

Syllabus For Electrical Control Panel Wiring Assistant

Course Name	Electrical Control Panel Wiring Assistant
Sector	ELECTRONICS & HARDWARE
Course Code	ELE/2024/ECWA/335
Level	3
Occupation	Electrical Control Panel Wiring Assistant
Job Description	An Electrical Control Panel Wiring Assistant is responsible for assembly of wire control panels according to schematics and engineering specifications, install control panels at client sites, ensuring proper functionality and compliance with safety regulations, test and troubleshoot control panels to identify and resolve issues, assist in the commissioning and startup of electronic systems, adhere to safety protocols and industry standards.
Course Duration	Total Duration 390 Hrs (T- 90, P - 180, OJT - 60 and ES - 60)
Trainees' Entry Qualification	Grade 10 OR Grade 8 pass and pursuing continuous schooling in regular school with vocational subject OR 8th grade pass with 2 yrs relevant experience OR Previous relevant Qualification of NSQF Level 2 with one year experience OR Previous relevant Qualification of NSQF Level 2.5 with 6 months experience
Trainers Qualification	B.E./B.Tech in Electrical/Electronics Engineering with 1 year experience in the relevant field Diploma in Electrical/Electronics Engineering with 2 years experience in the relevant field Or, NTC/NAC in Electrician/Electronics with 3 years experience in the relevant field Or, NSQF certificate holder in the relevant field with 3 years experience in the relevant field

Structure of Course:

Module No.	Module name	Outcome	Theory (Hrs)	Practical (Hrs)	Total (Hrs) [Multiple of 30]
1	Safety Procedures and Regulations	Apply Safe Working Practices	10	20	30
2	Introduction to Electrical & Electronics with Electrical Diagrams	Explain basics of electrical and electronics components and electrical diagrams	20	40	60
3	Control Panel Wiring and Assembly	Demonstrate the wiring and assembly of electrical	30	60	90

Module No.	Module name	Outcome	Theory (Hrs)	Practical (Hrs)	Total (Hrs) [Multiple of 30]
		control panel			
4	Control Panel Testing, Maintenance & Repair	Assist to execute the procedure of Control Panel Testing, Maintenance & Repair	30	60	90
5	OJT	Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	--	60	60
6	Employability Skill	As per guided curriculum	60	--	60
TOTAL:			150	240	390

SYLLABUS:**Module 1: Safety Procedures and Regulations****Outcome:** Apply Safe Working Practices**Theory Content:**

- Basic safety introduction and guidelines, Safety signs, hazards in the work area
- Precautions, Personal protection
- Basic injury prevention, elementary first aid
- Proper method of Power Off and Disconnect
- Use of C type Fire extinguishers
- Disposal of electronic wastes

Practical Content:

- To identify Safety Symbols
- To identify potential electrical, chemical, or physical hazard
- To demonstrate use of protective equipment
- To demonstrate elementary first aid techniques
- To demonstrate the proper method of Power Off and Disconnect
- To demonstrate use of C type Fire extinguishers
- To demonstrate proper methods of disposal of electronic wastes

Tools & Equipment needed:

ESD pins, Antistatic gloves, Air ionizer, Antistatic wrist strap, Safety clothes, Antistatic shoe
High visibility clothing, Gloves, Goggles, Safety footwear, Safety helmet, First Aid Box

Module 2 : Introduction to Electrical & Electronics with Electrical Diagrams**Outcome:** Explain basics of electrical and electronics components and electrical diagrams**Theory Content:**

- Basic of Electricity – Voltage, Current, Power, AC & DC,
- Common Electrical Components - Resistor, Capacitor, Inductor, Types of cables and wires,

Connectors and terminations, Fuses and Circuit Breakers, MCB, Surge Arrester, GFCI, AFCI Switches and Relays, Transformer, Generator, Motor, AC Drive, Soft Starter, etc.

