

**Syllabus for Electric Vehicle (EV) Charging Station Maintenance Technician (Operation and Maintenance)**

<b>Course Name</b>	<b>Electric Vehicle (EV) Charging Station Maintenance Technician (Operation and Maintenance)</b>
<b>Sector</b>	<b>Power</b>
<b>Course Code</b>	<b>POW/2023/EVCT/ 141</b>
<b>Occupation</b>	Operation and Maintenance - Distribution
<b>Job Description</b>	The Electric Vehicle (EV) Charging Station Maintenance Technician performs tasks for ensuring smooth operation of electric vehicle (EV) charging station as per standard practices. S/he provides support to customers for charging various types of electric vehicles. Also, the individual ensures effective maintenance of the charging station as per standard practice.
<b>Course Duration</b>	<b>Total Duration 250 Hrs (T-100 &amp; P-150)</b>
<b>Trainees' Entry Qualification</b>	12th pass OR 10th Pass OR ITI in Relevant Engineering Trade and minimum age of 18 Years or above.
<b>Trainers Qualification</b>	BE/ B.Tech in Electrical Engineering or Electronics Engineer with 1 years of relevant industry experience as an Engineer in the field of EV Charging station installation and commissioning. Or, Diploma in Electrical Engineering with 3 years of relevant industry experience as a Junior Engineer in the field of EV Charging station installation and commissioning. Or, ITI in Electrician with 5 years of relevant industry experience as a Technician in the field of EV Charging station installation and commissioning.

**Structure of Course:**

<b>Module No.</b>	<b>Module name</b>	<b>Outcome</b>	<b>Theory (Hrs)</b>	<b>Practical (Hrs)</b>	<b>Total (Hrs) [Multiple of 30]</b>
1	<b>Basic Electrical &amp; Electronics</b>	Apply basic Electrical / Electronics concept to use proper tools and measuring instruments to measure various electrical parameters.	10	20	30
2	<b>Introduction to Electric Vehicle &amp; Charging System</b>	Demonstrate use of various Charging Technology for different types of charging in EV charges station.	20	30	50

Module No.	Module name	Outcome	Theory (Hrs)	Practical (Hrs)	Total (Hrs) [Multiple of 30]
3	<b>Data Driven Infrastructure of EV Charging</b>	Demonstrate use of Software and set of programs required to access EV Charging System.	20	20	40
4	<b>EV Charging Station Operation &amp; Maintenance</b>	Maintain an EV Charging Station and Troubleshoot problems as per SOP.	30	50	80
5	<b>Work Effectively with Superiors</b>	Work effectively in real work place Implementing practices related to gender and PwD sensitization	10	15	25
6	<b>Work Safety &amp; First Aid Guide</b>	Apply health and safety practices at the workplace.	10	15	25
TOTAL:			100	150	250

## **SYLLABUS:**

### **Module No. 1: Basic Electrical & Electronics Outcome:**

**Outcome: Apply basic Electrical / Electronics concept to use proper tools and measuring instruments to measure various electrical parameters.**

#### **Theory Content:**

- 1.1 Explain Fundamental of electricity. Electron theory- free electron. Fundamental terms, definitions, units & effects of electric current.
- 1.2 State the importance of basic laws such as Ohms law, Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL) in electrical installations.
- 1.3 Explain how to check the supply unit with AC supply / multimeter to find out the voltage / current output.
- 1.4 Describe the use of multimeter and individually check the components of the section where voltage output is found to be less than desired or no output.
- 1.5 Explain proper use of tools and other common equipment. Fundamentals of common mechanical and non-mechanical tools.

#### **Practical Content:**

- 1.1 Practice on measuring instruments in single and three phase circuits e.g. multi-meter, Wattmeter, Ammeter, Voltmeter, etc.
- 1.2 Measure current and voltage in electrical circuits to verify Kirchhoff's Law.
- 1.3 Show how to check the supply unit with AC supply/multimeter to find out the voltage/current input/output and use of soldering station.

### **Tools & Equipment needed:**

Electric circuit components such as diode, transistor, IC, LED indicator, transformer, resistor, capacitor, thermistor, inductor, PCB, circuit breaker, Multimeter, power source, Ammeter, Voltmeter, Soldering Iron, Soldering wire, De-soldering pump

### **Module No. 2: Introduction to Electric Vehicle & Charging System**

**Outcome: Demonstrate use of various Charging Technology for different types of charging in EV charges station.**

#### **Theory Content:**

- 2.1 Guide to Electric Vehicle infrastructure. Non-dedicated & Dedicated EV charging system.
- 2.2 List different batteries for EV. Lithium-ion Batteries, Lithium Polymer (LiPo) Battery.
- 2.3 Explain Charging types in EV Charger Station. CCS; CHAdeMO; GB/T.
- 2.4 Describe Charging technologies for commercial EVs. AC and DC Charging Technologies.
- 2.5 Explain Electric vehicle charging standards and how they differ. Level 1, 2, 3, etc.

