Model Curriculum

QP Name: MEP Supervisor - Maintenance

QP Code: ICE/CONS/24/Q1001

Version: 1.0

NSQF Level: 5.0

Model Curriculum Version: 1.0

The Institution of Civil Engineers ||

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Table of Contents

Contents

Training Parameters 4

Program Overview 6

Training Outcomes 6

Compulsory Modules 6

Optional Modules 8

Module 1: Introduction to the role of a MEP Supervisor - Maintenance 9

Module 2: Basic Mechanical Fundamentals 10

Module 3: Heating, Ventilation, and Air Conditioning (HVAC) 12

Module 4: Maintenance of Mechanical Systems 14

Module 5: Handling and Preservation of Heavy-Duty Machines 16

Module 6: Basic Electrical Fundamentals 18

Module 7: AC Fundamentals 20

Module 8: Electric Supply System and Utilization 22

Module 9: Electrical Drawing 24

Module 10: Illumination Systems 25

Module 11: Basic Fundamentals Electronics 26

Module 12: Backup Systems 27

Module 13: Electrical Machines 29

Module 14: Diesel Generator 30

Module 15: Electrical Wiring 31

Module 16: Basic Low-Voltage systems 33

Module 17: Plumbing System 35

Module 18: Pumping of Water 38

Module 19: Computer Fundamentals 40

Module 20: Workplace Safety 42

Module 21: Fire Fighting 44

Module 22: Employability Skills 45

Module 23: Overview of Building Maintenance Systems 48

Module 24: Use and Control of BMS 49

Module 25: Automation 51

Module 26: On-the-Job Training 53

Annexure 54
Trainer Requirements 54
Assessor Requirements 55
Assessment Strategy 56
References 58
Glossary 58
Acronyms and Abbreviations 59

Training Parameters

Sector	Construction
Sub-Sector	Real Estate and Infrastructure Construction
Occupation	Facility Management
Country	India
NSQF Level	5.0
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3123.0302 & 3123.0400 & 3122.5600
Minimum Educational Qualification and Experience	*Completed 2nd year of diploma (after12th) with 1-year relevant experience in the MEP or electrical field OR *Completed 3-year diploma after 10th with 1.5-year relevant experience in the MEP or electrical field OR 12th Grade pass with 2-year relevant experience in the MEP or electrical field OR 10th Grade pass with 4-year relevant experience in the MEP or electrical field OR Previous relevant Qualification of NSQF Level 4.0 with 3-year relevant experience in the MEP or electrical field OR Previous relevant Qualification of NSQF Level 4.5 with 1.5-year relevant experience in the MEP or electrical field *Diploma in Civil OR Mechanical OR Electrical
Pre-Requisite License or Training	NA
Minimum Job Entry Age	20 Years
Last Reviewed On	30.05.2024
Next Review Date	29.05.2027
NSQC Approval Date	30.05.2024
QP Version	1.0
Model Curriculum Creation Date	30.05.2024

Model Curriculum Valid Up to Date	29.05.2027
Model Curriculum Version	1.0
Minimum Duration of the Course	510 Hours
Maximum Duration of the Course	600 Hours

Program Overview

This section summarises the end objectives of the program along with its duration.

Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills to:

- Discuss the maintenance and repair of different mechanical systems in a building.
- Elaborate on the operation and maintenance of heavy-duty machinery relevant to MEP work.
- Discuss the importance of supervising electrical works in ensuring safety and efficiency within a building infrastructure.
- Describe the process of supervising the fixing of conduits and LV wiring, highlighting key considerations for effective implementation.
- Determine the role of supervising plumbing work and maintaining the plumbing system in upholding hygiene standards and preventing potential hazards.
- Explain the principles of water pumping, including the operation and maintenance of water pumps.
- Explain how computer and IT skills are applied in the context of supervising various tasks within infrastructure management.
- Elucidate strategies for ensuring effective hospitality, health, and safety measures in the workplace environment.
- Discuss the significance of employability skills in the role of supervision within infrastructure maintenance.
- Describe the responsibilities involved in supervising the maintenance of infrastructure and utilizing Building Management Systems (BMS) for optimal performance.

Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
ICE/N1101: Supervise the maintenance and repair of mechanical systems **NOS Version- 1.0** **NSQF Level- 5.0**	**20:00**	**40:00**	**60:00**	**00:00**	**120:00**
Module 1: Introduction to the role of a MEP Supervisor – Maintenance	02:00	00:00	00:00	00:00	02:00
Module 2: Basic Mechanical Fundamentals	03:00	10:00	05:00	00:00	18:00
Module 3: Heating, Ventilation, and Air Conditioning (HVAC)	05:00	10:00	20:00	00:00	35:00
Module 4: Maintenance of Mechanical Systems	05:00	10:00	20:00	00:00	35:00

Module 5: Handling and Preservation of Heavy-Duty Machines	05:00	10:00	15:00	00:00	30:00
ICE/N1102: Supervise the electrical works **NOS Version- 1.0** **NSQF Level- 5.0**	**30:00**	**60:00**	**60:00**	**00:00**	**150:00**
Module 6: Basic Electrical Fundamentals	01:00	02:00	00:00	00:00	03:00
Module 7: AC Fundamentals	02:00	04:00	04:00	00:00	10:00
Module 8: Electric Supply System and Utilization	02:00	07:00	04:00	00:00	13:00
Module 9: Electrical Drawing	02:00	06:00	07:00	00:00	15:00
Module 10: Illumination Systems	02:00	06:00	04:00	00:00	12:00
Module 11: Basic Fundamentals Electronics	01:00	03:00	00:00	00:00	04:00
Module 12: Backup Systems	02:00	08:00	09:00	00:00	19:00
Module 13: Electrical Machines	03:00	03:00	05:00	00:00	11:00
Module 14: Diesel Generator	05:00	07:00	09:00	00:00	21:00
Module 15: Electrical Wiring	05:00	07:00	09:00	00:00	21:00
Module 16: Basic Low-Voltage systems	05:00	07:00	09:00	00:00	21:00
ICE/N1103: Supervise the maintenance and repair of the plumbing system **NOS Version- 1.0** **NSQF Level- 5.0**	**20:00**	**40:00**	**60:00**	**00:00**	**120:00**
Module 17: Plumbing System	12:00	18:00	25:00	00:00	55:00
Module 18: Pumping of Water	08:00	22:00	35:00	00:00	65:00
ICE/N1104: Apply computer and IT skills at work **NOS Version- 1.0** **NSQF Level -5.0**	**10:00**	**20:00**	**00:00**	**00:00**	**30:00**
Module 19: Computer Fundamentals	10:00	20:00	00:00	00:00	30:00

ICE/N1105: Ensure adherence to health and safety guidelines at work **NOS Version- 1.0** **NSQF Level -5.0**	**10:00**	**20:00**	**00:00**	**00:00**	**30:00**
Module 20: Workplace Safety	05:00	10:00	00:00	00:00	15:00
Module 21: Fire Fighting	05:00	10:00	00:00	00:00	15:00
DGT/VSQ/N0102: Employability Skills **NOS Version- 1.0** **NSQF Level- 4.0**	**60:00**	**00:00**	**00:00**	**00:00**	**60:00**
Module 22: Employability Skills	60:00	00:00	00:00	00:00	60:00
Total Duration	**150:00**	**180:00**	**180:00**	**00:00**	**510:00**

Optional Modules

The table lists the modules and their duration corresponding to the Optional NOS of the QP.

Option 1: Building Management System (BMS)

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
ICE/N1106: Supervise the use and control of BMS **NOS Version- 1.0** **NSQF Level -5.0**	**30:00**	**30:00**	**30:00**	**00:00**	**90:00**
Module 23: Overview of Building Maintenance Systems	04:00	04:00	00:00	00:00	08:00
Module 24: Use and Control of BMS	06:00	06:00	08:00	00:00	20:00
Module 25: Automation	20:00	20:00	22:00	00:00	62:00
Total Duration	**30:00**	**30:00**	**30:00**	**00:00**	**90:00**

Module Details

Module 1: Introduction to the role of a MEP Supervisor - Maintenance

Mapped to ICE/N1101, v1.0

Terminal Outcomes:

- Discuss the job role of a MEP Supervisor - Maintenance.