- Common Electronics Components - Diodes, Zener Diodes, LED, Transistor, IC, etc.
- Series and Parallel connection
- Breadboard and PCB
- Schematic symbols
- Wiring diagrams and blueprints
- Introduction to control panel electronics & schematics
- Soldering and de-soldering process

Practical Content:

- To identify basic electrical components
- To identify & select cable and wire
- To identify basic electronic components
- To practice simple circuit in breadboard and PCB
- To perform soldering
- To read wiring diagrams
- To draw simple electrical diagrams

Tools & Equipment needed:

Diode, Zener Diode, LED, NPN & PNP Transistor, Various ICs, Resistors, Capacitors, Inductors, Transformer, Generator, Motor, Relays, Contactors, Circuit breakers, Surge Arrester, GFCI, AFCI, PCB, Breadboard, Wires, Wire-stripper, Soldering Set, De-soldering gun, Switch, Printed electrical schematic symbols, Wiring Diagrams charts, Large paper for drawing diagrams, Drawing materials

Coaxial cable, Direct-buried cable, NM cable, Metallic sheathed cable, Multi core cable

Paired cable, Ribbon cable, Optic Fibre cable, Portable cord, Twin-sheathed cable, Twisted-pair cable

Module 3: Control Panel Wiring and Assembly

Outcome: Demonstrate the wiring and assembly of electrical control panel

Theory Content:

- Hand tools for wireman
- Measuring instruments (multimeters, continuity testers)
- Power tools (drills, wire strippers, crimpers)
- Busway – Types, Construction, Components
- Switchgear
- Wire stripping and splicing
- Proper crimping techniques
- Cable management and organization
- Residential Power Distribution, Load Centre
- Industrial and Commercial Power Distribution, Panel Boards
- Switchboards
- Planning and layout of control panels
- Component mounting and fastening
- Control panel enclosure selection
- Point-to-point wiring
- Proper grounding techniques

Practical Content:

- To test continuity and identify short circuit
- To measure Voltage and current using multimeters
- To identify resistance using color code and verify using multimeter
- To test various circuit components and measure it's parameters using multimeter
- To perform Wire stripping and splicing exercises
- To perform Connector crimping and termination techniques
- To test and replace fuses and circuit breakers
- To use hand tools and power tools
- To perform Cable routing and cable management
- To create and organize cable harness
- To perform enclosure selection and component mounting
- To perform point-to-point wiring in a control panel
- To perform grounding and bonding in control panel assembly

Tools & Equipment needed:

Multimeters, Drills & Bits, Contactors, Circuit breakers, Screw driver, Ratchet, Spanner, Plier
 Wire Stripper, Tester, Hammer, Hand bender, Ladder, Utility knife, Control panel enclosures
 Mounting hardware (screws, brackets, etc.), Grounding materials (grounding bars, conductors)
 Continuity testers

Module 4: Control Panel Testing, Maintenance & Repair

Outcome: Assist to execute the procedure of Control Panel Testing, Maintenance & Repair

Theory Content:

- Functionality testing
- Quality assurance and inspections
- Documentation and record-keeping
- Preventive maintenance
- Troubleshooting common issues
- Component replacement and repair
- Introduction to PLCs
- Basics of control panel automation
- Interface with sensors and actuators

Practical Content:

- To perform functionality testing of control panels
- To Inspect of finished panels
- To prepare documentation of testing procedures and results.
- To perform preventive maintenance of control panels
- To troubleshoot common issues
- To perform replacement and repair components

Tools & Equipment needed:

Multimeters, Drills & Bits, Contactors, Circuit breakers, Screw driver, Ratchet, Spanner
 Plier, Wire Stripper, Tester, Hammer, Hand bender, Ladder, Utility knife, Control panel
 enclosures, Mounting hardware (screws, brackets, etc.), Grounding materials (grounding bars,
 conductors), Continuity testers

Module 5: OJT

Outcome: Work in real job situation with special emphasis on basic safety and hazards in this domain

Practical Content:

Assessor will check report prepared for this component of Practical training of the course and assess whether competency has been developed to work in the real job situation with special emphasis on basic safety and hazards in this domain. (The trainee is expected to undertake work in actual workplace under any supervisor / contractor for **60 Hours**.)

Module Name: Employability Skills (60 Hrs)

Key Learning Outcomes**Introduction to Employability Skills**

Duration: 1.5 Hours

After completing this programme, participants will be able to:

1. Discuss the Employability Skills required for jobs in various industries
2. List different learning and employability related GOI and private portals and their usage

Constitutional values - Citizenship

Duration: 1.5 Hours

3. Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen
4. Show how to practice different environmentally sustainable practices.

