

SYLLABUS OF MODULES

FOR THE SECTOR

OF

E L E C T R I C A L

UNDER

MODULAR EMPLOYABLE SKILLS (MES)

Redesigned in – 2014

By

Government of India

Directorate General of Employment & Training

Ministry of Labour & Employment (DGET)

Preface

The redesigned modules of Electrical Sector consist of THREE modules with following details:

Module No	Module Name	Total Duration Hrs	Existing Modules			Competency as per NCO Code
ELERN14101	Electrician Domestic	600 (4-6 Months)	ELE101	Basic Electrical	120 hrs	7137.10, 7137.20
			ELE202	Home Appliances	120 hrs	
			ELE203	House Wiring	120 hrs	
			ELE204	EC & CFL Assembly	120 hrs	
			ELE209	Battery Maintenance	60 hrs	
				TOTAL	540 hrs	
ELERN14102	Electrician Transmission line	800 (6-8 Months)	ELE110	TL Tower Erection	470 hrs	7245.10
			ELE111	TL Stringing	470 hrs	
				TOTAL	940 hrs	
ELERN14103	Electrical Winder	600 (4-6 Months)	ELE101	Basic Electrical	120 hrs	7241.40, 8282.50
			ELE205	Transformer Winding	120 hrs	
			ELE206	Armature Winding	120 hrs	
			ELE207	AC/DC Motor Winding	120 hrs	
			ELE208	Electrical Power Tools	120 hrs	
				TOTAL	600 hrs	

Module No	Module Name	Space Norms	Power Norms	Unit Size	Instructor's Qualification
ELERN14101	Electrician Domestic	60 sq .m (Minimum size of one side to be 04m)	02 KW	20	As per General Information of each module
ELERN14102	Electrician Transmission line	60 sq .m (Minimum size of one side to be 04m)	02 KW	20	As per General Information of each module
ELERN14103	Electrical Winder	60 sq .m (Minimum size of one side to be 04m)	02 KW	20	As per General Information of each module

Space & Power norms will be as under in cases, where VTPs are operating more than one Module simultaneously:

No of Modules	Space Norms	Power Norms
01	60 sq m	02 KW
02	120 sq m	03 KW
03	180 sq m	04 KW

GENERAL INFORMATION FOR ELECTRICIAN DOMESTIC

Name of Sector	ELECTRICAL
Name of Module	Electrician Domestic
MES Code	ELE 701
Competency as per N C O Code	7137.10, 7137.20
Duration of Course	600 Hrs
Entry Qualification of Trainee	8th Pass + 14 yrs of age
Unit size (No. Of trainees)	20
Power Norms	2.0 KW
Space Norms (Workshop and Class Room)	60 sq.m Minimum size of one side to be 04m.
Instructors Qualification	Degree in Electrical Engineering with one year Experience OR Diploma in Electrical Engineering with two year Experience OR NTC/ NAC in Electrical Trade Group with three

	years of Experience
Desirable	Craft Instructor Certificate (CIC)

Course Contents for Module Electrician Domestic (ELE701)

Underpinning Knowledge (Theory)	Practical Competencies
Safety Practices - Fires in electrical Circuits & Precautions - Fire Extinguishers & its Types - General Safety of Tools & equipment - Rescue of person who is in contact with live wire - Treat a person for electric shock/ injury	- Fire Fighting - Safely handling Tools & Equipment - Use of proper Tools & equipment & its maintenance - Rescue of person who is in contact with live wire - Treat a person for electric shock/ injury
Introduction to Electricity - Concept of basic Electricity, Single phase & three phase circuits - Electrical terms like Voltage, Currents, Resistance, Impedance & power factor	- Simple electrical Connections using resistance, voltmeter, ammeter & multimeter. - Practice on simple three phase circuit
Introduction to Electronics Familiarization with electronic components like Capacitor, Choke coil, Diode, Transistor, Thyristor	- Using electronic components in basic Electrical circuits - Electronic choke & CFL assembly
Symbols, Diagram & Rules - Studies of diagram & Symbols used in basic Electrical Circuits, Wiring & installations. - Colour Code of carbon Resistors - IE rules for General Electricity	- Identifying accessories/ symbols as per symbols - Making plan of wiring and marking light, power and other points accordingly. - Practicing the colour coded resistor value, verifying with multimeter.
Simple electrical Circuits - Series & Parallel Circuits - Direct current & Polarity testing - Alternating Current & identifying phase neutral and earth terminals - Interpret the components as per circuits and laying components on PCB - Testing of assembled PCB	- Connecting number of lamps in series and parallel circuits - Testing DC supply polarity - Identifying phase, neutral and earthing in three phase supply. - Laying components as per layout & soldering on PCB - Trouble shooting of assembled circuit
Earthing - Concept of earthing, purpose & types - Pipe earthing & Plate earthing - Earthing of domestic installation	- Carry out pipe earthing & plate earthing - Carry out domestic installation testing for earthing
House wiring & its concepts - Conductors, Insulators & its types - Crimping & Crimping Tools, Soldering - Joints in Electrical Conductor - Concept of gauge of wire, conductor	- Skinning different types of cable ends - Making various joints like twist joint, married joint, Tee joint in stranded conductors - Prepare T.W. Board for fixing Flush type