Duration (in hours): 02:00	**Duration (in hours): 00:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the size and scope of the construction industry and its sub-sectors. • Discuss the role and responsibilities of a MEP Supervisor - Maintenance. • Identify various employment opportunities for a MEP Supervisor - Maintenance.	
Classroom Aids	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films	
Tools, Equipment and Other Requirements	
NA	

Module 2: Basic Mechanical Fundamentals

Mapped to ICE/N1101, v1.0

Terminal Outcomes:

- Describe the fundamental concepts of percentage, probability, ratio, and proportion and their application.
- Explain the principles of geometry and how geometric shapes are utilized in electrical system analysis.
- Discuss the practical applications of histograms and graphs in representing and interpreting electrical data.
- Demonstrate the calculation methods for speed, acceleration, force, power, and temperature.

Duration (in hours): 03:00	**Duration (in hours): 10:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the fundamental concepts of percentage, probability, ratio, and proportion in mathematical terms. • Explain the principles of geometry and how geometric shapes are analysed and measured. • Define histograms and graphs, and discuss their use in representing and interpreting data. • Explain the concepts of speed, acceleration, and force, including their units of measurement and calculation methods. • Discuss Newton's laws of motion. • Define power and temperature, and describe their effects and applications. • Define physical quantities, units, and conversions used in electrical engineering. • Discuss the practical applications of mathematics and physics in electrical systems. • Describe different types of pumps and elucidate their operations.	• Show how mathematical concepts such as percentage, probability, ratio, proportion, and geometry are applied in electrical engineering calculations. • Demonstrate how to create and interpret graphs and histograms. • Show how to perform temperature and power calculations. • Demonstrate the operations of different types of pumps.
Classroom Aids	
Computer, Peripherals (keyboard, mouse, monitor), Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	

Tools, Equipment and Other Requirements
Calculators or Computational Tools for Mathematical Calculations, Physics Demonstration Kits for Illustrating Concepts such as Force, Acceleration, and Temperature, Safety Equipment (Gloves, Goggles, etc.) for hands-on experiments

Module 3: Heating, Ventilation, and Air Conditioning (HVAC)

Mapped to ICE/N1101, v1.0

Terminal Outcomes:

- Discuss the basics of refrigeration and HVAC systems.
- Describe the components of an HVAC system.
- Elucidate the functions of key HVAC components.
- Explain the procedures for refrigerant handling and replacement.

Duration (in hours): 05:00	**Duration (in hours): 10:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the basics of refrigeration and Heating, Ventilation, and Air Conditioning (HVAC). • Elucidate the working cycles of HVAC systems. • Discuss the functions of different components in HVAC units. • Describe the functions of a compressor, condenser, evaporator, and refrigerants in HVAC systems. • Determine the proper procedures for handling and replacing refrigerants. • Explain the inspection and breakdown maintenance procedures for HVAC equipment. • Discuss the structural work required in a building for the installation of Mechanical, Electrical and Plumbing (MEP) systems. • Elaborate on how to read the MEP drawings, including the HVAC and building structural drawings.	• Demonstrate how to check the components of the critical HVAC system for correct functioning. • Show how to ensure workers understand mechanical drawings for HVAC equipment. • Demonstrate how to inspect the compressor for appropriate functioning and identify common problems arising from compressor failure. • Show how to ensure applicable procedures and checklists are followed for preventive, predictive, and corrective maintenance of HVAC equipment/system. • Demonstrate how to check the functionality of various control components, such as the thermostat, time delay relay, solenoid valves, relays, and contactors. • Show how to analyse circuit diagrams to determine the operating sequence of micro-processor-controlled systems.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Thermometer, Pressure Gauge, Heat Exchanger, Refrigerant, Compressor, Condenser, Expansion Valve, Evaporator, Air Handler, Ductwork, Thermostat, Fan, Filter, Blower Motor, Refrigerant Lines,	

Control Board, Multimeter, Capacitor Tester, Coil Cleaner, Leak Detector, Vacuum Pump, Recovery Machine, Charging Hose, Scale, Recovery Tank, Inspection Mirror, Lubrication Gun, Wiring Tester

Module 4: Maintenance of Mechanical Systems

Mapped to ICE/N1101, v1.0

Terminal Outcomes:

- Describe the maintenance procedure for different mechanical systems used in a building.

Duration (in hours): 05:00	**Duration (in hours): 10:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the need of different mechanical systems used in buildings, e.g. HVAC, fire protection, building automation systems, etc. • List the components and functions of different mechanical systems. • List the tools and equipment required for the maintenance and repair of mechanical systems. • Explain how to interpret and analyse building blueprints, mechanical drawings, and specifications. • Discuss the building codes, safety regulations, and industry standards relevant to mechanical systems used in buildings. • Explain the importance of effective collaboration with other trades (e.g., electrical, structural) during the maintenance of mechanical systems. • Describe the relevant commissioning procedures. • Explain the importance of developing and implementing maintenance plans for different mechanical systems.	• Demonstrate the appropriate techniques for safe and efficient maintenance and repair of various mechanical systems. • Show how to proficiently use the relevant tools and equipment for the maintenance and repair of mechanical systems. • Demonstrate how to conduct appropriate tests on mechanical systems to ensure their proper functioning and performance.
Classroom Aids	
Training Kit - Trainer Guide, Projector/LED Monitor, Computer/ Laptop, Presentations, Black/ Whiteboard, Marker, Projector, Video	
Tools, Equipment and Other Requirements	

Wrenches and Spanners, Screwdrivers, Pliers, Claw Hammer, Ball-peen Hammer, Allen Keys/Hex Wrenches, Utility Knife, Tape Measure, Spirit Level, Multimeter, Thermometer, Manometer, Flow Meter, Anemometer, Clamp Meter, Thermal Imaging Camera, Insulation Resistance Tester (Megger), Wire Strippers, Crimping Tools, Conduit Benders, Fish Tape, Soldering Iron, Voltage Tester, Refrigerant Gauge, Vacuum Pump, Pipe Cutters and Benders, Fin Comb, Leak Detector, Manifold Gauge Set, Pipe Wrenches, Tube Cutters, Threading Kit, Plumbing Torch, Plunger and Auger, Pressure Test Kit, Power Drills, Angle Grinder, Circular Saw, Reciprocating Saw, Jigsaw

Module 5: Handling and Preservation of Heavy-Duty Machines

Mapped to ICE/N1101, v1.0

Terminal Outcomes:

- Describe the handling and preservation of heavy-duty machines used in MEP work.

Duration (in hours): 05:00	**Duration (in hours): 10:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss the specifications and functions of various heavy-duty machines used in MEP work. • Explain the appropriate safety protocols and risk management strategies for operating and maintaining heavy-duty machinery. • Describe how to achieve operational proficiency while using heavy-duty machines for MEP tasks. • Explain the importance of carrying out preventive maintenance of the heavy machinery. • Explain the importance of using the repair tools and components recommended by the Original Equipment Manufacturer (OEM) for repairs. • Discuss the industry regulations and standards applicable to use and maintenance of relevant heavy-duty machinery. • Explain the significance of maintaining clear and accurate communication during the operation and maintenance of heavy-duty machinery.	• Demonstrate the use of different heavy-duty machinery in MEP work, including their controls and safe manoeuvring. • Show how to diagnose common mechanical, electrical, and hydraulic issues in heavy-duty machines. • Demonstrate how to carry out regular repair and maintenance of the relevant heavy machinery. • Prepare sample records for the repair and maintenance of heavy-duty machinery.
Classroom Aids	
Training Kit - Trainer Guide, Projector/LED Monitor, Computer/ Laptop, Presentations, Black/ Whiteboard, Marker, Projector, Video	
Tools, Equipment and Other Requirements	
Forklifts, Cranes, Trenchers, Wrenches and Spanners, Screwdrivers, Pliers, Claw Hammer, Ball-peen Hammer, Allen Keys/Hex Wrenches, Utility Knife, Tape Measure, Calipers and Micrometers, Pressure Gauges, Flow Meters, Thermometers, Vibration Analyzer, Tachometer, Insulation	

Resistance Tester (Megger), Clamp Meter, Wire Strippers and Crimpers, Soldering Iron, Voltage Tester, Hydraulic Jacks, Hydraulic Press, Pneumatic Wrenches, Hose Crimping Tool, Leak Detection Equipment, Engine Hoist/Crane, Load Testers, Bearing Pullers and Installers, Gear Pullers, Chain Hoists and Come-Alongs, Alignment Tools, Torque Multipliers, Grease Guns, Battery Testers and Chargers

Module 6: Basic Electrical Fundamentals

Mapped to ICE/N1102, v1.0

Terminal Outcomes:

- Explain the fundamental principles of electricity and its workings, including current, potential difference, and EMF.
- Describe materials used in circuits: conductors, insulators, semiconductors.
- Elucidate Ohm's Law, resistance, and resistor behaviour in series and parallel circuits; list practical applications of Ohm's Law.
- Explain the types of circuit connections: series, parallel, and combination circuits.
- Demonstrate measuring voltage, current, power, and energy using instruments; show troubleshooting skills for electrical tools and equipment.