Becoming a Professional in the 21st Century

Duration: 2.5 Hours

5. Discuss importance of relevant 21st century skills.
6. Exhibit 21st century skills like Self-Awareness, Behavior Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal or professional life.
7. Describe the benefits of continuous learning.

Basic English Skills

Duration: 10 Hours

8. Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone
9. Read and interpret text written in basic English
10. Write a short note/paragraph / letter/e -mail using basic English

Career Development & Goal Setting

Duration: 2 Hours

11. Create a career development plan with well-defined short- and long-term goals

Communication Skills

Duration: 5 Hours

12. Demonstrate how to communicate effectively using verbal and nonverbal communication

etiquette.

13. Explain the importance of active listening for effective communication
14. Discuss the significance of working collaboratively with others in a team

Diversity & Inclusion

Duration: 2.5 Hours

15. Demonstrate how to behave, communicate, and conduct oneself appropriately with all genders and PwD
16. Discuss the significance of escalating sexual harassment issues as per POSH act.

Financial and Legal Literacy

Duration: 5 Hours

17. Outline the importance of selecting the right financial institution, product, and service
18. Demonstrate how to carry out offline and online financial transactions, safely and securely
19. List the common components of salary and compute income, expenditure, taxes, investments etc.
20. Discuss the legal rights, laws, and aids

Essential Digital Skills

Duration: 10 Hours

21. Describe the role of digital technology in today's life
22. Demonstrate how to operate digital devices and use the associated applications and features, safely and securely
23. Discuss the significance of displaying responsible online behavior while browsing, using various social media platforms, e-mails, etc., safely and securely
24. Create sample word documents, excel sheets and presentations using basic features
25. utilize virtual collaboration tools to work effectively

Entrepreneurship

Duration: 7 Hours

26. Explain the types of entrepreneurship and enterprises
27. Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan
28. Describe the 4Ps of Marketing-Product, Price, Place and Promotion and apply them as per requirement
29. Create a sample business plan, for the selected business opportunity

Customer Service

Duration: 5 Hours

30. Describe the significance of analyzing different types and needs of customers
31. Explain the significance of identifying customer needs and responding to them in a professional manner.
32. Discuss the significance of maintaining hygiene and dressing appropriately

Getting Ready for apprenticeship & Jobs

Duration: 8 Hours

33. Create a professional Curriculum Vitae (CV)
34. Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively
35. Discuss the significance of maintaining hygiene and confidence during an interview
36. Perform a mock interview
37. List the steps for searching and registering for apprenticeship opportunities

Learning Outcome – Assessment Criteria

Module No.	Outcome	Assessment Criteria
1	Apply Safe Working Practices	<p>After completion of this module students will be able to:</p> <ul style="list-style-type: none"> 1.1 Identify Safety Symbols & any potential electrical, chemical, or physical hazard 1.2 Recognize the unsafe situations according to site policy and standard 1.3 Explain the appropriate PPE, which may include safety goggles, gloves, anti-static wristbands, and ESD (Electrostatic Discharge) protection if working with sensitive components 1.4 Demonstrate elementary first aid techniques and to use them under different circumstances. 1.5 Explain the proper method of Power Off and Disconnect 1.6 Identify and demonstrate C type Fire extinguishers 1.7 Describe methods of proper disposal of electronic wastes
2	Explain basics of electrical and electronics components and electrical diagrams	<p>After completion of this module students will be able to:</p> <ul style="list-style-type: none"> 2.1 Identify common electrical and electronic components 2.2 Describe the purpose, characteristics and applications of each components 2.3 Categorize electric circuits into series and parallel depending on the type of connection 2.4 Perform simple circuit in breadboard and PCB 2.5 Perform soldering and De-soldering 2.6 Identify and select different cable and wire 2.7 Identify and explain the symbols used in electrical diagram 2.8 Read and interpret wiring diagrams 2.9 Draw simple electrical diagrams
3	Demonstrate the wiring and assembly of electrical control panel	<p>After completion of this module students will be able to:</p> <ul style="list-style-type: none"> 3.1 Test the continuity and Identify short circuit 3.2 Use multimeter for various measurements 3.3 Identify and measure the value of resistance using Color Code 3.4 Perform Wire stripping, splicing, crimping and termination techniques 3.5 Test Fuses and Circuit Breakers 3.6 Identify Hand Tools and Power tools for various applications 3.7 Perform Component Mounting, Cable routing, Cable management, Cable harness

