



BATTERY & BATTERY CHARGES **with Application to UPS**



International Association
for Health and Occupational Safety
and the Environment



Course Introduction:

Five days course gives an insight to the subject of U.P.S. (Uninterruptible Power Supply) systems. The subject of "Power Quality" is discussed and the need for U.P.S. system is emphasized. The basic circuits for U.P.S. system are explained and also various configurations shall be discussed. The concept of supply reliability is discussed and the various factors affecting reliability are presented.

Course Objectives:

The object of this course is to present and appreciate the concept of U.P.S. is discussed and the types of "Critical loads" which need a U.P.S. supply are presented. One of the main objectives is to assist the practicing engineer in selecting a suitable U.P.S. the various factors, which affect the selection of a suitable U.P.S., are discussed in detail. The selection of a suitable U.P.S. configuration is discussed and its impact on the reliability of the system is presented.

Who Should Attend?

This course is designed to Electrical Maintenance Engineers, Operations Engineers and highly qualified technicians who would like to expand their knowledge of UPS systems and battery chargers.

Course Outline:

MODULE (1) IMPROVING RELIABILITY AND POWER QUALITY WITH STANDBY POWER SUPPLIES

- 1.1 Introduction
- 1.2 Power Supply Reliability
- 1.3 Classification of Power Quality Disturbances
- 1.4 Standby Power Supply Devices
 - 1.4.1 Duplicate Feeder from the Grid
 - 1.4.2 Engine Generating Sets (EGS)
 - 1.4.3 Battery Storage
 - 1.4.4 Uninterruptible Power Supply (UPS) System
- 1.5 Energy Sources

MODULE (2) UPS CONFIGURATIONS FOR 7 X 24 CONTINUOUS POWER FACILITIES

- 2.1 Introduction
- 2.2 UPS CONFIGURATIONS FOR 7 X 24 CONTINUOUS POWER FACILITIES
 - 2.2.1 Separating the Essential and Nonessential Loads
 - 2.2.2 Special equipment to support continuous operation
 - 2.2.3 Defining failure in a 7 × 24 facility
 - 2.2.4 Reliability and availability as tools in evaluation of critical facilities

- 2.2.5 Critical distribution system configurations
- 2.2.6 Reliability and availability of critical distribution system configurations
- 2.3 UPS CONFIGURATIONS FOR 7 X 24 CONTINUOUS POWER PLANTS
 - 2.3.1 Introduction
 - 2.3.2 Typical configurations of UPS systems for power generating station loads
- 2.4 Application Considerations
 - 2.4.1 Charging Methods
 - 2.4.2 Service Conditions
 - 2.4.3 Equipment Rating
 - 2.4.4 Output Ripple
 - 2.4.5 Output Regulation
 - 2.4.6 Fusing
 - 2.4.7 Surge Voltage Withstand Capability

MODULE (3) DESIGN AND SELECTION OF UPS SYSTEMS

- 3.1 Supply (UPS)
- 3.2 UPS Selection
 - 3.2.1 Determine the general need for an UPS
 - 3.2.2 Determine the purpose of the UPS
 - 3.2.3 Determine the power requirements
 - 3.2.4 Select the Type of UPS
 - 3.2.5 Determine if the safety of the selected UPS is acceptable
 - 3.2.6 Determine if the availability of the selected UPS is acceptable
 - 3.2.7 Determine if the selected UPS is maintainable
 - 3.2.8 Determine if the selected UPS is affordable
- 3.3 Static UPS system ratings and size selection
 - 3.3.1 Determining static UPS system rating
 - 3.3.2 Battery sizing
 - 3.3.3 Computation sheets
 - 3.3.4 Static UPS system selection criteria
- 3.4 Rotary UPS system ratings and size selection
 - 3.4.1 Determining rotary UPS system rating
 - 3.4.2 Motor and generator ratings
 - 3.4.3 Flywheel sizing
 - 3.4.4 Rotary UPS system selection criteria

MODULE (4) INSTALLATION, TESTING AND TROUBLESHOOTING OF UPS SYSTEMS

- 4.1 Introduction
- 4.2 Construction and installation of static UPS systems

- 4.2.1 Construction features of static systems
- 4.2.2 Installation requirements
- 4.3 Construction and installation of rotary UPS systems
 - 4.3.1 Construction features of rotary systems
 - 4.3.2 Installation requirements for rotary systems
- 4.4 Power distribution and equipment grounding and shielding requirements
 - 4.4.1 Power distribution equipment
 - 4.4.2 Grounding
 - 4.4.3 Computer power centers
 - 4.4.4 Shielding
 - 4.4.5 Radio frequency interference (RFI)
 - 4.4.6 Noise and noise reduction methods
- 4.5 Testing and Start-Up
 - 4.5.1 Installation inspection
 - 4.5.2 Individual component testing
 - 4.5.3 Visual and electrical wiring inspections
 - 4.5.4 Energizing and test of the UPS system
 - 4.5.5 Test forms
 - 4.5.6 Troubleshooting - Possible failures and corrective actions
- 4.6 Test equipment
 - 4.6.1 Use of maintenance personnel
 - 4.6.2 Use of diagnostics
 - 4.6.3 Suggested lists of test equipment and accessories

MODULE (5) MAINTENANCE FOR UPS SYSTEMS

- 5.1 Types of Maintenance
- 5.2 Maintenance for UPS systems
 - 5.2.1 Safety
 - 5.2.2 Preventive maintenance
 - 5.2.3 Corrective maintenance
 - 5.2.4 Recognizing impending problems
 - 5.2.5 Troubleshooting
 - 5.2.6 Spare parts availability
- 5.3 UPS battery maintenance
 - 5.3.1 Maintenance costs
 - 5.3.2 Maintenance access
 - 5.3.3 Preventive maintenance
 - 5.3.4 Maintenance procedures
 - 5.3.5 Maintaining flooded lead-acid cells

- 5.3.6 Maintenance considerations
- 5.3.7 Maintaining valve-regulated lead-acid cells
- 5.3.8 Ni-cad cells
- 5.3.9 Safety

MODULE (6) BATTERIES

- 6.1 Types of Batteries
- 6.2 The Dry Cell
- 6.3 The Lead Acid Cell
- 6.4 Mixing Electrolytes
- 6.5 Connections of Battery Cells
- 6.6 Series of Connections of Battery cells
- 6.7 Parallel of Connecting Battery Cell
- 6.8 Multiple Voltage Batteries

MODULE (7) BATTERY CHARGERS

- 7.1 Half Wave Rectifier
- 7.2 Full Wave Rectifier

MODULE (8) STATIC INVERTERS

- 8.1 Semi-Conducting Devices
- 8.2 Static Inverter
- 8.3 Static by Pass Switch

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Fees:

To be advised as per course locations. This rate includes participant's manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee / Tea
08:20 - 10:00	First Session
10:00 - 10:20	Coffee / Tea / Snacks
10:20 - 12:20	Second Session
12:20 - 13:30	Lunch Break & Prayer Break
13:30 - 15:00	Last Session