Duration (in hours): 01:00	**Duration (in hours): 02:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the fundamental principles of electricity and how it works. • Describe the different types of materials used in electrical circuits, including conductors, insulators, and semiconductors. • Define the concepts of current, potential difference, and Electromotive force (EMF) in electrical circuits. • Elucidate Ohm's Law, resistance, and the behaviour of resistors in series and parallel circuits. • List the practical applications of Ohm's Law in electrical circuits. • Describe the phenomenon of voltage drop in circuits, along with the voltage divider rule, in both series and parallel configurations. • Explain the various types of circuit connections used in electrical systems. • Define electrical work, power, and energy, and explain their relationships in electrical circuits. • Explain the effects of electric current, including heating, magnetic, and chemical effects.	• Show the process of determining electrical work requirements. • Demonstrate how to ensure the availability of appropriate tools and equipment based on work requirements. • Demonstrate the identification and classification of different types of materials used in electrical circuits. • Demonstrate the meaning and use of different MEP symbols. • Show how to supervise checks on equipment to ensure correct functioning and usability. • Demonstrate methods for measuring voltage, current, power, and energy in electrical systems using appropriate measuring instruments. • Show practical demonstrations of the effects of electric current, including heating, magnetic, and chemical effects, using resistive, inductive, and capacitive loads. • Demonstrate directing relevant workers to troubleshoot issues with tools and equipment.

• Define voltage and current and explain their significance in electrical circuits. • Explain the selection and use of appropriate tools and equipment for electrical works. • Describe the different effects of electric current on materials and devices.	
Classroom Aids	
Computer, Peripherals (keyboard, mouse, monitor), Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Multimeter, Power supply, Various resistors (different values and wattages), Breadboard, Wires and cables, Voltage and current probes, Battery, Light bulbs or LED bulbs, Diodes, Capacitors, Inductors, Switches, Insulation materials (e.g., electrical tape), Soldering iron and solder, Circuit simulator software (for virtual demonstrations), Safety goggles and gloves, Circuit components kit (including conductors, insulators, and semiconductors)	

Module 7: AC Fundamentals

Mapped to ICE/N1102, v1.0

Terminal Outcomes:

- Describe the fundamental differences between AC and DC, including their characteristics and applications in electrical systems.
- Explain the concepts of resistance, capacitance, and inductance, and their roles in electrical circuits.
- Explore the behaviour of R-L, R-C, and R-L-C series circuits, and understand their practical implications in circuit design.
- Discuss advanced topics such as power factor, 3-phase EMF generation, and load balancing, and their significance in electrical engineering and power systems.

Duration (in hours): 02:00	**Duration (in hours): 04:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Differentiate between AC (Alternating Current) and DC (Direct Current) and explain their characteristics. • Explain the advantages of AC over DC in electrical power transmission and distribution. • Describe the characteristics of a sinusoidal waveform in AC circuits. • Define resistance, capacitance, and inductance, and explain their roles in electrical circuits. • Differentiate between R-L, R-C, and R-L-C series circuits and explain their characteristics. • Explain the concept of active, reactive, and apparent power in electrical systems. • Describe the importance of power factor and methods for its improvement. • Explain the concept of the power triangle and its significance in electrical engineering. • Describe the principle of 3-phase EMF generation and its waveform. • Explain the concept of load balancing in electrical power distribution systems.	• Demonstrate the practical construction of simple AC and DC circuits using basic components such as resistors, capacitors, and diodes. • Show the use of appropriate tools and equipment to examine electrical units for power interruptions and continuity. • Demonstrate measuring the size and dimension of wires and conduits using appropriate tools. • Show the proper use of tools to cut and bend wires and conduits. • Demonstrate splicing wires by stripping insulation and twisting wires together using relevant tools.

Classroom Aids
Computer, Peripherals (keyboard, mouse, monitor), Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook
Tools, Equipment and Other Requirements
Oscilloscope (to visualize AC waveforms), Function generator (for generating AC signals), Multimeter (for measuring voltage, current, and resistance), Power supply (for providing DC power), Resistors, capacitors, and inductors (for building circuits and demonstrations), Circuit simulator software (for virtual demonstrations), Power analyzer (for analysing power quality and power factor), Load bank (for testing power systems), Three-phase generator (for demonstrating 3-phase EMF generation), Wire strippers and cutters (for working with wires and conduits), Conduit bender (for bending conduits to desired shapes), Insulation strippers (for stripping insulation from wires), Twist-on wire connectors (for splicing wires), Reference materials (books, diagrams, etc.), Safety goggles and gloves

Module 8: Electric Supply System and Utilization

Mapped to ICE/N1102, v1.0

Terminal Outcomes:

- Describe the various components and configurations of a Supply System, including its infrastructure and distribution network.
- Explain the processes involved in Generation & Transmission of electrical power, from power plant to end-users.
- Discuss the concept of Tariff, its calculation, and utilization in the context of electricity bills.
- Explore the workings and functionalities of a Power Plant, including its types, operations, and contribution.

Duration (in hours): 02:00	**Duration (in hours): 07:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the electricity supply system, including generation, transmission, and utilization. • Explain the principles underlying electricity generation, focusing on the methods employed in power plants. • Describe the transmission of electricity from power plants to end-users. • Describe the concept of tariff in electricity supply, explaining its purpose and structure. • Explain the utilization of tariff in the electricity industry. • Discuss the calculation of electricity bills. • Explain the importance and functioning of power plants in generating electricity. • Explain the functioning and maintenance of electrical control panels.	• Show how to identify parts of the electricity system like power plants and transmission lines. • Demonstrate how to measure electricity using relevant tools. • Show how to fix common problems with electricity systems.
Classroom Aids	
Computer, Peripherals (keyboard, mouse, monitor), Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	

Power generation model or diagram (to illustrate electricity generation), Transmission line model or diagram (to demonstrate electricity transmission), Utility bill examples (to explain tariff calculation and electricity bills), Power plant diagram or model (to show the functioning of power plants), Conduit threading tools (such as conduit threader or dies), Conduit support brackets and couplings, Digital ammeter, multimeter, tong tester, and earth tester (for hands-on demonstrations), Power connections (sockets, switches, etc.), Electrical wires and cables

Module 9: Electrical Drawing

Mapped to ICE/N1102, v1.0

Terminal Outcomes:

- Explain the significance of Electrical Symbols and their application in constructing simple electric circuits.
- Describe the process of creating Electrical Diagrams using standard circuit symbols and interpreting their components.
- Show proficiency in identifying and observing Standard Components commonly used in electrical systems.
- Demonstrate the ability to read, interpret, and implement electrical system drawings.

Duration (in hours): 02:00	**Duration (in hours): 06:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Define electrical drawings. • Explain the use of different electrical symbols used in electrical drawings as per industry standards. • Discuss the design principles of simple electric circuits using standard electrical symbols. • Describe the procedure for interpreting electrical system drawings. • Explain the concepts and procedures involved in lamp circuits, godown wiring, and staircase wiring. • Describe different types of light fixtures and their applications. • Discuss general and factory lighting techniques in electrical systems.	• Demonstrate the use of electronic circuit diagrams. • Demonstrate the preparation of electrical diagrams using standard electrical circuit symbols. • Show the observation of standard components.
Classroom Aids	
Computer, Peripherals (keyboard, mouse, monitor), Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Electrical drawings and schematics, Electrical symbols chart or guide, Whiteboard or projector/screen, Electrical circuit design software, Printed circuit boards (PCBs) or breadboards Various electronic components, Light fixtures samples, Lighting design software, Digital multimeter, Electrical wiring and connections	

Module 10: Illumination Systems

Mapped to ICE/N1102, v1.0

Terminal Outcomes:

- Describe the different types of light fixtures, including their characteristics and applications in lighting systems.
- Explain the procedure for installing diffusing fittings in electrical systems.

Duration (in hours): 02:00	**Duration (in hours): 06:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the different types of light Fixtures. • Explain the procedure for diffusing fittings in electrical systems. • Describe the use of concentrating reflectors in lighting systems. • Discuss the wiring practices for electrical systems.	• Show the appropriate lights selection as per illumination requirements. • Demonstrate the maintenance of lights using relevant tools and equipment. • Show the laying of cables through ducts or conduits and pulling wires to connection boxes or distribution boards.
Classroom Aids	
Computer, Peripherals (keyboard, mouse, monitor), Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Samples of different types of light fixtures, Demonstrative materials for diffusing fittings (e.g., diffusers, lenses), Samples or diagrams showing concentrating reflectors, examples or guidelines for wiring practices at construction sites, Lighting selection guide based on illumination requirements, Lighting installation kit including accessories, brackets, screws, and bolts, Electrical wiring materials (wires, connectors, junction boxes), Safety equipment (gloves, goggles, etc.)	

