 150mm Straight Grinder
11. Dual speed flexible grinder
12. 180mm Sander/Polisher
13. Blower
14. Heavy duty Cutter
15. Portable cut-off saw

## Maintenance of Batteries

**Name** : Maintenance of Batteries  
**Sector** : Electrical  
**Code** : ELE209  
**Entry Qualification** : 8<sup>th</sup> Standard 14 years and Above  
MES Modules on Basic Electrical Training  
**Duration** : 60 hrs

**Terminal Competency:**

**The participants will be able to:**

1. Observe the safety precautions while working
2. Preparation of electrolyte
3. Preparation of cells and arrangements of cells
4. Assembling of battery
5. Charging / recharging of battery
6. Care and preventive maintenance of battery

**Course Content:**

<b>Underpinning Knowledge (Theory)</b>	<b>Practical Competencies</b>
Safety precautions	<ul style="list-style-type: none"><li>• Safety precautions</li></ul>
Construction a lead acid battery	<ul style="list-style-type: none"><li>• Preparation of electrolyte</li></ul>
How to keep lead acid battery health.	<ul style="list-style-type: none"><li>• Preparation of cells and arrangements of cells</li></ul>
Recharging of battery,	<ul style="list-style-type: none"><li>• Assembling of battery</li></ul>
Check the condition of battery, reading of hydrometer, preparation of electrolyte and chemical effect. Battery chargers and its application precautions to be taken while operation.	<ul style="list-style-type: none"><li>• Charging / recharging of battery</li> <li>• Care and preventive maintenance of battery</li></ul>

**Tools and equipments:**

1. Screw Driver 8” 10”, 12”
2. Cutting Pliers 6”, 8”
3. Neon Tester
4. Heavy Duty Screw Driver 10”, 12”
5. Nose Pliers 6”
6. Hydrometer
7. High Discharge Tester
8. Battery charger

## List of Expert/Trade Committee Members

### CURRICULUM DEVELOPMENT FOR SHORT TERM COURSES BASED ON MODULAR EMPLOYABLE SKILLS

SECTOR/AREA: **Electrical**

Sl.	Name & designation	Remarks
	S/shri	
1	V.M.Rao, Director, ATI (V), Hyderabad	Chairman
2	S.Mastan, Sr.Manager, Midhani, Hydesrabad	Member
3	S.N.Pille, Chief Executive, S.N.Engineers, Hyderabad	Member
4	I.Nagaraju, RC All.Tech.Power Systems PVt.Ltd, Hyd	Member
5	H.Somasundram, Director, ATI EPI, R'pur, Hyderabad	Member
6	S.Chatterjee, JDT, ATI (V), Hyd	Member
7	G.Despande, T.O, RDAT, Hyderabad	Member
8	E.Balakrishna, DDT, ATI(V), Hyd	Member
9	A.Venkateswara rao, -do-	Member
10	V.V.Subba Rao, -do-	Member
11	P.K.Srivastava, ADT, -do-	Member
12	K.Kesavan, T.O, -do-	Member
13	S.Venugopalan, TO, -do-	Member

**Course Curriculum**

**Under  
SKILL DEVELOPMENT INITIATIVE SCHEME (SDIS)**

**Based on  
Modular Employable Skills (MES)**

**On**

# **ELECTRICAL SECTOR**

**Designed in**

**January 2011**

**Government of India  
Ministry of Labour & Employment  
Directorate General of Employment & Training**

**Course Curriculum under Skill Development Initiative Scheme (SDIS)  
based on Modular Employable Skills (MES)**

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List of members attended the Trade Committee Meeting for designing the course curriculum under Skill Development Initiative Scheme (SDIS) based on Modular Employable Skills (MES) on The Module of **in the Electrical Sector** held on 28th JANUARY 2011 at power Grid Corporation, Kolkata

Shri Anil Kumar, Director In Charge, C.S.T.A.R.I., Kolkata.