material & its current carrying capacity • Determination of Fuse size according to the load of circuit and its location • Study of different components used in house wiring. • Use of Megger & Test lamps in fault location • Energy meter installation • Concept of different types of switchgears used in general Electrical installations.	accessories • Make the wiring layout for a bedroom with light, fan & Power points • Carryout the wiring such as cleat, conduit, PVC casing and capping & concealed as per layout. • Assembly & installation of single & twin fluorescent lamp, Use of two way switches. • Wiring in two way or three way systems as prescribed and makes electrical connections through plugs and switches to different points. • Determine the number of lamps to be connected in series for particular supply voltage for making decorative serial lamp • Erection of switch boards & fixing of switch box casings cleats, conduit ceiling roses, switches etc. • Testing of electrical installations & equipment and locating faults using Megger, Test lamps & its removal. • Prepare & mount Energy meter board • Dismantling and assembling of switchgears in simple electrical installations
Home Appliances and its Repair • Voltage and Power requirement of all kinds of home appliances • Basic construction and assembly of electric iron, heater and fan • Basic construction and assembly of mixer, grinder, blender and OTG • Basic construction and electrical parts of washing machine, microwave oven, refrigerator and dish washer • Repair and service technique of home appliances	• Clean lubricate and replace bearing of ceiling fan • Test and replace capacitor and regulator of ceiling fan • Check and repair oscillator mechanism of table fan • Check and replace thermostat of electric iron and geyser • Dismantle and reassemble mixer and grinder • Check and replace thermostat and relay of refrigerator • Check water pump, timer and switches of washing machine • Check the internal connections and identify the fault in microwave oven
Battery Maintenance • Types/rating of batteries and their application in inverter and UPS	• Preparation of electrolyte • Preparation of cells and their arrangement

• Construction and parts of lead acid/ maintenance free battery. Specific gravity of battery • Process of discharging and recharging of battery • Battery chargers and precaution to be taken while charging	• Prepare terminals by using anti corrosive agent • Check specific gravity of lead acid battery • Check and note change in specific gravity while charging the battery
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List of Tools & Equipment for module Electrician Domestic (ELE701)

Sl No	Name of Tool/ Equipment	Quantity (nos)
1	Measuring tape 5 meters	05
2	Connector, 6"	05
3	Electrician Knife 10	05
4	Screw Driver 8" 10", 12"	05
5	Combination Pliers 6", 8"	05 each
6	Hacksaw 30 cm	05
7	Neon Tester	05
8	Heavy Duty Screw Driver 10", 12"	05 each
9	Nose Pliers 6", 8"	05 each
10	Round Nose Plier 15 cm	05
11	Heavy duty Cutter	05
12	Crimping tool	05
13	B.P.Hammer 1/2Kg, 1/4Kg	05 each
14	Fewer chisel 14cm, 20cm, 25cm	05 each
15	Cold Chisel 15 cm	05
16	Tri Square 30 cm	05
17	Pocker 15cm	05
18	Wire stripper 10 cm	05
19	13mm two speed driller	2
20	Power drilling Machine 6 mm	2
21	DE Spanner Set 8 Nos	2
22	Pipe Wrench 22mm	2
23	Portable cut-off saw	2
24	Volt meter 0-600 V (MC Type)	2
25	Volt meter 0-600 V (MI Type)	2
26	Ammeter 0-5 (MC Type)	2
27	Ammeter 0-5 (MI Type)	2
28	Watt meter 0-2.5KW	2
29	Energy meter 0-10A, 240V	2
30	Multimeter	2
31	Megger 500V	2
32	Line Tester	2