Module 11: Basic Fundamentals Electronics

Mapped to ICE/N1102, v1.0

Terminal Outcomes:

- Explain the fundamentals of electronics, key concepts, and principles.
- Describe basic electronic components, highlighting their functions and applications.
- Demonstrate the assembly of electronic circuit diagrams and the practical implementation of wiring techniques in electronic circuits.

Duration (in hours): 01:00	**Duration (in hours): 03:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the basic principles of electronics. • Describe the basic electronic components and circuits used in electrical systems. • Explain the interpretation of electronic circuit diagrams in electrical engineering. • Explain the principles of voltage regulation in electrical circuits. • Discuss the applications and functions of diodes and transistors in electronic circuits.	• Demonstrate the application of basic electronics principles. • Show checking the functionality of various control components such as thermostats, time delay relays, solenoid valves, relays, and contactors. • Guide in analysing circuit diagrams to determine the operating sequence of microprocessor-controlled systems. • Show the threading of conduit ends appropriately as per standard procedures. • Demonstrate the connection of couplings and fabrication of conduit support brackets using appropriate tools. • Show the use of digital ammeter, multimeter, tong tester, and earth tester for installing and repairing power connections.
Classroom Aids	
Computer, Peripherals (keyboard, mouse, monitor), Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Samples of basic electronic components (resistors, capacitors, inductors, diodes, transistors), Electronic circuit demonstration board or kit, Circuit diagrams for interpretation exercises, Voltage regulation demonstration kit, Diodes and transistors samples or diagrams, Breadboard for circuit prototyping, Multimeter for measuring circuit parameters, Oscilloscope for visualizing electronic signals, Safety equipment (gloves, goggles, etc.)	

Module 12: Backup Systems

Mapped to ICE/N1102, v1.0

Terminal Outcomes:

- Explain the function of batteries and cells function in backup systems and discuss their capacity and ratings.
- Describe how inverters and Uninterruptible Power Supplies (UPS) work in backup systems and show how they are connected.
- Describe the use of generators in backup systems for residential areas, malls, and hotels.
- Demonstrate how to install and connect generators.

Duration (in hours): 02:00	**Duration (in hours): 08:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Elucidate the rules governing electronic connections in electrical circuits. • Describe the types of batteries and cells used in electrical applications. • Explain the current capacity and rating of batteries in electrical systems. • Define the concept of battery management systems (BMS) and their role in optimizing battery performance and lifespan. • Discuss the working principles and connections of inverters and uninterruptible power supply (UPS) systems. • Describe the various types of inverters, including grid-tied, off-grid, and hybrid models, and compare their features and applications. • Explain the usage of generators in residential, commercial, and industrial settings. • Explore the factors affecting generator sizing and selection for different load requirements, considering aspects such as power output, fuel type, and runtime. • Explain the air hazard and symptoms of carbon monoxide poisoning, and implement appropriate preventive and remedial measures	• Demonstrate how to fit and connect batteries and cells in electrical systems. • Show the process of testing and measuring the current capacity and rating of batteries using appropriate instrumentation. • Show inspecting the regulation of power flow from the generator to the load to match phase sequence, frequency, and voltage. • Demonstrate monitoring and mapping the performance of diesel generators. • Show how to identify the mechanical and thermal hazards associated with diesel engines. • Show how to identify the electrical hazards associated with automatic transfer switch, bad wiring connections, DC batteries (24-to-30-volt DC), generator voltage (415 VAC) and implement the appropriate preventive measures. • Demonstrate implementing the standard procedure for Planned Preventative Maintenance (PPM) of diesel generators to reduce breakdowns.

Classroom Aids
Computer, Peripherals (keyboard, mouse, monitor), Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook
Tools, Equipment and Other Requirements
Demonstration Board or Kit Showing Electronic Connections and Circuit Rules, Samples or Diagrams of Different Types of Batteries and Cells, Battery Capacity and Rating Demonstration Materials, Inverter and UPS System Demonstration Kit, Generator Samples or Diagrams, Diesel Generator Monitoring System, Safety Equipment for Diesel Generator Operation (Fire Extinguishers, Protective Gear)

Module 13: Electrical Machines

Mapped to ICE/N1102, v1.0

Terminal Outcomes:

- Describe the various types of motors, breakers and transformers and their applications.
- Describe the components and functions of electrical panels and distribution boards (DBs).
- Explain the purpose and operation of Automatic Power Factor Correction (APFC) Panels.
- Demonstrate the maintenance process of an HVAC equipment.

Duration (in hours): 03:00	**Duration (in hours): 03:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the different types of motors and their starting connections. • Describe the functioning and types of transformers used in electrical systems. • Explain the wiring and components of a transformer and their respective functions. • Describe the cooling systems employed in transformers. • Discuss the functioning of breakers, substation equipment, electrical panels, and distribution boards (DB) in electrical systems. • Explain the purpose and usage of Automatic Power Factor Control (APFC) Panels.	• Show checking components of critical HVAC systems for correct functioning. • Demonstrate understanding mechanical drawings for HVAC equipment. • Show inspection of the compressor and identification of common problems. • Demonstrate following procedures and checklists for HVAC equipment maintenance. • Show checking functionality of various control components such as thermostat, time delay relay, solenoid valves, relays, and contactors. • Demonstrate analysing circuit diagrams to determine operating sequences of microprocessor-controlled systems.
Classroom Aids	
Computer, Peripherals (keyboard, mouse, monitor), Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Samples or diagrams of different types of motors, Motor starting connections demonstration kit, Transformer samples or diagrams, Transformer components kit (windings, core, insulation), Cooling system demonstration materials (e.g., cooling fans, radiators), Breaker, substation equipment, electrical panel, and distribution board samples or diagrams, Automatic Power Factor Control (APFC) Panel demonstration kit, Electrical wiring materials (wires, connectors, junction boxes), Safety equipment (gloves, goggles, etc.)	

Module 14: Diesel Generator

Mapped to ICE/N1102, v1.0

Terminal Outcomes:

- Explain the importance of a building maintenance system.
- Elucidate the types of facilities and components integrated into a BMS.
- Discuss the introductory concepts of engineering and provide an organizational chart.
- Describe the duties and responsibilities of a BMS supervisor.

Duration (in hours): 05:00	**Duration (in hours): 07:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain diesel generators and their applications in residential, commercial, and industrial settings. • Elucidate the differences between AC generators and DC generators and their respective advantages in various applications. • Discuss the inspection procedures for generators and the importance of breakdown maintenance in ensuring their reliability. • Describe the utilization of generators in residences, malls, and hotels, highlighting their role in ensuring uninterrupted power supply and backup during outages.	• Show how to monitor and map the performance of diesel generators. • Demonstrate the functioning, inspection, and breakdown maintenance of AC and DC generators. • Demonstrate how to identify the problems associated with the operation of DG and ensure their resolution within the specified time. • Demonstrate how to check for the use of appropriate spares and tools for maintenance work on diesel generators. • Show how to implement the standard procedure for Planned Preventative Maintenance (PPM) of the DG to reduce breakdowns.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Multimeter, Insulation Tester, Load Bank, Fuel Quality Tester, Oil Analysis Kit, Cooling System Pressure Tester, Torque Wrench, Voltage Regulator, Transfer Switch, ATS (Automatic Transfer Switch), Circuit Breaker, Battery Charger, Fuel Transfer Pump, Exhaust Gas Analyzer, Megger Tester	

Module 15: Electrical Wiring

Mapped to ICE/N1102, v1.0

Terminal Outcomes:

- Explain the key considerations for the fitting of conduits.

Duration (in hours): 05:00	**Duration (in hours): 07:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the different methods of wiring considering factors such as safety, efficiency, and compliance with regulations. • Elucidate the types and sizes of wires and cables required for connection within conduit systems. • Discuss the importance of adhering to appropriate cabling and earthing practices as mandated by IE rules. • Explain the variety of wiring accessories such as connectors, terminals, and junction boxes, and their respective functions. • Describe the different types of conduiting commonly employed in electrical systems, outlining their features, advantages, and limitations. • Discuss the various conduit pipe wiring materials available and their suitability for different environments, considering factors such as durability and cost-effectiveness. • Explain the advantages and disadvantages of concealed conduiting methods in electrical systems, addressing considerations such as accessibility and aesthetics.	• Demonstrate how to evaluate building layouts for optimal LV wiring routing. • Show how to select appropriate conduit types and sizes according to wiring requirements and local regulations. • Show how to mark planned conduit routes on walls, ceilings, or floors, avoiding obstacles and maintaining proper clearances. • Show how to use hand and power tools for drilling, cutting, and bending conduits accurately. • Demonstrate how to determine conduit lengths needed for each segment of the route and instruct the workers to cut them to required lengths. • Show how to direct the workers to bend conduits to navigate corners or obstacles, ensuring smooth, and accurate bends. • Demonstrate how to ensure the fastening of conduits to building structures using appropriate fasteners, straps, or clamps. • Show how to instruct the workers to connect conduit segments using compatible fittings such as couplings, elbows, connectors, etc.