#### **Practical Content:**

- 2.1 Show how to check and measure battery capacity, through use of multimeter.
- 2.2 Demonstrate how to use a multimeter and individually check the components of the section where voltage output is found to be less than desired or no output.
- 2.3 Demonstrate connection of batteries to EV and EV chargers and record various outcomes or distortions.
- 2.4 Show how to use CCS; CHAdeMO; GB/T plug & sockets, Cables.
- 2.5 Demonstration of AC-DC EV Charging System.

### **Tools & Equipment needed:**

CCS; CHAdeMO; GB/T plug, socket & cables, Screw driver set, wrench set, pliers, spanner set, EV Batteries, Multimeter, AC-DC EV Charging system.

### **Module No. 3: Data Driven Infrastructure of EV Charging**

**Outcome: Demonstrate use of Software and set of programs required to access EV Charging System.**

#### **Theory Content:**

- 3.1 Explain the use of RFID system. Payment and tracking use of RFID.
- 3.2 Study and discuss OCPP and how it is use to communicate between a networked charging station and a network management system such as Charge Point.
- 3.3 List different online platforms for EV Charging stations and identify its benefits.

### **Practical Content:**

- 3.1 Demonstrate Radio Frequency Identification system, how it is use, features and types, RFID cards and Tags.
- 3.2 Show how to do Device Management, Transaction handling, Smart Charging functionalities through OCPP.
- 3.3 Show how to use different apps and platforms of different EV companies.

### **Tools & Equipment needed:**

RFID Cards, RFID tags, AC-DC Charging system, PC/laptop, Tab/mobile, Internet connection (with router).

## **Module No. 4: EV Charging Station Operation & Maintenance**

**Outcome: Maintain an EV Charging Station and Troubleshoot problems as per SOP.**

### **Theory Content:**

- 4.1 Discussing General maintenance for charging infrastructure includes storing, charging cables securely, checking parts periodically, and keeping the equipment clean.
- 4.2 List the various components require routine inspections, establishing responsibility for maintenance costs, Capturing and reviewing charger data is a crucial part of station.
- 4.3 Study and discuss and understand the Five Pillars of EV Charging Station Maintenance and Management.
- 4.4 Study and discuss the benefits and drawbacks of network and non-network chargers.
- 4.5 Study and discuss the lifespan and maintenance techniques of EV batteries and station.

### **Practical Content:**

- 4.1 Demonstrate Level 1,2, and 3 of network and non-network charging.
- 4.2 Performing demonstration on EV charging stations regular maintenance. Charging station maintenance includes regular inspections of the charging station, its components, and any necessary repairs.
- 4.3 Demonstrate how to Reset the Charging Dock connector by unplugging it and reinserting it fully into the vehicle receptacle. Ensure that the connector latch engages completely.
- 4.4 Show how to inspect the Charging Dock output cable and connector terminals for damage. If damaged, discontinue use immediately and replace socket.

### **Tools & Equipment needed:**

Digital multimeter, Register Doc, Pen, cleaning brushes and cleaning liquid, safety gloves.

## **Module No. 5: Work Effectively with Superiors**

**Outcome: Work effectively in real work place Implementing practices related to gender and PwD sensitization**

### **Theory Content:**

- 5.1 State the importance of work ethics and workplace etiquette
- 5.2 Study and discuss the common reasons for interpersonal conflict and ways of managing them effectively. And also, the importance of following organizational guidelines for dress code, time schedules, language usage and other behavioral aspects.
- 5.3 Explain the common workplace guidelines and legal requirements on non-disclosure and confidentiality of business-sensitive information.
- 5.4 Study and discuss ways to create sensitivity for different genders and Persons with Disabilities (PwD).

### **Practical Content:**

- 5.1 Study and discuss ways to create sensitivity for different genders and Persons with Disabilities (PwD).
- 5.2 Create a sample feedback form to obtain feedback from customers, colleagues etc.
- 5.3 Roleplay to demonstrate the use of professional language and behavior that is respectful of PwD and all genders.
- 5.4 Apply organizational protocol on data confidentiality and sharing only with the authorized personnel.

### **Tools & Equipment needed:**

Sample of Escalation Matrix, Organization Structure

## **Module No. 6: Work Safety & First Aid Guide**

**Outcome: Apply health and safety practices at the workplace.**

### **Theory Content:**

- 6.1 Study and discuss job-site hazards, risks and accidents.
- 6.2 Explain the organizational safety procedures for maintaining electrical safety, handling tools and hazardous materials
- 6.3 Study and discuss use of caution around electric vehicle chargers
- 6.4 Study and discuss proper ventilation, UL-listed EV chargers, residual current device, etc.
- 6.5 Describe the importance of maintaining appropriate postures while lifting heavy objects.
- 6.6 Describe the concept of waste management and methods of disposing hazardous waste.