33	Fire extinguishers	2each
34	Electrical & Electronic components	As required
35	Soldering iron 25W, 250V	2
36	Hydrometer	2
37	High Discharge tester	1
38	Battery charger	1
Domestic Equipments		
39	Electric Heater 1000 W (min)	1
40	Electric Iron 750 W (min)	1
41	Electric Kettle 500 W (min)	1
42	Ceiling Fan	1
43	Table Fan	1
44	Washing Machine	1
45	Automatic Iron 750 W (min)	1
46	Induction Heater	1
47	Storage Heater/ Geyser 1000w (min)	1
48	Wet Grinder	1
49	100mm Heavy duty mini Grinder	1
50	150mm Straight Grinder	1
51	Dual speed flexible grinder	1
52	180mm Sander/Polisher	1
53	Blower	1
54	Choke and CFL assembly	1each
55	Battery 100 Ah	1
56	Single phase transformer	1
57	Single phase motors like permanent capacitor, capacitor start induction run, capacitor start capacitor run& Universal motors.	1each
58	Domestic pump with starters 0.5 HP (min)	1

GENERAL INFORMATION FOR ELECTRICIAN TRANSMISSION LINE

Name of Sector	ELECTRICAL
Name of Module	Electrician Transmission line
MES Code	ELE702
Competency as per N C O Code	7245.10
Duration of Course	800 Hrs
Entry Qualification of Trainee	8 th Pass + 18yrs of age (Physically fit to climb towers, should not be colour blind)
Unit size (No. Of trainees)	20
Power Norms	2.0 KW
Space Norms (Workshop and Class Room)	60 sq.m Minimum size of one side to be 04m.
Instructors Qualification	Degree in Electrical Engineering with one year Experience OR Diploma in Electrical Engineering with two year Experience OR NTC/ NAC in Electrical Trade Group with three years of Experience
Desirable	Craft Instructor Certificate (CIC)

Course Contents for Module Electrician Transmission Line (ELERN14102)

Underpinning Knowledge (Theory)	Practical Competencies
Foundation works (Audio Visual(AV)) • Survey • Pits marking • Excavation • Stub setting/ earthing	• Transmission Line Survey • Practice for Pit marking and excavation • Sub setting/earthing through Audio visual on Tower Foundation
Transmission Line Towers (AV) • Type of Towers including ULEs (Unequal Leg Extensions) details • Structural Drawings and Bill of Material • Markings and identification of Tower Parts • Loading, unloading and stacking of Tower Materials	• Identifying types of towers(for various voltage levels) through Audio Visual inputs • Reading structural drawings • Prepare bill of material • Identification of tower parts • Practice stacking of Tower material
Tools and related Plans for Tower erection • Identification, Up-keeping and Proper uses of tools (AV) • Identification, Up-keeping and Proper uses of Personal Protection Equipment (PPE) (AV) • Testing Healthiness and identification of faulty PPEs • Detailed description of derricks (AV) • Do's and Don't • Communication sets	• Practical use of Tools and Plans for Tower erection • Testing healthiness of Tools & Plans • Use of communication sets • Practice use of Personal Protection Equipment (PPEs) for Tower erection
Safety in tower erection and stringing (AV) • Safety rules as per BIS for tower erection • First Aid arrangements • Handling of emergency situations • Proper display & markings of safety procedure and dander boards	• Safe working practice on the site and ensuring adherence to safety procedures • Field demonstration on safety during erection
Soft Skills • Team Work • Communication • Discipline & punctuality • Positive attitude and behaviour • Emotional contents (AV)	• Observing discipline and punctuality on work, keeping and promoting positive attitude, maintaining good interpersonal relationship • Working in team
Field Quality Plan and Erection Procedures • Standard field quality plans and procedures • Quality associated with erection works. • Staking of Pieces at Site and ensuring availability of full material.	• Visual checking of materials for Stacking,Cleanliness, Galvanizing, Damages • Tack welding etc. • Identification of proper size and quantity of Bolts and Nuts

• Ground Assembly process • Hosting of derricks • Proper size and quantity of Bolts and Nuts • Sequence of tower erection, • Detailed erection process (step by step) • Special arrangements for various crossings (River, Power line, National Highway, Railway).	• Complete checking for tightening of nuts and bolts • Proper use of pulleys/winches and balancing while lifting the material • Practice anchoring/guying angle of derrick poles, • Practice different kinds of knots of ropes • Actual climbing on tower with tools • Practice step wise erection procedure • Site Visits for Practical demonstration through observation of actual tower erection at construction site
Tools & Plans associated with Stringing works (AV) • Insulator hoisting • Hardware fitting • Stringing	• Practical use of Tools and Plans for Power Transmission Line Stringing
Identification of materials (AV) • Insulator types • Fittings and rollers • Drum schedules • Identification, Proper uses and Up-keeping of PPE for stringing	• Identification and proper use of materials related to Stringing work • Practical use of Personal Protection Equipment (PPEs) for Power Transmission Line Stringing
Field Quality Plan and Procedures related to stringing • Standard field quality plan and procedures • Quality associated with works • Placement of TSE and Drums • Guys of TSE and Tower • Paying out of Pilot wire • Paying out of Earth Wire • Paying out of Conductors • Use of MSCJ • Rough sagging • Procedures and precautions for arrangements for various crossings. • Important earthing arrangements for PowerLine crossings (LT & HT) • Final sagging, clipping, spacing, jumpering • Important safety aspects • Do's and Don't	• Insulators- Visual check for cleanliness/glazing/cracks/white spots, IR Value • Visual checking of conductor drums etc. • During stringing- Conductor/ earth wire-scratch/cut check, repair sleeve, mid span joints etc. • After stringing- check for clearances, jumpering, copper bond, placement of spacer/damper • Practice for Power Transmission Line Stringing such as placement of TSE & Drums, use of Guys & MSCJ • Practice paying out of Pilot wire/Earth wire/ conductors • Practice clipping/spacing/jumpering, • Site visit for Gaining practical competencies through observation of actual Stringing at construction site. • Field demonstration on safety during stringing work