Classroom Aids
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop
Tools, Equipment and Other Requirements
Conduit Bender, Hacksaw, Pipe Cutter, Reaming Tool, Conduit Deburring Tool, Screwdriver, Drill, Fish Tape, Conduit Fittings (Connectors, Couplings, Elbows, etc.), Level, Tape Measure, Hammer, Conduit Straps or Clamps, Conduit Seals or Bushings, Wire Pulling Lubricant. Wire Strippers, Wire Cutters, Needle-Nose Pliers, Crimping Tool, Voltage Tester, Cable Ties, Wire Connectors (Wire Nuts), Fish Tape, Wire Pulling Lubricant, Screwdriver, Drill, Labelling Machine, Cable Staples, Electrical Tape, Wire Markers.

Module 16: Basic Low-Voltage systems

Mapped to ICE/N1102, v1.0

Terminal Outcomes:

- Describe the steps involved in overseeing the LV wiring process.
- Explain the basic low-voltage systems like TV and telephone, along with additional systems like internet, intercom, and security.
- Describe the role of fire sensors in these systems for safety.
- Explain the rules and standards for making connections in low-voltage systems.

Duration (in hours): 05:00	**Duration (in hours): 07:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss the Indian Electricity (IE) rules governing domestic and industrial wiring in the context of installing conduits and carrying out LV wiring. • Describe the types and use of wires and cables suitable for LV wiring. • Describe the basic low-voltage systems, such as TV and telephone systems. • Explain the operation and functions of intercom and security systems. • Discuss the functioning of fire sensors and their importance in safety systems. • Describe the operation and applications of various sensors used in electronic systems. • Describe the best practices for wiring, encompassing techniques for safe and efficient conduit fitting and LV wiring in compliance with regulations and standards. • Discuss the necessity of incorporating protective devices such as fuses, circuit breakers, MCBs, ELCBs, and relays in LV wiring systems to ensure safety and prevent electrical hazards. • Elucidate the use of different electrical symbols as per regulations	• Show how to determine the optimal cable routing and placement using construction site layout. • Demonstrate how to select appropriate single or three-phase cables based on load requirements and site conditions. • Show the workers how to cut cables according to specified lengths ensuring proper insulation and protection. • Demonstrate how to check that cables are secured using appropriate clamps and protective coverings to prevent damage. • Show how to check that the cables are connected to power sources, distribution panels, and site equipment according to electrical diagrams and specifications. • Demonstrate the necessary tests on the electrical circuit following the standard procedure. • Show how to supervise the fitting of required fixtures such as power sockets, switches, wires, MCBs, etc. • Show how to instruct the workers to securely install the Distribution Board (DB) and to connect it to the main power cable. • Show the inspection process of earthing of the panels as per the

and standards in electrical diagrams and plans for conduit fitting and LV wiring. • Discuss the principles involved in the design of simple electric circuits, including circuit layout, component selection, and connectivity considerations relevant to conduit fitting and LV wiring.	standard procedure. • Demonstrate the termination of low-voltage cables and tagging embedded electrical lines appropriately. • Demonstrate the use of various sensors in electronic systems, including calibration and testing procedures.
Classroom Aids	
Computer, Peripherals (keyboard, mouse, monitor), Projection Equipment, PowerPoint Presentation and software, Facilitator's Guide, Participant's Handbook	
Tools, Equipment and Other Requirements	
Samples or Diagrams of Basic Low-Voltage Systems (TV, Telephone), Intercom and Security System Demonstration Kit, Fire Sensor Demonstration Materials, Various Sensor Samples or Diagrams (Temperature Sensors, Motion Sensors, etc.), Low-Voltage Cable Termination Tools (Crimpers, Wire Strippers), Cable Tagging Materials (Labels, Markers), Electrical Line Tagging Materials (Tags, Labels), Safety Equipment (Gloves, Goggles, etc.)	

Module 17: Plumbing System

Mapped to ICE/N1103, v1.0

Terminal Outcomes:

- Explain the process of supervising the plumbing work.
- Elucidate the methods used to supervise the maintenance a plumbing system.

Duration (in hours): 12:00	**Duration (in hours): 18:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the different types of pipes, pipe joints utilized in plumbing systems. • Discuss the different types of taps and valves employed in plumbing systems and their respective functions. • Explain how to interpret plumbing system drawings. • Describe the typical piping layout in a residential or commercial plumbing system. • Determine the essential sanitary and kitchenware components integrated into plumbing systems. • Explain the inspection process for identifying and rectifying faults in a plumbing system, such as clearing choked pipes and blockages. • Discuss the selection and usage of appropriate plumbing tools, equipment, and accessories. • Explain the placement procedures for pipe assemblies. • Describe the procedure for assembling different types of pipe sections, tubing, and fittings. • Elucidate the cutting, threading, and bending procedures for pipes. • Elucidate how to plan and execute	• Demonstrate how to select appropriate plumbing tools and equipment based on work requirements. • Show how to supervise the assembling of pipe sections, tubing, and fittings using various joining methods. • Demonstrate how to identify and mark the position of pipe fittings and connections accurately. • Show how to instruct the workers to measure, cut, thread and bed pipe to the required angle, using hand and power tools or equipment. • Demonstrate the process of fitting pipe assemblies, fittings, valves, appliances, and fixtures using hand and power tools. • Demonstrate how to implement appropriate measures to prevent water leakage. • Demonstrate how to check the installed plumbing system for potential problems and identify their causes. • Show how to supervise the assembly of fittings, fixtures, and appropriate tools required for different plumbing tasks. • Demonstrate instructing the workers

plumbing connections around obstructions. • Describe different types of tests conducted on plumbing systems, including tests on joints, fixtures • Define the practices involved in the regular maintenance of plumbing systems. • Explain the principles of effective vendor management and communication in plumbing systems maintenance. • Explain the preparation of the plumbing system repair sequence, including assessment, inspection, and fault rectification processes. • Describe how to identify leaks in premises and use appropriate hardware for leak detection. • Define the operation principles of effluent/waste treatment plants, including wastewater treatment. • Elucidate the reverse osmosis (RO) water purification technology for sewage treatment plant (STP). • Explain the operation of sewage treatment plants and drainage systems. • Describe water testing procedures and safety standards applicable to plumbing systems. • Explain the process of water tank cleaning. • Describe the operation of hydro-pneumatic systems in plumbing systems. • Explain the functioning and maintenance of plumbing control panels. • Explain the practices for cleaning the	for replacing faulty pipe assemblies, fittings, valves, appliances, and fixtures using appropriate tools. • Show how to test joints and fixtures for proper functioning. • Show the proper maintenance activities for a plumbing system. • Demonstrate the appropriate measures to achieve quality finishing in the repair of sanitary fixtures and fittings. • Show how to ensure minimal wastage of material and minimal damage to other systems.

plumbing work area and disposing of waste according to waste management protocols.	
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Pipe Wrench, Adjustable Wrench, Pipe Cutter, Plumber's Tape (Teflon Tape), Plunger, Auger (Plumber's Snake), Pipe Fittings (Elbows, Couplings, Tees, etc.), Sealant (Pipe Dope), Torch and Solder (for Soldering Copper Pipes), Pipe Reamer, Hacksaw, Tape Measure, Level, Pliers, Screwdrivers, Pipe Inspection Camera (Optional for Diagnosing Issues).	

Module 18: Pumping of Water

Mapped to ICE/N1103, v1.0

Terminal Outcomes:

- Explain the functioning of different types of water pumps.
- Demonstrate the maintenance of different types of water pumps.