6.7 Explain various warning and safety signs & Describe different ways of preventing accidents at the workplace.

**Practical Content:**

- 6.1 Demonstrate the use of protective equipment suitable as per tasks and work conditions.
- 6.2 Prepare a report to inform the relevant authorities about any abnormal situation/behavior of any equipment/system.
- 6.3 Demonstrate the steps to free a person from electrocution safely.
- 6.4 Demonstrate the use of fire extinguisher.
- 6.5 Demonstrate the application of defined emergency procedures such as raising alarm, safe/efficient, evacuation, moving injured people, etc.

**Tools & Equipment needed:**

Personal Protection Equipment, Safety Cotton Gloves, Safety Footwear, Warning Signs and Tapes, Fire Extinguisher, Window Glass Breaker, First Aid Kit, Fire Extinguisher.

**Learning Outcome – Assessment Criteria**

Module No.	Outcome	Assessment Criteria
1	Apply basic Electrical / Electronics concepts to use proper tools and measuring instruments to measure various electrical parameters.	<b>After completion of this module students will be able to:</b> 1.1 Gain knowledge on Fundamental of electrical and electronics 1.2 Gain knowledge on Ohms law, KCL, KVL, Current, Voltage 1.3 Testing parameters of AC/DC Current & Voltage 1.4 Proper use of tools

Module No.	Outcome	Assessment Criteria
2	Demonstrate use of various Charging Technology for different types of charging in EV charges station.	<p><b>After completion of this module students will be able to:</b></p> <p>2.1 Gain knowledge on Electric Vehicle  2.2 Fundamental of EV Charging Station  2.3 Gain knowledge of different EV batteries  2.4 Operation of CCS; CHAdeMO; GB/T.  2.5 AC and DC Charging Technologies &amp; Level 1,2,3 charging system</p>
3	Demonstrate use of Software and set of programs required to access EV Charging System.	<p><b>After completion of this module students will be able to:</b></p> <p>3.1 Gain knowledge on how to use RFID technology  3.2 Payment and tracking use of RFID technology  3.3 Online platforms for EV Charging stations and identify its benefits  3.4 How to use OCPP system</p>
4	Maintain an EV Charging Station and Troubleshoot problems as per SOP.	<p><b>After completion of this module students will be able to:</b></p> <p>4.1 Gain knowledge on how to maintain EV charging station  4.2 Understand the Five Pillars of EV Charging Station  4.3 Brief knowledge on network and nonnetwork chargers  4.4 Maintenance techniques of EV</p>
5	Work effectively in real work place Implementing practices related to gender and PwD sensitization	<p><b>After completion of this module students will be able to:</b></p> <p>5.1 read warnings, instructions and other text material on product labels, components, etc. and relevant signages, warnings, labels or descriptions on equipment, etc. while carrying out work activities  5.2 listen, speak, and write in an inclusive, respectful manner in line with organizational protocol  5.3 deliver product to next work process on time  5.4 communicate problems appropriately to others  5.5 liaise with authorities and supervisors as per organizational protocol</p>

Module No.	Outcome	Assessment Criteria
6	Apply health and safety practices at the workplace.	<p><b>After completion of this module students will be able to:</b></p> <p>6.1 write health and safety compliance report</p> <p>6.2 provide an emergency or safety incident brief to seniors or relevant authorities in a calm, clear and to-the-point manner</p> <p>6.3 precautionary activities to prevent the fire accident</p> <p>6.4 interpret general health and safety guidelines labels, charts, signages</p> <p>6.5 communicate general health and safety guidelines to colleagues/co-workers</p>

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

Sl No	Items Name	Specification	Qty
1	Screw Driver Set	Standard	5
2	Wrench	Standard	5
3	Spanner Set	Standard	5
4	Pliers	Standard	5
5	Battery	EV Standard	2
6	AC Charging System	EV Standard	1
7	DC Charging System	EV Standard	1
8	Digital Multimeter	Standard	5
9	Different types Charging Plug	CCS, CHAdeMO, GB/T	One each
10	Safety Gloves	Cotton Standard	5
11	Window Glass Breaker	Standard	1
12	Safety Shoe	Standard	5

Sl No	Items Name	Specification	Qty
13	Dust Bin	Standard	2
14	Hand Wash	Standard	5
15	First Aid-Kit	Standard	1
16	Fire Extinguisher	3 in One Standard	1
17	RFID Cards/Tags	EV Standard	2
18	Computer/Laptop	Standard	1
19	Tablet/Mobile	Standard	2
20	Internet Connection (with router)	Standard	1
21	Soldering Station	Standard	5

### Marks Distribution

Outcome	Outcome Code	Total Th marks	Total Pr marks
Apply basic Electrical / Electronics concept to use proper tools and measuring instruments to measure various electrical parameters.	PWR/3108/OC1	20	120
Demonstrate use of various Charging Technology for different types of charging in EV charges station.	PWR/3108/OC2	40	160
Demonstrate use of Software and set of programs required to access EV Charging System.	PWR/3108/OC3	40	120
Maintain an EV Charging Station and Troubleshoot problems as per SOP.	PWR/3108/OC4	60	200
Work effectively in real work place Implementing practices related to gender and PwD sensitization	PWR/3108/OC5	20	100
Apply health and safety practices at the workplace.	PWR/3108/OC6	20	100