• Removal of clamps and connectors	

Tools & Equipment For Module Electrician Transmission Line:

Sl.No	Item Discription	Quantity	Expected Life
1	Winch (Manual/Motorized)	1 No	
2	Ginpole / Derrick	1 No./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	
10	Running block for conductor-bundle	1 no.	
11	Head board	1 no.	
12	Pilot wire-	Sample piece	
13	Ground roller	1 no.	
14	Pulling grips	1 no.	
15	Drum mounting jack for conductor drum	1 set	
16	Hydraulic compression machine with suitable capacity with die sets	at site	
17	Four sheave pulley	1 set	
18	Conductor lifting tackle	1 set	
19	Come-along clamp for conductor & earthwire	1 no each	
20	Trifor	at site	
21	Hydraulic wire cutter	at site	
22	Wire rope	sample piece	
23	Polypropylene rope (suitable dia)	sample pieces	
24	Sag board	1 set	
25	Megger	1 no	
26	Theodolite	1 no	
27	Twin bundle suspension fitting and Tension fitting	1 set	
28	Insulators	4 nos. each type	
29	Flags	samples	
30	Binocular	1 no.	
31	Hammers, Spanners, Slings, Hecksaw	1 each	
32	Torque wrench	1 no	
33	Turn-buckle	1 no	
34	Vernier Caliper	1 no	
35	Safety equipment viz. safety helmets, safety belts, first	as per	

	aid box	requirement (at least one each)	
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GENERAL INFORMATION FOR ELECTRICIAN WINDER

Name of Sector	ELECTRICAL
Name of Module	Electrical Winder
MES Code	ELE703
Competency as per N C O Code	7241.40, 8282.50
Duration of Course	600 Hrs
Entry Qualification of Trainee	8 th Pass + 14 yrs of age MES Module on Electrician Domestic
Unit size (No. Of trainees)	20
Power Norms	2.0 KW
Space Norms (Workshop and Class Room)	60 sq.m Minimum size of one side to be 04m.
Instructors Qualification	Degree in Electrical Engineering with one year Experience OR Diploma in Electrical Engineering with two year Experience OR NTC/ NAC in Electrical Trade Group with three years of Experience
Desirable	Craft Instructor Certificate (CIC)

Course Contents for Module Electrical Winder (ELERN14201)

Underpinning Knowledge (Theory)	Practical Competencies
Safety Precaution • First aid box • Safe handling of stripping/winding tools • BIS rules for winding/rewinding	• Identify different tools for stripping old wire • Practice proper and safe use of tools
Electrical supply system • AC single phase and 3-phase supply • Difference between single and three phase supply in respect of voltage, current and power	• Measure/Test single phase supply by multimeter/ test lamp • Measure/Test three phase supply by multimeter/ double test lamp
Introduction to re-winding • Types of winding wires • Types of insulating materials • Insulating materials as per class of insulation (A/E/B/C/F/H) • Reasons for insulation failure in electrical machines • Terminology used in winding like pole pitch, coil pitch, etc.	• Identify different winding wires • Identify different insulating material • Test electrical fan/motor for its insulation failure • Dismantle electrical fan/motor • Identify the damaged/burnt part of winding in fan/motor
• Method of stripping the old winding • Methods of preparing the winding former and the coils. • Preparation of winding data as per old winding and rating plate of machine	• Prepare the winding former and the coils of different size and shape • Record the winding data like size/gauge of wire, number of turns, coil connection, coil pitch, etc. • Practice stripping/removing the old winding of fan/motor
Rewinding procedure of motor • Procedure followed for re-winding of all kind of electric motors like single phase AC motors, pump motors, ceiling fan motors, table fan motors, submersible pump motor, etc. • Various methods used of inserting coil into the slots. • Preparation of winding table, connection diagram, winding diagram for given Motor • Testing for continuity and insulation	• Prepare insulating paper and wooden / insulating stick as per the slot of motor • Prepare the coil as per size, number of turns and coil pitch of the given motor • Insert and dress the insulating material in each slot of the motor • Insert the coil and mark start/ end point • Connect the coils as per connection diagram • Test for continuity and winding insulation • Assemble the motor and run (without varnishing)