Duration (in hours): 08:00	**Duration (in hours): 22:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the basic principles of fluid dynamics and water pumping systems. • List different types of water pumps and their applications, e.g. hydromatic and borewell pumps. • Discuss the concept of energy efficiency in water pumping systems and the factors that influence it. • Explain the principles of hydraulic design, including the calculation of head, flow rate, and system curve. • Discuss the environmental considerations and impacts of water pumping, including energy consumption and sustainability practices. • Explain the selection of appropriate pumps for specific applications based on applicable factors. • Elaborate on how to calculate the water pressure and flow rate from overhead tanks.	• Demonstrate the process of installing and commissioning different types of water pumps. • Show how to use water pumps taking the necessary health and safety measures. • Demonstrate how to implement control systems and sensors to monitor and optimise water pumping operations. • Show how to carry out maintenance of water pumps, including the resolution of common issues.
Classroom Aids	
Training Kit - Trainer Guide, Projector/LED Monitor, Computer/ Laptop, Presentations, Black/ Whiteboard, Marker, Projector, Video	
Tools, Equipment and Other Requirements	
Centrifugal Pump, Submersible Pump, Positive Displacement Pump, Valves and Fittings, Piping Sections, Pump Seals and Bearings, Filtration Units, Hoses and Tubing, Pipe Wrenches, Spanners,	

Screwdrivers, Pliers, Allen Keys/Hex Wrenches, Pressure Gauges, Flow Meters, Multimeters, Calipers and Micrometers, Insulation Resistance Tester (Megger), Clamp Meter Soldering Iron

Module 19: Computer Fundamentals

Mapped to ICE/N1104, v1.0

Terminal Outcomes:

- Explain how to effectively use the appropriate operating system.
- Describe techniques for utilizing the Internet efficiently.
- Explain the functionalities of Microsoft Word.
- Describe the various features and functions of Microsoft Excel for data management.
- Elucidate the key components of Microsoft PowerPoint and demonstrate how to create impactful presentations.
- Discuss the fundamentals of computer networking and how to undertake networking tasks.
- Describe the process of undertaking e-commerce activities and the importance of e-commerce in modern business practices.

Duration (in hours): 10:00	**Duration (in hours): 20:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the components of a computer system, including hardware and software. • Define system software and application software. • Explain the use of different types of Operating Systems (OS). • Describe the features of various OS types and Network OS. • Describe the role of the operating system (OS) in managing computer resources. • List the steps to add and remove programs on a computer. • Elucidate basic Windows Explorer operations for file management. • Define the basic operations involved in email operations, including account creation, composing mails, and attaching files. • Describe the fundamentals of the Internet and how to surf the web effectively. • Explain the guidelines for chatting in official WhatsApp groups, emphasizing	• Show how to connect a computer to the Internet following the appropriate procedure. • Demonstrate basic computer networking tasks such as setting up a network connection and sharing files. • Demonstrate the use of different networking components for computer networking. • Show how to install a network interface card. • Explain the limitations and merits of network topologies. • Demonstrate accessing the Internet using a browser and applications. • Show how to perform basic Internet operations such as browsing websites, conducting online searches, and downloading information. • Demonstrate creating a personalized email account, exchanging emails, and engaging in text and voice chatting. • Show how to register on social media platforms.

chat etiquette for professional communication. • Describe the formal documentation and email etiquette necessary for official communication. • Describe the main features and functions of Microsoft Word, Excel, and PowerPoint. • Describe the concept and applications of computer networking. • Define e-commerce and discuss its significance in modern business practices.	• Demonstrate essential features and functions common to Microsoft Word, Excel, and PowerPoint. • Show how to use advanced features specific to each Microsoft Office application, such as Mail Merge in Word, formulas and functions in Excel, and slide transitions and animations in PowerPoint. • Demonstrate basic e-commerce transactions such as online shopping and payment processing. • Emphasize following appropriate e-commerce safety measures. • Demonstrate the IT ticket logging and handling procedure.
Classroom Aids	
Training Kit - Trainer Guide, Projector/LED Monitor, Computer/ Laptop, Presentations, Black/ Whiteboard, Marker, Projector, Video	
Tools, Equipment and Other Requirements	
Computer or Laptop with Microsoft Office Suite Installed, Operating System Installation Disk or USB Drive, User Manual or Online Documentation, Web Browser (E.G., Chrome, Firefox, Safari)	

Module 20: Workplace Safety

Mapped to ICE/N1105, v1.0

Terminal Outcomes:

- Discuss the importance of etiquette and hospitality in various settings.
- Describe strategies for upholding health and safety standards in the workplace.

Duration (in hours): 05:00	**Duration (in hours): 10:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the types of safety hazards commonly found at construction sites. • Elucidate the procedure for responding to accidents and other emergencies at a construction site. • Discuss the use of appropriate Personal Protective Equipment (PPE) based on various working conditions. • Describe the proper handling of relevant tools, equipment, and materials at a construction site. • Determine the effect of construction materials on health and the environment. • Explain the storage procedures for different types of waste at a construction site. • Describe housekeeping activities relevant to tasks at construction sites. • Discuss ways to manage infections in the workplace. • Explain different methods of cleaning, disinfection, sterilization, and sanitization at construction sites. • Describe the importance of adhering to work permits. • Elucidate Integrated Management System (IMS) and the quality policy. • Define the quality and Environment, Health & Safety (EHS) objectives.	• Demonstrate how to practice appropriate etiquette and disciplined behaviour at work. • Show how to use appropriate types of verbal and non-verbal communication at work. • Demonstrate maintaining professional and positive body language at work, including appropriate eye contact. • Show how to follow appropriate telephonic etiquette in the workplace. • Demonstrate maintaining a welcoming and positive behaviour with customers, while avoiding arguments. • Demonstrate maintaining appropriate body posture while lifting, handling, and carrying heavy objects. • Demonstrate the implementation of appropriate procedures during health and safety emergencies at work. • Demonstrate selecting and following the appropriate cleaning method for different types of floors. • Show how to maintain personal hygiene, including wearing clean clothes and regular handwashing. • Demonstrate different first aid practices, including Cardiopulmonary Resuscitation (CPR). • Demonstrate adherence to incident

	report procedures. • Demonstrate the preparations required for internal/external audits. • Show how to follow work instructions and utilize assigned control numbers.
Classroom Aids:	
Training Kit - Trainer Guide, Projector/LED Monitor, Computer/ Laptop, Presentations, Black/ Whiteboard, Marker, Projector, Video	
Tools, Equipment, and Other Requirements	
Personal Protective Equipment (PPE) such as Helmets, Goggles, Gloves, and Masks, First Aid Kits, Fire Extinguishers, Safety Barriers or Guardrails, Safety Inspection Checklists, Training Materials or Presentations On Health and Safety Procedures, Incident Reporting Forms	

Module 21: Fire Fighting

Mapped to ICE/N1105, v1.0

Terminal Outcomes:

- Describe the different types of fires that may occur at construction sites.

Duration (in hours): 05:00	**Duration (in hours): 10:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss the different types of fires that may occur at construction sites. • Discuss the importance of electrical safety measures in preventing workplace accidents. • Describe the key components of a comprehensive fire safety plan for a commercial building. • Explain the potential hazards associated with improper material handling in a warehouse setting. • Elucidate the steps involved in conducting a risk assessment for chemical substances in a laboratory environment. • Discuss the importance of regular safety assessments in identifying and mitigating workplace hazards. • Describe the protocol for evacuating a building during a fire emergency, emphasizing key safety measures. • Elucidate the procedure for operating different types of fire extinguishers.	• Demonstrate how to identify different types of hazards and risks in the workplace, such as slipping on a wet floor, tripping due to unattended objects, falls, and fire hazards. • Show how to prevent and control fire hazards in the workplace, including participating in fire drills to ensure personal preparedness to deal with fire emergencies. • Demonstrate how to check fire extinguishers for proper functioning and ensure their regular maintenance. • Show how to use the appropriate Personal Protective Equipment (PPE) to minimize safety hazards related to the use of equipment. • Demonstrate how to follow organizational procedures to respond to accidents and emergencies, ensuring immediate first aid for affected personnel. • Demonstrate the critical steps to be taken in administering first aid for a severe laceration in the workplace.
Classroom Aids:	
Training Kit - Trainer Guide, Projector/LED Monitor, Computer/ Laptop, Presentations, Black/ Whiteboard, Marker, Projector, Video	
Tools, Equipment, and Other Requirements	
Personal Protective Equipment (PPE) such as Helmets, Goggles, Gloves, and Masks, First Aid Kits, Fire Extinguishers, Safety Barriers or Guardrails, Safety Inspection Checklists, Training Materials or Presentations on Health and Safety Procedures, Incident Reporting Forms	

Module 22: Employability Skills

Mapped to DGT/VSQ/N0102, v1.0

Duration (in hours): 60:00

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 the 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. Elucidate the appropriate code of conduct.

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. Discuss the difference between job and career.
12. Create a career development plan with well-defined short- and long-term goals.

