

SYLLABUS OF MODULES

FOR THE SECTOR

OF

ELECTRICAL

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 Industrial Sector consist of ONE module with following details:

| Module No | Module Name | Total Duration Hrs | Existing Modules | | | Competency as per NCO Code |
|------------|-------------------------------|-------------------------|------------------|--|---------------------|----------------------------|
| IELRN14101 | Electrician Industrial | 700 (5-7 Months) | IEL101 | Basic Electricity & Industrial Wiring | 240 hrs | |
| | | | IEL102 | Motors, Transformer and Earthing | 240 hrs | |
| | | | IEL103 | Cables and Industrial Equipments (Inverter, Lead Acid Battery and Operation of DG set) | 240 hrs | |
| | | | | Control Panel Wiring | New addition | |
| | | | | TOTAL | 720 hrs | |

| Module No | Module Name | Space Norms | Power Norms | Unit Size | Instructor's Qualification |
|------------|-------------------------------|--|-------------|-----------|---|
| IELRN14101 | Electrician Industrial | 60 sq .m (Minimum size of one side to be 04m) | 03 KW | 20 | As per General Information of each module |

GENERAL INFORMATION FOR ELECTRICIAN INDUSTRIAL

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| Name of Sector | INDUSTRIAL ELECTRICAL |
| Name of Module | Electrician Industrial |
| MES Code | IEL701 |
| Competency as per N C O Code | |
| Duration of Course | 700 Hrs |
| Entry Qualification of Trainee | 8 th Pass + 14 yrs of age |
| Unit size (No. Of trainees) | 20 |
| Power Norms | 3.0 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) |

Terminal Competency:

After completion of training the trainee will be able to:-

1. Perform Industrial wiring and panel wiring and its maintenance.
2. Maintenance and operation of the single and 3 phase motor with different types of starter and its maintenance.
3. To connect step down and step up transformer and its testing.
4. Identify the cable sizes and perform cable jointing
5. Check the condition and maintenance of lead acid battery
6. Operation and day to day routine maintenance of DG Sets.
7. Earth resistance testing and maintenance.

Course Contents for Module Electrician Industrial (IELRN14101):-

| Underpinning Knowledge (Theory) | Practical Competencies |
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| <p>Safety Practices</p> <ul style="list-style-type: none"> • Fires in electrical Circuits & Precautions • Fire Extinguishers ,its types and operation • General Safety of Tools &equipment • Rescue of person who is in contact with live wire • Treat a person for electric shock/ injury | <ul style="list-style-type: none"> • Fire Fighting and use of fire extinguishers • 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 |
| <p>Introduction to Electricity</p> <ul style="list-style-type: none"> • Concept of basic Electricity, Single phase & three phase circuits • Measurement of Electrical quantities like Voltage, Currents, Resistance, Impedance, power factor and energy. | <ul style="list-style-type: none"> • Simple electrical Connections using resistance, voltmeter, ammeter & multimeter etc. • Practice on simple single phase and three phase circuit |
| <p>Basic Tools and Accessories</p> <ul style="list-style-type: none"> • Knowledge of tools required for- marking, punching, cutting, drilling, filing, stripping, crimping, socketing and fixing glands & screws etc. • Knowledge of Measuring tools, wire gauges etc. • Classification / identification of the electrical equipments cables, wires and electrical accessories used in industry. | <ul style="list-style-type: none"> • Identification, usage of hand tools. • Maintenance of hand tools& usage of various Measuring instruments. • Knowledge of series and parallel circuit. |
| <p>Symbols, Diagram & Rules</p> <ul style="list-style-type: none"> • Studies of diagram & Symbols used in basic Electrical Circuits, Wiring & | <ul style="list-style-type: none"> • Identifying accessories/ symbols as per symbols. |

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| <p>installations.</p> <ul style="list-style-type: none"> • Different types of wires & conductors, Load carrying capacity. • Knowledge of different electrical wiring-residential, industrial and O.H. Lines. • IE rules for General Electricity. • Practice and working on cable lay out and different circuits • Marking the position of different accessories and its connection. | <ul style="list-style-type: none"> • Uses of fuses, MCB & its selection. • Practice on wiring diagram. • Making plan of wiring accordingly. |
| <p>Earthing</p> <ul style="list-style-type: none"> • Concept of earthing, purpose & types • Pipe earthing & Plate earthing | <ul style="list-style-type: none"> • Carry out pipe earthing & plate earthing • Carry out testing and maintenance of earth resistance. |
| <p>Industrial wiring & its concepts</p> <ul style="list-style-type: none"> • Conductors, Insulators & its types • Crimping & Crimping Tools, Soldering • Joints in Electrical Conductor • Concept of gauge of wire, conductor material & its current carrying capacity • Determination of Fuse size according to the load of circuit and its location • Knowledge of Different types of cables, its uses and identification. • As per IE rules choice of cable. Selection of cables as per given parameters. • Use of Megger & Test lamps in fault location • Types of faults and method of fault findings. • Energy saving concept. • Concept of different types of switchgears used in general Electrical installations. | <ul style="list-style-type: none"> • Skinning different types of cable ends • Making various joints like twist joint, married joint, Tee joint in stranded conductors • Checking & testing of Electrical wiring as per drawing. Fault finding and preventive maintenance, trouble shooting. • Dismantling and assembling of switchgears in simple electrical installations. • Practice on glanding of cables, lying of cables and different type of cable jointing. • Practice on different types of cable trays bending 45° and 90° |
| <p>Control Panel Wiring concept</p> <ul style="list-style-type: none"> • Knowledge of Cable Binding Strap & Buttons, Nylon Cable Ties, Sleeves, Lugs, Ferrules, Gromats & clips, Self adhesive gaskets, PVC Cable Channels, PVS steel wire pipe, terminal connectors, Toggle switch and terminal strip, rotary switch, | <ul style="list-style-type: none"> • Wire bending practice –Bending eyelets, stripping, crimping and connecting sockets. Stripping of wires & cables. • Crimping practice. Practice on crimping thimbles, Lugs. |

