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## UPS/Battery Systems 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 begins with a discussion of the need for UPS systems. It then covers the relative comparisons between various UPS topologies and their modes of operation. The course also deals extensively with the various battery designs used in UPS systems, including an in-depth examination of How batteries are designed, scheduled maintenance, as well as procedures for safely testing and maintaining battery systems.

A solid working knowledge of the typical electrical components found within a UPS is developed before exploring 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 troubleshooting exercise. Students are given failure scenarios where they work in groups to find 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 troubleshooting.

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 workshop to be placed in context.

## **LEARNING OBJECTIVES**

This course is designed to enable participants to:

- Describe various equipment used for power monitoring.
- Recognize the cause and source of power system disturbances.
- Explain how to mitigate any existing and potential problems, thereby minimizing equipment disoperation and process downtime.
- Analyze types of electrical systems loads and their power quality considerations.
- Calculate harmonic voltages and currents

## **WHO SHOULD ATTEND**

- Electrical Engineers
- Electrical Maintenance Tradespeople & Technicians
- Instrumentation and Control Engineers
- Power System Protection and Control 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

## COURSE OUTLINE

### Part 1 - Review electrical and electronic building block theory

- Electrical ( Resistance, inductance and capacitance )
- Electronic ( Two, three, fourth and multi-layer semi-conductors )

### Part 2 - Understanding basic UPS electrical theory

- Power factor, displacement power factor, crest factor and K-factor
- 4 types of load profile
- Electrical abnormal disturbance with detail study Fourier Series
- General common solutions
- Different type of passive filters, active filter, MOV, and M-G set

### Part 3 - Symmetrical electrical component study

- True meaning of three phase rotation ( CW and CCW )
- Electrical fault and short circuit study.

#### **Part 4 - Electrical grounding**

- Review different type of grounding applications
- Un-ground, solid ground, high resistor ground, low resistor ground and isolated grounding

#### **Part 5 - UPS System topology**

- 1, 2, 3 and 4th and future generation UPS Systems
- Objective of UPS Systems
- Classical sections of UPS Systems
- Rectifier/chargers, step-up and step-down choppers, battery, inverter and bypass
- Detailed study of the above sections and their limitations

#### **Part 6 - UPS System configuration**

- Single, shared, hot-standby and Static Transfer Switches
- Forward and transfer operations requirements and factors

#### **Part 7 - Transformers study**

- Linear and non-linear operations
- Different configurations
- Phase shifting considerations

## **Part 8 - Battery energy storage device ( Chemical type )**

- Seal and wet cell ( pros and cons )
- Internal material and weight explanation
- Factors that affect battery performance and battery life cycle

## **Part 9 - Lithium Ion Battery**

- New selection of electric-chemical energy devices
- Lithium Ion Battery development
- Potential internal issues and prevention
- Outlook for the L-Ion for UPS System applications

## **Part 10 - Non-battery energy storage devices**

- Review Maxwell's 4 equations
- Flywheel operational principal and its advantage and disadvantage
- Capacitor banks option
- Super-fast generator and no-break ATS

## **Part 11 - UPS, battery and standby generator sizing calculations**

- KVA, KW, leading and lagging power factor design considerations

## **Part 12 - UPS-human interface development**

- Modbus, SNMP and real-time communications

### **Part 13 - UPS system specification detail study**

- Real life Case Study example for typical UPS application.

### **Part 14 - UPS and battery preventive maintenance procedures and key measurements**

- Life cycle components replacement study
- Capture waveforms and power quality reading interpretation

### **Part 15 - Most common UPS system issues**

- General guard line of UPS and battery problems

### **Quick Quiz and review**

### **Questions and answers period**

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