Sl. No.	Name and Designation S/Shri	Organization	Remarks
1	Ravi P. Singh, Executive Director	Power Grid Corporation, Kolkata	Chairman
2	Anil Kumar, Director In Charge	CSTARI, Kolkata	Member
3	Chetan verma, General Manager (HRD)	Power Grid Corporation, Gurgaon	Member
4	P.L.Ghosh, Assistant General Manager	Kalpataru Power Transmission Ltd., Kolkata	Member
5	A.K.Jain, Chief Engineer	Damodar valley Corpn., Kolkata	Member
6	Yatindra Dwivedi, Chief Manager (HRD)	Power Grid Corporation, Gurgaon	Member
7	Bhaskar Sarathy, Manager	Larsen & Toubro, Chennai	Member
8	Devendra Burade, Manager (Human Resource)	Jyoti Stringing Ltd., Delhi	Member
9	Goutam Banerjee, Senior Engineer (Project)	West Bengal State Electricity Transmission corpn. Ltd., Kolkata	Member
10	P.Das Sharma, Chief Engineer (Project)	West Bengal State Electricity Transmission corpn. Ltd., Kolkata	Member
11	Jacob Verghese, Dev. Manager	KEC, Nagpur	Member
12	Prakash Bose, Manager	Kalpataru Power Transmission Ltd., Kolkata	Member
13	Virendra Kumar, Deputy Manager	Power Grid Corporation, Kolkata	Member
14	Sanjay Kumar, Dy. Director of Trg.	Regional Directorate of Apprenticeship Training (ER), Kolkata	Member
15	L.K.Mukherjee, Dy. Director of Trg.	CSTARI, Kolkata	Member
16	Dr. Soumen Basu, Dy. Director	Directorate of Industrial Training, West Bengal	Member
17	Subrata Das, Asst. Director	Directorate of Industrial Training, West Bengal	Member
18	Ashoke Rarhi, Asst. Director of Trg.	CSTARI, Kolkata	Member
19	R. N. Manna, Training Officer	CSTARI, Kolkata	Member
20	Raj Kumar Roy, Instructor (Elect.)	Industrial Training Institute, Kalyani	Member
21	Biswajit Show, Instructor (Elect.)	Industrial Training Institute, Tollygaunge, Kolkata	Member

## LEVEL – I

**Module Name:** Power Transmission Line Tower Erection  
**Sector:** Electrical  
**Code:** **ELE 110**  
**Entry Qualification:** Ability to read and write, no handicap, physically fit to climb towers, should not be colour blind.  
**Age:** Minimum Age: 18 Years, Maximum Age: 25 years  
**Duration:** 470 Hrs

**Terminal competency:** The participant will be able to

- Understand erection procedure and erect the tower with tools and procedures while observing the safety precautions

**Course Contents:**

<b>Underpinning Knowledge (Theory)</b>	<b>Practical Competencies</b>
<b>1. Elementary details about Transmission line foundation works (Audio Visual(AV))</b> <ul style="list-style-type: none"> <li>• Survey</li> <li>• Pits marking</li> <li>• Excavation</li> <li>• Stub setting/ earthing</li> </ul>	Elementary practical skills for Pits marking, excavation and stub-setting/earthing through Audio visual on Tower Foundation, Transmission Line Survey
<b>2. Transmission Line Towers (AV)</b> <ul style="list-style-type: none"> <li>• Type of Towers including ULEs (Unequal Leg Extensions) details</li> <li>• Structural Drawings and Bill of Material</li> <li>• Markings and identification of Tower Parts</li> <li>• Loading, unloading and stacking of Tower Materials</li> </ul>	Identifying types of towers(for various voltage levels) through Audio Visual inputs, reading structural drawings & bill of material, identification of tower parts and stacking of Tower material
<b>3. Environmental Impact</b> <ul style="list-style-type: none"> <li>• Awareness about environmental impact</li> <li>• ROW issues</li> <li>• Damage Control</li> </ul>	Practical ways to handle tower parts and material in order to minimize environmental impact/damage, straight line use of tractors
<b>4. Introduction to Tools and Plans related to Tower erection</b> <ul style="list-style-type: none"> <li>• Identification</li> <li>• Up-keeping</li> <li>• Proper uses (AV)</li> <li>• Detailed description of derricks (AV)</li> <li>• Do's and Don't</li> <li>• Testing its Healthiness</li> <li>• Important Parts of Towers and its fitting sequence</li> <li>• Communication sets</li> </ul>	Practical use of Tools and Plans for Tower erection including testing of T&Ps
<b>5. Personal Protection Equipments (PPE's)</b> <ul style="list-style-type: none"> <li>• Identification</li> <li>• Up-keeping</li> <li>• Proper uses (AV)</li> </ul>	Practical use of Personal Protection Equipments(PPEs) for Tower erection

