

Hands-On

# Protective Relays



## Course Description

This is a comprehensive Hands-On course stressing Protective Relaying application and reliability to minimize production down time due to power outages. This course covers basic relay operating principles for various types of protective relays providing workers great insight to the importance of relaying for system protection.

This course also covers Utility Relay Maintenance providing the fundamental principles of protective relaying, application of protective relaying is presented by the testing and maintenance of the most common relay types. Instrument transformers, over current, frequency, and voltage relay applications are covered in depth with emphasis placed on maintaining overall protective system reliability.

This course is geared from small to large industrial plants or municipal distribution systems from basic to complex protective relay needs will find this course a must.

## Students Will Learn

- **Identify the Effects of Current Transformers (CTs) on Power Systems Protection**
- **Recognize Protective Relay Coordination Related Disturbances and Outages**
- **Collect the Required Data to Perform a Detailed Coordination Study**
- **Complete Protective Relay Device Settings to Protect Electrical Power Equipment.**
- **Over-current Relays**
- **Voltage Relays**
- **Generator Protection**
- **Differential Relays**
- **Transfer Trip Circuits ( Carrier, Audiotone, Pilot Wire )**
- **And more...**

## Target Audience

Electrical contractors, industrial electricians, electrical technicians, and engineers concerned with relay testing and maintenance in industrial or commercial plants, power plants, substations and buildings.

## Prerequisites

Basic Electricity

## Course Outline

### Module I: Introduction to Power Systems Relaying

- System Planning
- Power System Studies
- Phasor Fundamentals
- Relaying Principles
- Review of Short Circuit Calculations
- Fundamentals of Coordination

### Module II: Power Systems Grounding

- Symmetrical Components
- Ungrounded Systems
- Solidly-Grounded Systems
- Resistance-Grounded Systems
- Ground Fault Detection Methods

### Module III: Current Transformers

- Types, CT Ratios, Polarity
- Burden, Accuracy Classes, Saturation Calculations

### Module VI: Protection Fundamentals

- Line, Cables, Feeders
- Medium Voltage Motors
- Power Transformers

### Module V: Protective Relay Schemes

- Directional Relays
- Differential Relays
- Ground Relays

## Delivery Method

Instructor-Led with numerous exercises and case-studies.

## **Equipment Requirements**

**(This apply's to our hands-on courses only)**

BTS always provides equipment to have a very successful Hands-On course. BTS also encourages all attendees to bring their own equipment to the course. This will provide attendees the opportunity to incorporate their own gear into the labs and gain valuable training using their specific equipment.

## **Course Length**

2 Days