



Electrical Engineering

Grounding, Bonding, Lightning & Surge Protection of Utilities & Industries

Course Introduction

Power Quality

This course provides a comprehensive illustration of the various elements of design and practical installations associated with Earthing, Bonding, Lightning and Surge Protection employed in Electrical Systems. There are Practical Examples provided for up-to-date theory, practice and knowledge necessary for Design, Construction, Personal Safety, Operations, Power Quality, and Problem Solving and managing Electrical Facilities.

The course offers a complete coverage of grounding and bonding procedures, electrical code requirements, substation and safety grounding, sensitive electronic equipment and lightning / surge protection. Everyday case studies used to reinforce knowledge of the grounding and bonding principles will be studied during this course. Various disciplines of engineers working in Industrial Plants who require knowledge of Earthing Systems to ensure the safety of people, electrical equipment and buildings would highly benefit.

Target Audience

- Power system protection engineers
- System planners
- Technical staff responsible for Smart Grid integration into power system monitoring and control

Learning Objectives

- Apply various Methods of Grounding Electrical Systems
- Detail the applicable National Standards
- Describe the purposes of Grounding and Bonding

- List the Types of Systems that cannot be grounded
- Describe what Systems can be operated ungrounded
- Correctly shield Sensitive Communications Cables from Noise and Interference
- Apply Practical Knowledge of Surge and Transient Protection
- Troubleshoot and Fix Grounding and Surge Problems
- Design, install and test an effective grounding system for Electronic Equipment
- Understand Lightning and how to minimize its Impact on Industrial Facility and Electrical Utilities.
- Protect Sensitive Equipment from Lightning

Course Outline

• DAY 01

Module (01) Network Structures

- 1.1 Structure of Distribution Networks
- 1.2 The Supply Source
- 1.3 MV Power Supply
- 1.4 Different MV Service Connections
- 1.5 LV Networks inside the Site
 - 1.5.1 LV Switchboards Supply Modes
 - 1.5.2 LV Switchboards Backed up by Generators
 - 1.5.3 LV Switchboards backed up an UPS

Module (02) Earthing System

- 2.1 The need for Earthing Systems
- 2.2 Step and Touch Voltage
- 2.3 Earthing System at Low Voltage
- 2.4 Medium Voltage Earthing System
- 2.5 Limiting Resistance Earthing

• Day 02

Module (03) Soil Investigation

- 3.1 Soil Characteristics
- 3.2 Soil as a Grounding Medium
- 3.3 Effect of Voltage Gradient
- 3.4 Effect of Current Magnitude
- 3.5 Effect of Moisture, Temperature and Chemical
- 3.6 Use of Surface Material Layer
- 3.7 Soil Structure and Selection of Soil Model
- 3.8 Investigation of Soil Structure
- 3.9 Classification of Soils and Range of Resistivity
- 3.10 Resistivity Measurements
- 3.11 Interpretation of Soil Resistivity Measurements

• Day 03

Module (04) Earthing System Design

- 4.1 Simple Earthing System Design
- 4.2 Earthing System Components
 - 4.2.1 Ground Rods
 - 4.2.2 Bar Wiring
 - 4.2.3 Clamping
 - 4.2.4 Welding
- 4.3 Techniques for Ground System Construction
- 4.4 Ground Resistivity Measurements
- 4.5 Ground System Resistivity Measurements
- 4.6 Bonding
- 4.7 High Frequency Bonding and “Grounding”
- 4.8 Sample Calculations

Module (05) Grounding of Electronic Equipment

- 5.1 Electrical Power System Selection Consideration
- 5.2 Equipment Selection and Installation Considerations
- 5.3 Grounding Considerations
- 5.4 380 Hz to 480 Hz System

- 5.5 Industrial System Noise Considerations
- 5.6 Industrial System Grounding Practices

• **Day 04**

Module (06) Lightning Protection

- 6.1 Integral Protection System
- 6.2 Construction Protection Classes
- 6.3 Accessories and Equipment
- 6.4 Grounding Consideration or Lightning Protection
- 6.5 Separately Mounted Protection Systems
- 6.6 Overhead Ground Wire Type
- 6.7 Waveguide Installation and Grounding
- 6.8 Lightning Generated Transient Surge Protection
- 6.9 Transient Source and Equipment Damage

Module (07) Surge Protection

- 7.1 Surge Definition
- 7.2 Bonding as a means of Surge Proofing
- 7.3 Surges and Surge Protection
- 7.5 Surge Protection of Electronic Equipment
- 7.6 Achieving graded Surge Protection
- 7.7 Positioning and Selection of Lightning/Surge Arrestor
- 7.8 Surge Protection for Sensitive Equipment

• **Day 05**

Module (08) Noise Mitigation

- 8.1 Electrical Noise and Measures for Noise Reduction
- 8.2 Earth Loop as a Cause of Noise
- 8.3 Ways in Which Noise Can Enter a Signal Cable
- 8.4 Shielded Isolation Transformer
- 8.5 The Use of Insulated Ground (IG) Receptacle
- 8.6 Zero Signal Reference Grid and Signal Transport
- 8.7 Harmonics in Electrical Systems

Confirmed Sessions

FROM	TO	DURATION	FEES	LOCATION
May 26, 2025	May 30, 2025	5 days	4250.00 \$	UAE - Dubai
Sept. 15, 2025	Sept. 19, 2025	5 days	4250.00 \$	UAE - Abu Dhabi
Dec. 1, 2025	Dec. 5, 2025	5 days	4250.00 \$	UAE - Dubai