<ul style="list-style-type: none"> <li>• Do's and Don't</li> <li>• Testing its Healthiness and identification of faulty PPEs</li> </ul>	
<p><b>6. Field Quality Plan and Procedures</b></p> <ul style="list-style-type: none"> <li>• Standard field quality plans and procedures <ul style="list-style-type: none"> <li>○ Visual checking of materials for Stacking, Cleanliness, Galvanizing, Damages, completeness</li> <li>○ Sequence of erection, checking for completeness, tightening of nuts and bolts, Tack welding etc.</li> </ul> </li> <li>• Quality associated with erection works.</li> </ul>	<p>Ensuring quality associated with Tower erection works and ensuring Field Quality Plan and Procedures</p>
<p><b>7. Erection Procedures (AV)</b></p> <ul style="list-style-type: none"> <li>• Staking of Pieces at Site and ensuring availability of full material.</li> <li>• Ground Assembly</li> <li>• Hosting of derricks</li> <li>• Identification of proper size and quantity of Bolts and Nuts</li> <li>• Detailed erection process (step by step)</li> </ul>	<p>Practical experience for checking material availability for Tower erection, stacking of pieces, ground assembly, hoisting of derricks, proper use of pulleys/winches, balancing while lifting the material, anchoring/guying angle of derrick poles, kinds of knots of ropes, use of proper bolts and nuts and step-wise erection procedure, Special arrangements to be used for various crossings (River, Power line, National Highway, Railway).</p>
<p><b>8. Safety in Erection (AV)</b></p> <ul style="list-style-type: none"> <li>• Safety procedures</li> <li>• First Aid arrangements</li> <li>• Handling of emergency situations</li> <li>• Proper display &amp; markings of safety procedure and details.</li> </ul>	<p>Safe working on the site and ensuring adherence to safety procedures</p>
<p><b>9. Soft Skills</b></p> <ul style="list-style-type: none"> <li>• Emotional contents (AV)</li> <li>• Team Work</li> <li>• Communication skill</li> <li>• Discipline &amp; punctuality</li> <li>• Positive attitude and behavior</li> </ul>	<p>Observing discipline and punctuality on work, keeping and promoting positive attitude, maintaining good interpersonal relationship and working in team</p>
<p><b>10. Practical Field Training</b></p> <ul style="list-style-type: none"> <li>• Actual climbing on tower with tools and procedures</li> <li>• Field demonstration on safety during erection</li> <li>• Erection of tower (step by step) in control environment</li> </ul>	<p>Full erection of Power Transmission Line Tower observing safety procedures</p>
<p><b>11. Site Visits</b></p> <ul style="list-style-type: none"> <li>• Practical demonstration</li> </ul>	<p>Gaining practical competencies through observation of actual tower erection at construction site</p>
<p><b>12. Recapturing, practical demonstration, appraisal and validation</b></p>	<p>Recapturing practical competencies acquired and learning by performance during appraisal</p>

**Tools & Equipments(Power Transmission Line Tower Erection):**

1. Winch(Manual/Motorized) – 1 No.
2. Ginpole( 1 No.)/Derrick( 2 Nos.)
3. Polypropylene rope- 10 bundles of 220 mtrs.
4. Single/Four sheave pulley- 4 nos. each
5. Crow bars, spanners, hammers, hooks, slings- 4 nos. each
6. Torque wrench- 4 nos.
7. Safety equipment viz. safety helmets, safety belts, first aid box, Fall Arrestors – as per requirement( at least one each)
8. Audio-visual Aids.- 1 set
9. Slings, D-shackle, wire rope(12 mm)- 4 nos. each

## LEVEL – I

**Module Name:** Power Transmission Line Stringing  
**Sector:** Electrical  
**Code:** ELE 111  
**Entry Qualification:** Ability to read and write, no handicap, physically fit to climb towers, should not be colour blind.  
**Age :** Minimum Age: 18 Years, Maximum Age: 25 years  
**Duration:** 470 Hrs

**Terminal competency:** The participant will be able to

- Understand stringing procedure and perform stringing work with tools and procedures while observing the safety precautions

**Course Contents:**

<b>Underpinning Knowledge (Theory)</b>	<b>Practical Competencies</b>
<b>1. Elementary details of foundation and Tower stringing (AV)</b> <ul style="list-style-type: none"> <li>• Type of Tower (Tension and suspension)</li> <li>• Survey</li> <li>• Pits marking</li> <li>• Excavation</li> <li>• Stub setting/ earthing</li> <li>• Type of Towers including ULEs (Unequal Leg Extensions) details</li> </ul>	Elementary practical skills for Pits marking, excavation and stub-setting/earthing through Audio visual on Tower Foundation and stringing, Identifying types of towers and Transmission Line Survey
<b>2. Pre-check of erected tower (AV)</b> <ul style="list-style-type: none"> <li>• Missing members</li> <li>• Tightening</li> </ul>	Checking of erected tower before stringing
<b>3. T&amp;P associated with Stringing works (AV)</b> <ul style="list-style-type: none"> <li>• Insulator hoisting</li> <li>• Hardware fitting</li> <li>• Stringing</li> </ul>	Practical use of Tools and Plans for Power Transmission Line Stringing
<b>4. Personal Protection Equipments (PPE's)</b> <ul style="list-style-type: none"> <li>• Identification</li> <li>• Proper uses</li> <li>• Up-keeping</li> <li>• Do's and Don't</li> <li>• Testing its Healthiness</li> </ul>	Practical use of Personal Protection Equipments(PPEs) for Power Transmission Line Stringing
<b>5. Identification of materials (AV)</b> <ul style="list-style-type: none"> <li>• Insulator type</li> <li>• Fittings and rollers</li> <li>• Drum schedules</li> <li>• Do's and Don't</li> </ul>	Identification and proper use of materials related to Stringing work
<b>6. Field Quality Plan and Procedures related to stringing</b> <ul style="list-style-type: none"> <li>• Standard field quality plan and procedures               <ol style="list-style-type: none"> <li>a. Insulators- Visual check for</li> </ol> </li> </ul>	Ensuring quality associated with Tower erection works and ensuring Field Quality Plan and Procedures