Module No.	Outcome	Assessment Criteria
		3.8 Perform point-to-point wiring in a control panel, grounding and bonding in control panel assembly
4	Assist to execute the procedure of Control Panel Testing, Maintenance & Repair	<p>After completion of this module students will be able to:</p> <p>3.1 Demonstrate the testing procedures for control panels, including functional, performance and safety tests</p> <p>3.2 Assist to inspect the finished panels</p> <p>3.3 Prepare documentation of testing procedures and results</p> <p>3.4 Perform preventive maintenance of control panels</p> <p>3.5 Identify and troubleshoot the common faults</p> <p>3.6 Replace the required components</p> <p>3.7 Maintain and organized documentation of testing procedures, results and any identified issues</p> <p>3.8 Follow electrical codes and regulations during the maintenance and repair process</p>
5	OJT	Assessor will check report prepared for this component of Practical training of the course and assess whether competency has been developed to work in the real job situation with special emphasis on basic safety and hazards in this domain. (The trainee is expected to undertake work in actual workplace under any supervisor / contractor for 60 Hours.)
6	Employability Skill	As per guided curriculum

List of Tools, Equipment & materials needed for 30 Trainees (Practical)

SI No	Items Name	Specification	Qty
1	Digital Multimeter	3½ digit	20
2	Electrician Screw driver set with insulated handle	300mm, 200mm, 100mm, 75 mm	Each of 10 sets
3	Crimping tools	10-100 mm	10 sets
4	Spanner set	6X7 to 16X7 (set of 6)	5 sets
5	Wire stripper	-	20 nos
6	Neon tester, Steel rule	-	20 nos. each
7	Knife	Double Beded Electrician	30 nos
8	Hammer	cross peen with handle	30 nos
9	Hammer	Ball peen with handle	30 nos
10	Plier both insulated and side cutting	150 mm	30 nos
11	Bradawl	-	30 nos
12	Pincer	150 mm	30 nos
13	Scriber	Knurled centre position	30 nos
14	Tennon saw	250 mm	30 nos
15	Hand drill machine	0-6 mm capacity	2 nos.

SI No	Items Name	Specification	Qty
16	Portable Electric drill machine	6 mm	1 no
17	Pilar Electric drill machine	12 mm	1 no
18	Allen key	-	2 nos
19	Pliers (Flat, Round and longnose)	100 and 150 mm	10 each
20	Tweezers	100 mm	30
21	File (Flat, Round and half round)	200 mm	10 each
22	Soldering iron	25W, 65W and 125 W	10 each
23	De- soldering gun	-	10 nos
24	Analog Multimeter	0 to 1000 M ohms	20 nos
25	Megger	500 V	2 nos
26	Earth tester	0-30 ohm	2 nos
27	Load banks	5 Kw (Lamp/heater type)	2 nos
28	DC power supply	0-440V, 0- 15A	2 nos
29	Voltage stabiliser	I/P- 150-230V AC O/P- 220 V AC, 1 KVA	2 nos
30	Dual Trace Oscilloscope	30 MHz	2 nos
31	Discrete component Trainer	-	1 no
32	Linear IC Trainer	-	1 no
33	Digital IC Trainer	-	1 no

Marks Distribution

Outcome	Outcome Code	Total Th marks	Total Pr marks	Total OJT marks
Apply Safe Working Practices	ELE/1025/OC1	20	120rks	0
Explain basics of electrical and electronics components and electrical diagrams	ELE/1025/OC2	30	150	0
Demonstrate the wiring and assembly of electrical control panel	ELE/1025/OC3	50	190	0
Assist to execute the procedure of Control Panel Testing, Maintenance & Repair	ELE/1025/OC4	50	190	0
Work in real job situation with special emphasis on basic safety and hazards in this domain (OJT).	ELE/1025/OC5	0	0	150
Employability Skills – 60 Hrs	DGT/VSQ/N0102	50	0	0