Varnishing and final test • Types of varnishes • Methods of impregnation • Methods of insulation resistance improvement	• Practice varnishing of re-winded motor • Check the insulation of winding by megger • Make proper connections and check the performance of motor
Rewinding procedure of transformer • Basic construction and coil arrangement in primary and secondary side of transformer (single phase & three phase) • Concept of turns and voltage ratio • Types of wires and strips used for transformer coil • Procedure for removing core and coil from transformer tank • Methods of testing and general faults in transformer coil • Procedure for coil rewinding – hand and motorised coil winding • Procedure for placing insulation between coils and core • Connection and IR testing of primary and secondary • Varnish impregnation and its advantages	• Measure and determine the size of winding wire/strip for primary and secondary • Test and identify the faults in coil of primary and secondary • Dismantle the core and coil • Repair/ rewind the faulty coils • Clean the core and provide suitable insulation • Use of hand and motorised coil winding • Reassemble the coils of primary and secondary • Make connections and test for continuity and IR of primary and secondary • Familiarization and operation with the motorized coil winding machine • Test the transformer for insulation, transformation ratio and performance
Armature winding • Concept of DC supply • Types of armature winding like lap and wave winding • Terminology used in armature winding like pole pitch, coil pitch, back and front pitch, progressive and retrogressive winding etc. • Method of dismantling the burnt winding wire • Preparation of winding data for given armature • Procedure for providing insulation, inserting coil and connection to commutator • Procedure for securing coil ends on armature • Impregnation and testing of armature winding	• Dismantle the DC motor and identify the parts of armature • Check and test the armature • Record the winding data and coil connections • Strip/remove the armature winding • Clean and insert the insulation in the slots • Prepare and insert the coil in slots • Identify coil ends and make connections to commutator raiser • Properly secure/tie the coil ends on the armature • Test for continuity and IR of winding • Varnish the armature winding
Repair of electrical power tools • Types of electrical power tools as per	• Dismantling and reassembling of

their application like hand drilling machine, angle grinder, rotary hammer, sander/polisher, blower, heavy duty cutter, portable cut off saw etc. • 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 • Methods of preventive and breakdown maintenance	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. • Trouble shooting in hand tools testing of insulation, armature defects, capacitor testing, carbon brush replacing after bedding – testing the protective devices • Practice maintenance of hand tools, overhauling, changing defective parts etc.

Tools and Equipment for Module Electrical Winder:

Sl. No	Item Description	Quantity	Expected Life
1	Screw Driver 8", 10", 12"	2 nos. each	
2	Cutting Plier 6", 8"	2 nos. each	
3	Neon Tester	4 nos.	
4	Heavy Duty Screw Driver 10", 12"	2 nos. each	
5	Nose Plier 6"	4 nos.	
6	Bearing puller	1 no.	
7	Standard Wire Gauge	4 nos.	
8	DE Spanner Set 8 Nos.	2 set	
9	Pipe Wrench 22mm	1 no.	
10	Soldering iron 25 W and 40 W	1 no. each	
11	Wire stripper	2 nos.	
12	Multimeter digital	2 nos.	
13	13mm two speed drill machine	1 no.	
14	100mm Heavy duty mini Grinder	1 no.	
15	150mm Straight Grinder	1 no.	
16	Dual speed flexible grinder	1 no.	
17	180mm Sander/Polisher	1 no.	
18	Blower	1 no.	
19	Heavy duty Cutter	1 no.	
20	Portable cut-off saw	1 no.	
21	Motorized coil winding machine	1 no.	
22	Hand operated coil winding machine	2 no.	
23	Transformer single phase 2 KVA	1 no.	
24	Transformer three phase oil filled 10 KVA	1 no.	
25	Growler machine	1 no.	
26	Ceiling fan	1 no.	
27	Single phase motor 2 HP for winding practice	1 no.	
28	Three phase motor 5 HP for winding practice	1 no.	
29	DC motor 2 HP for winding practice	1 no.	

30	Winding wire of different gauge	As per requirement	
31	Different insulating material	As per requirement	