Communication Skills Duration: 5 Hours

13. Elucidate the importance of communication and professional communication.
14. Explain the importance of following verbal and non-verbal communication etiquette in various settings.
15. Elucidate the process of interacting with reporting superiors regarding job order, work output requirements, targets, performance indicators, and incentives.
16. Discuss how effective coordination ensures the timely completion of tasks in accordance with quality standards.
17. Describe the steps involved in ensuring the timely resolution of problems,

complaints, and delays through coordination with relevant personnel and superiors.

18. Determine the role of active communication and respect in achieving a smooth workflow and resolving work standards and quality-related concerns with personnel and superiors.
19. Explain the significance of maintaining appropriate documentation concerning completed work schedules as per organizational requirements.
20. Elucidate the importance of prioritizing teamwork and supporting team members in achieving shared goals.

Diversity & Inclusion Duration: 2.5 Hours

21. Describe the recommended practices for preventing sexual harassment, physical and verbal abuse, and the objectification of women in the workplace.
22. Discuss the appropriate safety precautions to follow while utilizing transportation facilities and during night trips, particularly concerning women's safety.
23. Elucidate the process for escalating issues related to abuse and sexual harassment in the workplace according to the POSH Act and organizational procedures.
24. Determine how to effectively educate co-workers on women's rights and the importance of showing respect to all genders, including persons with disabilities.

Financial and Legal Literacy Duration: 5 Hours

25. Outline the importance of selecting the right financial institution, product, and service.
26. Demonstrate how to carry out offline and online financial transactions, safely and securely.
27. List the common components of salary and compute income, expenditure, taxes, investments etc.
28. Discuss the legal rights, laws, and aids.
29. Elucidate the purchase, inspection, indenting, and recordkeeping procedure for stores.

Essential Digital Skills Duration: 10 Hours

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

Entrepreneurship Duration: 7 Hours

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

39. Describe the best practices for leading teams.
40. Explain the 5S Standards and their implementation for organize the workplace and create a productive work environment.
41. Explain how to manage clients, contractors, subordinates and labourers.

Customer Service Duration: 5 Hours

42. Explain the importance of implementing appropriate hygiene, grooming standards, and professional dress code at work to cater to different types of customers.
43. Elucidate the significance of practicing and encouraging active listening for effective communication with both customers and co-workers.
44. Discuss the methods used to ensure effective probing of customers to identify their needs and expectations.
45. Describe the strategies for maintaining effective communication with customers, keeping them informed regarding any issues and developments involving them.
46. Determine the steps involved in identifying and addressing customer dissatisfaction and complaints promptly and effectively.
47. Explain the importance of being fair and firm with staff to achieve work objectives and describe leave and attendance management.
48. Explain the importance of upskilling self and staff for continuous improvement.

Getting Ready for apprenticeship & Jobs Duration: 8 Hours

49. Create a professional Curriculum Vitae (CV)
50. Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively.
51. Discuss the significance of maintaining hygiene and confidence during an interview.
52. Elucidate how to give a personal introduction and present oneself.
53. Perform a mock interview.
54. List the steps for searching and registering for apprenticeship opportunities.

Module 23: Overview of Building Maintenance Systems

Mapped to ICE/N1106, v1.0

Terminal Outcomes:

- Explain the importance of Building Management Systems (BMS) in optimizing building performance.
- Identify the facilities and components integrated into a BMS.
- Discuss fundamental engineering concepts applicable to BMS planning.
- Describe the duties of a BMS supervisor in project management.

Duration (in hours): 04:00	**Duration (in hours): 04:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the importance of a Building Management System (BMS) in MEP (Mechanical, Electrical and Plumbing) systems optimization. • Elucidate the various types of facilities commonly found in the industry, emphasizing their integration into BMS. • List different BMS components. • Explain the architecture of a typical BMS. • Determine the duties and responsibilities of a BMS Supervisor within a maintenance framework, focusing on project planning and coordination.	• Show the functioning of various components of a BMS, including sensors, controllers, and communication protocols. • Illustrate the engineering principles and organizational chart associated with implementing a BMS, highlighting roles and communication channels within the project team.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
BMS Software, Computers/Laptops, Programmable Logic Controllers (PLCs), Sensors, Actuators, Control Panels, Ethernet Modules, Routers, Switches, VPN Software, etc.	

Module 24: Use and Control of BMS

Mapped to ICE/N1106, v1.0

Terminal Outcomes:

- Explain the use and control procedure for the BMS.

Duration (in hours): 06:00	**Duration (in hours): 06:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain how to analyse the data collected by the BMS through the monitoring of building systems. • Describe the implementation of control strategies such as scheduling, setpoint adjustments, and demand response to enhance efficiency. • Explain how BMS integrates with other building systems and technologies, such as Internet of Things (IoT) devices and renewable energy sources. • Describe the use of BMS to implement energy management practices and sustainability measures. • Discuss the security features of BMS and how to manage user access and permissions. • Discuss the relevant regulations, standards, and best practices concerning BMS operations. • Explain the importance of checking for software updates, and performing backup and routine system checks.	• Show the system navigation and user interface, including different functions of a BMS software. • Demonstrate how to control HVAC, lighting, security, and other building systems using BMS. • Show how to apply various control strategies to optimise building system performance using BMS. • Demonstrate how to identify, acknowledge, and respond to alarms, and perform root cause analysis to resolve issues. • Show how to perform routine maintenance and install software updates on the BMS to ensure its continued reliability and effectiveness.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Various sensors and transducers (e.g., temperature sensors, motion sensors), Control panels and communication devices (e.g., HVAC controllers, Modbus devices), Fire alarm system components (e.g., smoke detectors, fire alarm control panel), Security system components (e.g., CCTV cameras, access control systems), Sensors, Controller programming software or tools, Programming block diagram software (e.g., PLC programming software), Multimeter for testing sensors and controllers,	

Wiring tools (e.g., wire strippers, crimpers), Hand tools (e.g., screwdrivers, pliers), Personal protective equipment (e.g., safety goggles, gloves), Access to BMS components for hands-on training (e.g., demonstration kits, mock setups).

Module 25: Automation

Mapped to ICE/N1106, v1.0

Terminal Outcomes:

- Discuss how to monitor and control the BMS.

Duration (in hours): 20:00	Duration (in hours): 20:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss the benefits of building automation. • Determine the building automation system and explain its functioning. • Describe how to monitor and control the BMS (Building Management System). • Describe the use of hardware and software System Controllers. • Explain the importance and applications of sensors and actuators in BIM. • Elucidate the domestic network and device interconnection. • Determine how to control lighting, audio, video, acoustics, Fire Alarm System, and CCTV in BIM. • Describe the maintenance procedures for different types of CCTV systems. • Explain the operation of DVR systems and their synchronization with CCTV. • Define the maintenance, fault-finding, and repair processes of fire detection, control circuits, and sprinklers. • Describe the maintenance procedures for firefighting pumps. • Discuss the benefits and functioning of the Access Control System. • Explain the handing/taking over process for the access control system. • Describe how to monitor and	• Show how to utilize and apply access control systems effectively. • Demonstrate how to monitor the operation and control of various components such as power supply systems, locks, and alarms. • Show how to use appropriate software for monitoring the building automation system. • Demonstrate how to diagnose battery problems using a multi-meter and effectively manage incidents while maintaining accurate records. • Show how to ensure the proper utilization of CCTV systems, fire alarms, and firefighting systems according to standard procedures. • Demonstrate how to identify the types and components of cameras and fire alarm systems, and record both analogue and digital footage. • Show how to check the condition of cables, connectors, and batteries in the fire alarm system. • Demonstrate how to verify the correct functioning of different functions of the fire alarm system such as silence, reset, fire drill, faults, logs, and the operation and types of sprinkler systems. • Show how to check and verify the time, date, detector sensitivity, firefighting system, alarm sensors, and other essential components in the fire alarm system. • Demonstrate how to inspect,

control the BMS. • Explain the working principle of lifts and elevators. • Elucidate the monitoring of AMCs (Annual Maintenance Contracts) and the SLA (Service Level Agreement) for every AMC. • Elucidate interior guidelines and enforcement procedures. • Describe documentation adherence and familiarization with IP Multimedia System (IMS). • Explain stores and material management procedures and the updating process in registers.	maintain, and fault-find lifts and elevators, and show how to monitor lift and elevator service reports. • Demonstrate the establishment and implementation of an escalation matrix.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Programmable Logic Controllers (PLCs), Building Management System (BMS) software, Occupancy sensors, Temperature sensors, Motion sensors, Thermostats, HVAC actuators, Lighting actuators, Ethernet cables, Wi-Fi routers, Zigbee or Z-Wave devices, Lighting control panels, Audio/video receivers, Speakers, Fire alarm control panels, CCTV cameras, Video management software, Keycard readers, Biometric scanners (fingerprint, facial recognition), Electronic door locks, Access control software, Supervisory Control and Data Acquisition (SCADA) system, Human Machine Interface (HMI) panels, Remote terminal units (RTUs)	

