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## UPS 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 batteries used for UPS systems are covered next. How a battery works, their maintenance, safety and testing is thoroughly discussed.

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**

### **UPS System Training**

#### **Instructor**

*Peter Ho, Power Quality/UPS Consultant, Electricity Forum*

#### **DAY ONE**

##### **Session 1: Introduction to UPS Systems**

- Power conditioners
- Uninterruptible power systems
- Power quality source alternatives
- Power disturbance cost comparisons

##### **Session 2: Three General Types of UPS's**

- Kinetic (Motor Generator Sets)
- Flywheel
- Static and Components
- Rectifier
- Batteries
- Inverter

##### **Session 3: Three types of Static UPS's**

- Traditional UPS
- Static UPS
- Static UPS with Bypass

#### **Session 4: UPS Operation Overview**

- The Need for UPS System
- Power System Disturbances
- Basic Type of UPS Systems

#### **Session 5: Introduction to Batteries**

- Primary Batteries
- Secondary Batteries

#### **Session 6: Lead Acid Batteries**

- Chemistry
- Different types
- Capacity Factors
- S-Curves
- Battery Safety and Maintenance
- Float and Equalize Voltages
- Load Testing

#### **Session 7: Nickel Cadmium Batteries**

- Chemistry
- Battery Types
- Capacity Factors

- Battery Safety and Maintenance
- Float and Equalize Voltages
- Load Testing

## **DAY TWO**

### **Session 8: Passive Electronic Components**

- Resistors Circuits
- Capacitor Circuits
- Inductor Circuits

### **Session 9: Semiconductors**

- Diodes
- SCR's
- Transistors

### **Session 10: Logic Gates**

- AND/NAND Gates
- OR/NOR Gates
- Inverter Gate
- D Type Flip Flop
- XOR/XNOR Gates

### **Session 11: Operational Amplifiers**

- Inverting Op Amp
- Non-inverting Op Amp

- Differential Op Amp
- Unity Gain Op Amp
- Summing Op Amp
- Integrating Op Amp
- Comparator Op Amp

### **Session 12: AC to DC Conversion**

- Full Bridge
- Three Phase
- Six Pulse

### **Session 13: DC to AC Inversion**

- Quasi Square wave
- PWM waveform

### **Session 14: UPS System Overview**

- Rectifier Stage
- Inverter Stage

### **Session 15: UPS System Troubleshooting**

- Basic Use of Test Equipment
- Rectifier Troubleshooting
- Inverter Troubleshooting

### **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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