



Electrical Engineering

## Power Quality, Earthing and Bonding

# Course Introduction

---

## Power Quality

The increasing use of equipment sensitive to power system disturbances and the related economic aspects, the increasing awareness of power quality issues and deregulation have created a need for understanding the causes of these problems and the ways to solve. The course covers the Power quality issues, power frequency disturbances, electrical transients and earthing systems in electrical power systems.

The course concerns the sources of distortion (loads) and the interaction between those and the propagation of the distortion in the power system. Effects on the power system are also indicated. Harmonics, its effects on electric power system and how to overcome are highlighted.

## Target Audience

---

- Electrical power generation systems and distribution engineers in utilities and industrial plants
- Managers of private electricity producers and large power consumers
- Substation engineers
- Consulting engineers
- Manufacturers of power equipment technicians and technologists
- Other technical personnel involved in the design, operation and maintenance of high/medium voltage substations
- Operations technicians
- Electrical maintenance technicians and supervisors

# Learning Objectives

---

- Power Quality definitions and issues in electrical Power System.
- Voltage sag, voltage swing and power frequency disturbances
- Earthing methods, Bonding and static electricity affects on power quality
- Harmonics In Electrical Power Systems
- Power factor correction and Electromagnetic interferences and their consequences on power quality
- Power quality improvement using Distributed Generators in distribution systems.
- Measuring and Solving Power Quality Problems

## Course Outline

---

### • DAY 01

#### **Introduction to Power Quality**

- 1.1. Definition of Power Quality
- 1.2. Power Quality Progression
- 1.3. Power Quality Terminology
- 1.4. Power Quality Issues
- 1.5. Susceptibility Criteria
- 1.6. Responsibilities of the Suppliers and Users of Electrical Power
- 1.7. Power Quality Standards

#### **Power Frequency Disturbance**

- 2.1. Common Power Frequency Disturbances
- 2.2. Cures for Low-Frequency Disturbances
- 2.3. Voltage Tolerance Criteria

### • Day 02

## **Electrical Transients**

- 3.1. Transient System Model
- 3.2. Examples of Transient Models and Their Response
- 3.3. Power System Transient Model
- 3.4. Types and Causes of Transients

## **Harmonics**

- 4.1. Definition of Harmonics
- 4.2. Harmonic Number
- 4.3. Odd and Even Order Harmonics
- 4.4. Harmonic Phase Rotation and Phase Angle Relationship
- 4.5. Causes of Voltage and Current Harmonics
- 4.6. Individual and Total Harmonic Distortion
- 4.7. Harmonic Signatures ( Fluorescent Lighting, Adjustable Speed Drives, Personal Computer and Monitor)
- 4.8. Effect of Harmonics on Power System Devices (Transformers, AC Motors, Capacitor Banks, Cables, Bus ways, Protective Devices)
- 4.9. Guidelines for Harmonic Voltage and Current Limitation
- 4.10. Harmonic Current Mitigation( Equipment Design, Harmonic Current Cancellation, Harmonic Filters)

### **• Day 03**

## **Grounding and Bonding**

- 5.1. Shock and Fire Hazards
- 5.2. National Electrical Code Grounding Requirements
- 5.3. Essentials of a Grounded System
- 5.4. Ground Electrodes
- 5.5. Earth Resistance Tests
- 5.6. Earth-Ground Grid Systems (Ground Rods, Plates, Ground Ring)
- 5.7. Power Ground System
- 5.8. Signal Reference Ground
- 5.9. Signal Reference Ground Methods
- 5.10. Single-Point and Multipoint Grounding

### **• Day 04**

## **Power Factor**

- 6.1. Active and Reactive Power
- 6.2. Displacement and True Power Factor
- 6.3. Power Factor Improvement
- 6.4. Power Factor Correction
- 6.5. Power Factor Penalty
- 6.6. Other Advantages of Power Factor Correction
- 6.7. Voltage Rise Due to Capacitance
- 6.8. Application of Synchronous Condensers
- 6.9. Static VAR Compensators
- 
- **Electromagnetic Interference**
- 7.1. Frequency Classification
- 7.2. Electrical Fields
- 7.3. Magnetic Fields
- 7.4. Power Frequency Fields
- 7.5. High-Frequency Interference
- 7.6. Electromagnetic Interference Susceptibility
- 7.7. EMI Mitigation
- 7.8. Cable Shielding to Minimize Electromagnetic Interference
- 7.9. Health Concerns of Electromagnetic Interference

## • Day 05

### Static Electricity

- 8.1. Tribo-electricity
- 8.2. Static Voltage Buildup Criteria
- 8.3. Static Model
- 8.4. Static Control
- 8.5. Static Control Floors
- 8.6. Humidity Control
- 8.7. Ion Compensation
- 8.8. Static-Preventative Casters
- 8.9. Static Floor Requirements
- 8.10. Measurement of Static Voltages
- 8.11. Discharge of Static Potentials

- 10. Measuring and Solving Power Quality Problems
- 10.1. Power Quality Measurement Devices
- 10.2. Power Quality Measurements
- 10.3. Number of Test Locations
- 10.4. Test Duration
- 10.5. Instrument Setup
- 10.6. Instrument Setup Guidelines

## Confirmed Sessions

FROM	TO	DURATION	FEES	LOCATION
June 23, 2025	June 27, 2025	5 days	4250.00 \$	UAE - Dubai
Sept. 28, 2025	Oct. 2, 2025	5 days	4250.00 \$	KSA - Riyadh
Dec. 22, 2025	Dec. 26, 2025	5 days	4950.00 \$	Turkey - Antalya