



Content
Community
Connection

United States
One Franklin Square, Suite 302
Geneva, NY 14456
Tel: 315-7889-8323
Fax: 315-789-8940

Canada
1885 Clements Rd, Unit 218
Pickering, ON L1Z 1X5
905-686-1040
Tel: Fax 905-686-1078
Toll Free: 1-855-824-6131

Power Quality And UPS Training

Contact us Today for a FREE quotation to deliver this course at your company's location.

<https://www.electricityforum.com/onsite-training-rfq>

This two-day technical course also deals with the need for UPS systems. It then covers the relative comparisons between various UPS topologies and their modes of operation. The batteries used for UPS systems are also covered How a battery works, their maintenance, safety and testing is thoroughly discussed.

A solid working knowledge of the typical electrical and electronic components found within a UPS system is explained, as well as how AC is converted to DC and then inverting DC back to AC. When all of the above elements of a UPS are understood, a theoretical rectifier and inverter feedback loop are thoroughly discussed. This will be followed by a testing and troubleshooting section. Students will be given failure scenarios where they will learn how to determine which circuit component has opened, shorted or significantly changed in value to produce the alarm condition described. The course finishes with a general discussion on UPS system testing and maintenance procedures.

This UPS system training course is designed to assist organizations to identify the many savings to be gained from proper UPS system design, application, testing and maintenance..

Some working knowledge of basic electrical engineering principles is required, although this will be revised at the beginning of the course. Real-life experience in working with batteries and UPS systems will enable the course to be placed in context.

Satisfactory completion of the two-day version of this course satisfies the requirements of the Engineering Institute of Canada for the award of 1.4 Continuing Educations Unit credits.

After completion of the course the delegate will be able to:

- Understand the functionality of different UPS Type
- Size the UPS and battery bank for an application
- Recommend solution for a practical implementation
- Perform Maintenance and Parameter settings on a UPS
- Perform Battery maintenance and results interpretation
- Design a complete UPS System and recommend the proper grounding solution

WHO SHOULD ATTEND

- Industrial, Commercial, Institutional Electrical Engineers
- Electrical Maintenance Tradespeople & Technicians
- Instrumentation and Control Engineers
- Power System Protection and Control Engineers
- Consulting Electrical Engineers
- Building Service Designers
- Data Systems Planners and Managers
- Other electrical personnel involved in the maintenance industrial, commercial and institutional power systems.

STUDENTS RECEIVE

- **FREE** Electricity Forum 120-Page Digital Power Quality Handbook (Value \$20.00)
- **\$100 Coupon** Toward Any Future Electricity Forum Event (Restrictions Apply)
- 1.4 Continuing Education Unit (CEU) Credits
- **FREE** Magazine Subscription (Value \$20.00)
- Course Materials In Paper Format

Related Courses

[Power Quality Training](#)

[Power Quality Troubleshooting Training](#)

COURSE OUTLINE

Modern Power Quality/UPS/Battery System Problems and Solutions

Instructor

Peter Ho, Power Quality/UPS Consultant, Electricity Forum

DAY ONE

**Session 1: Power Quality - Definitions according to National Electrical Code, IEEE
STD 1100, IEEE STD 519**

- The Sine Wave
- Faraday Law
- Lenz Law
- Power Waveform
- Electromagnetic Fields
- Phase Angle
- Tolerance Limits

Session 2: Transient Overvoltage Problems

- Troubleshooting Transient Overvoltage Problems
- Technical Criteria
- IEEE C62.41 Guidelines
- Transient Overvoltage Suppressors
- Suppression Technologies
- IEE Location Categories
- Gas Tubes
- Silicon Avalanche Diodes
- Metal Oxide Varistors

Session 3: Harmonics in the Power System

- The Harmonic Factor
- Harmonic Waveforms
- Voltage Harmonics
- Current Harmonics
- Total Harmonic Distortion
- DC Power Supplies
- Harmonic Generators

Session 4: Harmonics in the Power System - Part 2

- Sources of Harmonics
- Symptoms and Effect on Equipment

- Power Factor Capacitors and Resonance
- Harmonic Limitations (IEEE Standard 519)
- Series Resonance and Filter Design
- Third Harmonic Neutral Current

Session 5: Power Quality Survey & Power Analysis

- The Site Survey
- Receptacle Branch Circuit
- Recording the Findings
- Flat-Topped Voltage
- Neutral-Ground Voltage Test
- Current in the Neutral Conductor
- Sared Neutrals
- Performance Wiring

Session 6: Power Quality Mitigation Techniques

- K-Factor Transformers
- Power Line Conditioners
- Harmonic Filters
- Lightning/Surge Protection
- Redundant Electrical Supply/Automatic Switching
- Standby/Emergency Power Generation

DAY TWO

1. Review: Electrical and Electronic Fundamentals

- Electrical (resistance, inductance and capacitance)
- Electronic (diode, SCR, bi-polar transistor and IGBT)

- Understanding the linear and non-linear theory
- Power factor, displacement power factor, crest factor and k-rating term
- Electrical Disturbance (control and un-control)

2. Building Blocks of UPS Systems

- Rectifiers
- Choppers
- Batteries
- Inverters
- Internal bypass static switches
- Other components

3. UPS Specification

- In-depth study of rectifier and charger operation theory
- Input requirement and limitation (Voltage, current frequency and rate of change of X)
- DC bus upper and lower setting and alarm

4. Battery Requirements

- Types of batteries
- Theory of battery operation using ohm law
- Factors that affect battery performance and life cycle
- DC maximum and cut off voltage
- Monitoring systems

5. Static Switches (internal and external)

- SS operational limitation

- Fully rated and partial rated

6. UPS Interface

- Standby generator with UPS
- Potential generator issues (sizing, harmonics, in-rush I, hunting, oscillation etc)
- Building communication interface (static contact and real time on line)
- Smoke, fire, heat, security, water, repo and others

7. UPS Grounding and Neutral Configuration

- Most common issue
- Principle and method

8. UPS Maintenance

- Most common maintenance issues with UPS

9. UPS System Testing and Commissioning

- Factory and on-site testing
- Non-destructive and destructive testing
- Most items requires as per specification
- Load bank (linear or non-linear)
- Battery discharge testing
- Battery recharging test
- Performance testing

Questions and Answers

COURSE TIMETABLE

Both days:

Start: 8:00 a.m.

Coffee Break: 10:00 a.m.

Lunch: 12:00 noon

Restart: 1:15 p.m.

Finish: 4:30 p.m.

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