



TECHNICAL ENGINEERING COURSES

Power Quality Assessment

Modern Power System Protection

Distributed Generation

And More...

Power Quality Assessment and Enhancement

Introduction

The use of electronic devices and digital equipment in both industrial and domestic applications has dramatically increased in the recent years. These devices are both instigators and victims of power quality phenomena and the spread of their use has pushed Power Quality (PQ) issues to the forefront of the power transmission and distribution concerns.

This course provides a comprehensive coverage of all aspects of PQ issues including mitigation strategies. It introduces the audience to PQ definitions, limitations, applicable standards as well as techniques used for PQ analysis of Power Systems.

The course is designed to help attendees to understand causes, effects and means of addressing different power quality problems. It introduces them to modeling and simulation methods of power systems for PQ study purposes. These methods are demonstrated using case studies based on actual power quality problems.

Various kinds of PQ problems such as voltage sags, interruptions, transients, flicker and harmonics and their effect on the load/system equipment are examined in detail. Mitigation strategies investigated include: passive filtering, active and hybrid power filtering, static VAR compensation, DVR, UPQC. In addition, the requirements and impacts of distributed generation DG on the network power quality are presented.

What you will learn

- Power quality: measures, definitions and standards.
- Monitoring techniques with emphasis on the number of monitoring sites and their locations.
- Different means of identification, classification and localization techniques of PQ problems.
- Harmonic analysis: methodology, mitigation techniques and case studies.
- Short and long duration voltage variation phenomena: causes, effects, mitigation and case studies.
- Distributed generation and power quality; operating conflicts and network interfacing.

Audience

- System planning and operation engineers dealing with power system performance and customer concerns about PQ issues.
- Consulting engineers, project managers and project engineers involved in selecting and implementing PQ enhancement measures.
- Industrial plant engineers and operating and maintenance personnel concerned with the immunity of their equipment to PQ events and how to improve it.

Course Language:

English

Duration:

3 days

Instructor:

Dr. Ehab F. El-Saadany

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Course Outline

Day 1

- Power Quality
 - Problem, history and definitions
 - Power quality cost and interest
- Introduction to power quality phenomena
 - General definitions and classification
- Discussion of relevant standards
 - IEC Standards
 - IEEE Standards
 - Other international PQ standards
- Sources of PQ problems
 - The utility
 - The customer
 - The manufacturer
- PQ monitoring
 - Benefits of monitoring
 - PQ indices
- PQ monitoring algorithms and their limitations
- Commercial power quality monitors
 - Bus monitoring
 - System monitoring
- Optimum number and location of PQ monitors
- PQ event detection algorithm

Day 2

- Automated classification of PQ problems
- Classification algorithms
 - Detection
 - Pre-processing
 - Feature extraction
 - Classification
- Harmonics
 - Sources
 - Effects
 - Indices
- Harmonic modeling and analysis
 - Load modeling and analysis methods
 - Harmonic interactions
 - Parametric investigations
- Harmonic mitigation techniques
 - Passive filters
 - Active filters
 - Hybrid filters
- Case studies
- Custom power devices for PQ improvement
- Thyristor-controlled static compensators

Day 3

- Active power line conditioners
 - Inverters for APLC
 - APLC topologies
 - Shunt, series and hybrid topologies for APLC
- APLC functionality and switching techniques
 - Current control
 - Voltage control
- DSTATCOM for:
 - Harmonics
 - Sag
 - Unbalance mitigation
- Use of DVR for:
 - Sag mitigation
 - Flicker suppression
- Case studies
- Distributed generation
 - Advantages
 - Requirements
 - Challenges
- Flexible distributed generators

Instructor



Ehab F. El-Saadany holds a Ph.D. in Electrical Engineering since 1998. Dr. El-Saadany is an Assistant Professor in the Department of Electrical and Computer Engineering at the University of Waterloo. His research interests involve distribution systems' control and operation, power quality, power electronics and digital signal processing applications in power systems and mechatronics.

Dr. El-Saadany is a member of the IEEE. He has been involved in several national and international industrial projects involving power quality issues. He authored and coauthored over 50 refereed journal and international conference papers.



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