<p>cleanliness/glazing/cracks/white spots, IR Value</p> <p>b. Visual checking of conductor drums etc.</p> <p>c. During stringing- Conductor/earthwire-scratch/cut check, repair sleeve, midspan joints etc.</p> <p>d. After stringing- check for clearances, jumpering, copper bond, placement of spacer/damper</p> <ul style="list-style-type: none"> <li>• Quality associated with works</li> </ul>	
<p><b>7. Stringing procedures (AV)</b></p> <ul style="list-style-type: none"> <li>• Placement of TSE and Drums</li> <li>• Guys of TSE and Tower</li> <li>• Paying out of Pilot wire</li> <li>• Paying out of Earth Wire</li> <li>• Paying out of Conductors</li> <li>• Use of MSCJ</li> <li>• Rough sagging</li> <li>• Procedures and precautions for arrangements for various crossings.</li> <li>• Important earthing arrangements for Power Line crossings (LT &amp; HT)</li> <li>• Final sagging</li> <li>• Clipping, spacing, jumpering</li> <li>• Important safety aspects</li> <li>• Do's and Don't</li> <li>• Removal of clamps and connectors</li> </ul>	<p>Practical experience for Power Transmission Line Stringing such as placement of TSE &amp; Drums, use of Guys &amp; MSCJ, paying out of Pilot wire/Earth wire/ conductors, rough/final sagging, clipping/spacing/jumpering, special arrangements required for various crossings (River, Power line, National Highway, Railway) etc.</p>
<p><b>8. Safety in Stringing</b></p> <ul style="list-style-type: none"> <li>• Safety procedures (AV)</li> <li>• First Aid arrangements</li> <li>• Handling of emergency situations</li> <li>• Proper display &amp; markings for safety procedures and guidelines</li> </ul>	<p>Safe working on the site and ensuring adherence to safety procedures</p>
<p><b>9. Soft Skills</b></p> <ul style="list-style-type: none"> <li>• Emotional contents (AV)</li> <li>• Team Work</li> <li>• Communication</li> <li>• Discipline &amp; punctuality</li> <li>• Positive attitude and behavior</li> </ul>	<p>Observing discipline and punctuality on work, keeping and promoting positive attitude, maintaining good interpersonal relationship and working in team</p>
<p><b>10. Practical Field Training</b></p> <ul style="list-style-type: none"> <li>• Actual stringing in control environment.</li> <li>• Field demonstration on safety during stringing work</li> </ul>	<p>Stringing of Power Transmission Line observing safety procedures</p>
<p><b>11. Site Visits</b></p> <ul style="list-style-type: none"> <li>• Demonstration of actual string work</li> </ul>	<p>Gaining practical competencies through observation of actual Stringing at construction site</p>
<p><b>12. Recapturing, practical demonstration, appraisal and validation</b></p>	<p>Recapturing practical competencies acquired and learning by performance during appraisal</p>

### **Tools & Equipments (Power Transmission Line Stringing):**

1. Running block for conductor-bundle – 1 no.
2. Head board- 1 no.
3. Pilot wire- Sample piece
4. Ground roller- 1 no.
5. Pulling grips- 1 no.
6. Drum mounting jack for conductor drum- 1 set
7. Hydraulic compression machine with suitable capacity with die sets- at site
8. Four sheave pulley- 1 set
9. Conductor lifting tackle- 1 set
10. Come-along clamp for conductor & earthwire – 1 no each
11. Winch – motorized/manual – at site
12. Trifor- at site
13. Hydraulic wire cutter – at site
14. Wire rope – sample piece
15. Polypropylene rope (suitable dia) - sample pieces
16. Sag board – 1 set
17. Megger – 1 no.
18. Theodolite – 1 no.
19. Twin bundle suspension fitting and Tension fitting – 1 set
20. Insulators- 4 nos. each type
21. Flags- samples
22. Binocular- 1 no.
23. Hammers, Spanners, Slings, Hecksaw- 1 each
24. Torque wrench- 1 no.
25. Turn-buckle- 1 no. sample
26. Vernier Caliper- 1 no.
27. Audio Visual Aid- 1 set
28. Safety equipment viz. safety helmets, safety belts, first aid box – as per requirement  
( at least one each)