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| <p>CAM switch, Crimping tools, Hooter & Tower light, C.T., fuse base & link. Connectors, Indicator Lights, Push Buttons.</p> <ul style="list-style-type: none"> Control and power circuits, Contactors, Overload relays, Moulded Case Circuits Breakers, Motor Protection Relays, Motor Protection Circuit Breakers etc. | <ul style="list-style-type: none"> Building Contactor control circuits - Pushbutton operation, Logic building using NC /NO controls. Practice layout for assembly of various wiring accessories |
| <p>Industrial Motors and controls</p> <ul style="list-style-type: none"> Knowledge of motors & types & their Construction. Working principle of Single phase motor & 3 phase induction motor. Difference between squirrel cage and slip ring induction motors. Knowledge of circuit diagram of motors & transformer. Introduction to AC Drive and connection, configuration and parameterization. | <ul style="list-style-type: none"> Practice on motor star, delta connection. Connect star delta and DOL starter and a three phase motor. Starting method of slip ring induction motor Practice on control circuits of motors: - using on off switch locally and remote control. Demonstration on controlling of Speed, direction and their measurements. Application of single phase preventer Three phase Induction motor control using Drive |
| <p>Transformer connection and its concepts</p> <ul style="list-style-type: none"> Basic principle of transformer, Identification of its different parts, types of transformers, protections used for transformers,. Break Down Voltage test. Knowledge of various preventive and breakdown maintenance work to be performed on motors and transformers | <ul style="list-style-type: none"> Tracing primary and secondary winding of transformer practice on parallel operation of transformer & Polarity test. Connection of Step-down transformer, 3 phase transformer in a given load. Testing dielectric strength of transformer oil, and its insulation. |
| <p>DG Set and Accessories</p> <ul style="list-style-type: none"> Knowledge of Function of DG sets different parts. Knowledge of Parts of lead acid battery. Knowledge of maintenance of lead acid battery. Preventive maintenance of various parts of DG sets and routinely cleaning of filters etc | <ul style="list-style-type: none"> Practice on starting method of DG Sets. Change of lubricant, coolant. Working on DG Set panel and its protection. Practice on identification of different parts of lead acid battery. Checking of its electrolyte. Charging practice of lead acid battery and its testing. |

List of Tools & Equipment for module Electrician Industrial (IELRN14101)

| 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 | Fermer 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 | Watt meter 0-2.5KW | 2 |
| 25 | Energy meter 0-10A,240V | 2 |
| 26 | Digital Multimeter | 2 |
| 27 | Digital/Hand driven Megger 500V | 2 |
| 28 | Line Tester | 2 |
| 29 | Fire extinguishers | 2 |
| 030 | Electrical & Electronic components | 2 |
| 031 | Soldering iron 25W, 250V | 2 |
| 032 | Hydrometer | 2 |
| 33 | High Discharge tester | 2 |
| 34 | Battery charger | 2 |
| 35 | Wire guage | 2 |
| 36 | Centre punch | 2 |
| 37 | Earth tester | 2 |
| 38 | AC drive with 3 phase Induction motor | 1 |
| 39 | MCCB | 2 |
| 40 | ELCB and RCCB | 2 |
| 41 | NO/NC push buttons | 5 each |
| 42 | Star-delta starter | 2 |
| 43 | DOL starter | 2 |

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| 44 | Tong Tester | 2 |
| 45 | Single phase transformer 2 KVA | 1 |
| 46 | 3 phase transformer oil filled 10 KVA | 1 |
| 47 | 3 phase squirrel cage Induction motors 5HP | 2 |
| 48 | Single phase preventer | 2 |
| 49 | Tachometer | 2 |
| 50 | Power factor meter | 2 |
| 51 | CT and PT | 2 each |
| 52 | Rubber Hand gloves | 2 pair |
| 53 | DG Set | 1 |
| 54 | Lead Acid Batteries | 2 |
| 55 | Cable(Different Types) | As required |
| 56 | Cable Trays(Ladder and punched) | 2 each |
| 57 | Soldering flux | As required |
| 58 | Lug | As required |
| 59 | Blow lamp | 2 |