Module 26: On-the-Job Training

Mapped to MEP Supervisor - Maintenance

Mandatory Duration (in hours): 210:00	Recommended Duration (in hours): 00:00
Location: On-Site	

Terminal Outcomes

- Demonstrate understanding of fundamental principles of electricity, including current, potential difference, and EMF.
- Show how to elucidate Ohm's Law, resistance, and behaviour of resistors in series and parallel circuits, list practical applications.
- Demonstrate types of circuit connections: series, parallel, and combination.
- Show how to measure voltage, current, power, and energy using instruments and troubleshoot electrical tools and equipment.
- Explain differences between AC and DC, including characteristics and applications.
- Demonstrate understanding of concepts of resistance, capacitance, and inductance in electrical circuits.
- Show how to explore R-L, R-C, and R-L-C series circuits and their practical implications.
- Demonstrate understanding of advanced topics like power factor, 3-phase EMF generation, and load balancing in electrical engineering.
- Show how to describe components and configurations of a Supply System and its distribution network.
- Demonstrate understanding of processes involved in Generation & Transmission of electrical power.
- Show how to discuss Tariff calculation and utilization in electricity bills.
- Demonstrate understanding of workings and functionalities of Power Plants.
- Show how to describe the process of creating Electrical Diagrams using standard symbols.
- Demonstrate proficiency in identifying Standard Components used in electrical systems.
- Show how to interpret Electrical System Drawings effectively.
- Demonstrate understanding of various types of motors, breakers, and transformers and their applications.
- Show how to explain the purpose and operation of Automatic Power Factor Correction (APFC) Panels.
- Demonstrate maintenance process of HVAC equipment effectively.
- Show how to discuss basics of refrigeration and HVAC systems.
- Demonstrate proficiency in monitoring and controlling BMS effectively.

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialisation**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
B. Tech	Electrical Engineering or Electrical and Electronics Engineering or Mechanical Engineering	3	Mechanical, Electrical and Plumbing (MEP)	0	-	
Diploma	Electrical/ Mechanical domain	5	Mechanical, Electrical and Plumbing (MEP)	0	-	
ITI	Electrical/ Mechanical domain	7	Mechanical, Electrical and Plumbing (MEP)	0	-	

Trainer Certification	
Domain Certification	**Platform Certification**
Certified for Job Role "MEP Supervisor - Maintenance", mapped to QP: "ICE/CONS/24/Q1001, v1.0", Minimum accepted score is 80%	Recommended that the Trainer is certified for the Job Role: "Trainer (VET and Skills)", mapped to the Qualification Pack: "MEP/Q2601, v2.0". The minimum accepted score as per MEPSC guidelines is 80%.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training/Assessment Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
B. Tech	Electrical Engineering or Electrical and Electronics Engineering	3	Mechanical, Electrical and Plumbing (MEP)	0	-	
Diploma	Electrical Engineering or Electrical Trades	6	Mechanical, Electrical and Plumbing (MEP)	0	-	
ITI	Electrician or Electrical Technician	8	Mechanical, Electrical and Plumbing (MEP)	0	-	

Assessor Certification	
Domain Certification	**Platform Certification**
Certified for Job Role "MEP Supervisor - Maintenance", mapped to QP: "ICE/CONS/24/Q1001, v1.0", Minimum accepted score is 80%	Certified for the Job Role: "Assessor (VET and Skills)", mapped to the Qualification Pack: "MEP/Q2701, v2.0", with a minimum score of 80%.

Assessment Strategy

This section includes the processes involved in identifying, gathering, and interpreting information to evaluate the Candidate on the required competencies of the program.

1. Assessment System Overview:

- Batches assigned to the assessment agencies for conducting the assessment on SIP
- The batch allocation Matrix prepared for each month based on previous months' performance of AAs, which determines the quantum of Assessment which can be allocated to each AA for a month
- Post allocation of assessment, Assessment agencies send the assessment confirmation to SSC
- Assessment agency deploys the ToA certified Assessor for executing the assessment
- SSC monitors the assessment process.

2. Testing Environment:

- A combination of Theory and practical/demonstration test is deployed to assess knowledge and Skill respectively of Learners.
- Assessment is conducted at Training center in in-person/offline mode
- For Skill assessment, environment is simulated to create a realistic Working Environment that should replicate the key features of the workplace. In job roles, where it is difficult to replicate the same, the OJT assessment is implemented.
- During the practical task, trainees are assessed on their workmanship, quality of finished product, time management, etc., based on the performance criteria (PC), knowledge and understanding and their professional and soft skills as specified in the qualification pack.
- Knowledge assessment is done through closed ended questions up to level 4 and from level 5 onwards, it is mixture of open ended and closed ended questions

3. Assessment Quality Assurance levels/Framework

- Assessment criteria is developed for each QP which acts as a guide for developing question set /banks
- Sample questions aligned with Assessment criteria for each QP are developed by SSC and validated by industry
- Taking reference of Assessment criteria and Sample Questions, AAs create the question bank which is further validated by SSC
- Questions are mapped to the specified assessment criteria
- It is mandatory that Assessor and Trainer must be ToA certified & ToT Certified respectively
- Continuous Monitoring through virtual and In-person mode are conducted to ensure the assessment is conducted as per stipulated process
- Process and Technical audit of assessment batches by quality team are conducted to avoid the errors in assessment process
- A well -defined comprehensive framework of NON-COMPLIANCE MATRIX is defined and implemented to identify the non-compliance made by assessor and AA and punitive actions are taken correspondingly.

- The capacity building sessions are conducted regularly for assessors and assessment agencies to update them about best practices in assessment

4. Types of evidence or evidence-gathering protocol:

- Post Assessment, the evidences are uploaded by Assessor to assessment agency and further assessment agency to SSC as per stipulated TAT
- Evidences are broadly the photographic and video graphic in nature
- Assessment agencies upload the evidence on SIP and detailed evidence on SSC digital platform (ZoHO)
- Evidences are; NOS wise-Geotagged photographs and videos of Theory Test &Practical Tasks, Attendance sheet, result summary sheet, group photographs.

5. Method of verification or validation:

- The process and technical audit of assessment batches are done by SSC
- Attendance of each candidate is verified and it is ensured that only those candidates are assessed by assessors who are meeting the stipulated minimum percentage of attendance
- The result of each candidate is verified, it is verified that that result on SIP are matching with respect to summary sheet submitted by AAs
- Under detailed technical audit for sample of batches, the knowledge and skill assessment results for each candidate is checked in technical aspect.
- All the evidences of batches are preserved on server of SSC digital platform

On the Job:

- On job training (OJT), candidates undergo training and leaning at actual workplace for a fixed period of time and a certain weightage of assessment is allocated out of total skill weightage of Qualification Pack for undergoing OJT as stipulated by ICE. This OJT score and assessors' end point score are combined to arrive at final Marking/grading of trainees' skill test. The OJT score is determined by Supervisor of company under which candidates undergo on job training.

References

Glossary

Term	Description
Declarative Knowledge	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
Key Learning Outcome	Key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
OJT (M)	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
OJT (R)	On-the-job training (Recommended); trainees are recommended the specified hours of training on site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a task. It is the ability to work, or produce a tangible work output by applying cognitive, affective or psychomotor skills.
Training Outcome	Training outcome is a statement of what a learner will know, understand and be able to do it upon the completion of the training.
Terminal Outcome	Terminal outcome is a statement of what a learner will know, understand and be able to do upon the completion of a module. A set of terminal outcomes help to achieve the training outcome.

Acronyms and Abbreviations

Term	Description
QP	Qualification Pack
NSQF	National Skills Qualification Framework
NSQC	National Skills Qualification Committee
NOS	National Occupational Standards
ICE	The Institution of Civil Engineers
MCQ	Multiple Choice Question
EHS	Environment Health and Safety
EMF	Electromotive force
LV	Low-Voltage
AC	Alternating Current
DC	Direct Current
DB	Distribution Boards
APFC	Automatic Power Factor Control
MCB	Miniature Circuit Breaker
ELCB	Earth Leakage Circuit Breaker
CCTV	Closed-Circuit Television
HVAC	Heating, Ventilation, and Air Conditioning
BMS	Building Management System
BIM	Building Information Modeling