Training Course on Power Quality Analysis and Mitigation Techniques

Professional Development Training Course Outline

Category	Engineering	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Introduction

With the increasing complexity of modern power systems and the integration of renewable energy, electric vehicles, and sensitive electronic loads, power quality (PQ) has emerged as a critical aspect of electrical engineering and grid reliability. Training Course on Power Quality Analysis and Mitigation Techniques offers a comprehensive understanding of power quality disturbances, their causes, impacts, and practical mitigation techniques. From voltage sags, harmonics, and flicker, to transients and power factor issues, participants will gain essential skills in identifying, analyzing, and resolving power quality problems in both utility and industrial environments.

Designed for engineers, energy managers, and utility professionals, the course leverages real-world case studies, power quality monitoring tools, and simulation-based techniques to address challenges posed by non-linear loads, distributed generation, and automation systems. Participants will also explore standards such as IEEE 519, IEC 61000, and apply solutions like active filters, UPS systems, dynamic voltage restorers, and reactive power compensation. The program is ideal for anyone seeking to ensure grid compliance, equipment reliability, and energy efficiency in modern electrical systems.

Programme Curriculum

Training Course on Power Quality Analysis and Mitigation Techniques

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Course Objectives

1. Understand key concepts and standards of power quality
2. Identify and classify various power quality disturbances
3. Analyze harmonics and their effects on power systems
4. Monitor power quality using advanced diagnostic tools
5. Interpret data from PQ analyzers and waveforms
6. Implement mitigation solutions such as filters and compensators
7. Design power factor correction systems
8. Address voltage sags, swells, flicker, and interruptions
9. Understand PQ issues in renewable and EV integration
10. Apply simulation tools to model and resolve PQ issues
11. Mitigate PQ problems in data centers and industrial plants
12. Ensure compliance with IEEE 519 and IEC 61000 standards
13. Improve energy efficiency and reduce system losses

Organizational Benefits

1. Enhanced reliability of electrical systems and critical loads
2. Reduced downtime and equipment failure
3. Compliance with global power quality standards
4. Improved energy efficiency and reduced operational costs
5. Accurate diagnosis and faster resolution of PQ issues
6. Increased asset lifespan and ROI on electrical infrastructure
7. Reduced penalties from utilities due to poor PQ
8. Better planning of electrical expansion and upgrades
9. Optimization of renewable energy integration
10. Stronger reputation for sustainability and system resilience

Target Participants

- Electrical and Power Engineers
- Utility and Substation Operators
- Energy Managers and Facility Engineers
- Renewable Energy System Designers
- Maintenance Technicians
- Automation and Control Engineers
- Data Center Managers
- Industrial Plant Engineers
- Consultants in Power Systems

Course Outline

Module 1: Fundamentals of Power Quality

1. Definition and importance of PQ
2. Power quality indices
3. Key disturbances: types and characteristics
4. Cost and impact of poor PQ
5. Case Study: Power quality audit in a hospital

Module 2: Power Quality Standards

1. Overview of IEEE 519
2. IEC 61000 and compatibility levels
3. EN 50160 standard
4. Local regulatory guidelines
5. Case Study: PQ compliance in industrial plant

Module 3: Voltage Sags and Swells

1. Causes and effects of sags and swells
2. Measurement techniques
3. Equipment sensitivity curves (CBEMA, ITIC)
4. Ride-through solutions
5. Case Study: Semiconductor plant sag mitigation

Module 4: Harmonics and Interharmonics

1. Harmonic sources and waveform distortion
2. Total Harmonic Distortion (THD)
3. Effects on motors, transformers, and cables
4. Harmonic filters (passive and active)
5. Case Study: Harmonic mitigation in commercial buildings

Module 5: Flicker and Voltage Fluctuations

1. Sources of flicker
2. Flicker quantification (Pst, Plt)
3. Effects on lighting and devices
4. Mitigation strategies
5. Case Study: Flicker analysis in welding operation

Module 6: Transients and Surges

1. Causes of electrical transients
2. Surge categories (switching, lightning)
3. Surge Protection Devices (SPD)
4. Monitoring and insulation coordination
5. Case Study: Lightning-induced transient mitigation

Module 7: Power Factor and Reactive Power

1. Understanding displacement and distortion power factor
2. Causes of low power factor
3. Capacitor banks and synchronous condensers
4. Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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