Training Program:

Protection Of Electrical Power Systems

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Introduction:

Power system protection is an essential component of all forms of electrical power systems. In practice, protective relaying is directly associated with security of supply, the reduction of damage to faulted plant, cost of energy and, most importantly, all aspects of safety. The subject is unique in requiring knowledge of all topics broadly classified under the title of electrical power engineering, including generation, utilization, maintenance and the transmission of electrical power. As a consequence, it enhances an engineer €™s working knowledge and becomes an important asset for power system planning, operation and management.

The course focuses attention on the fundaments of the subject and illustrates the protection philosophies in common use by reference to the application of modern multi-functional microprocessor relays to practical situations.

Who Should Attend?

The aim of the programme is to update the working knowledge of practicing protection engineers and senior technicians as well as those in closely related branches of electrical power engineering responsible for specification, installation, inspection, and maintenance and commissioning of electrical plant

Course Objectives:

By the end of this course delegates will be able to:

- The need for protection & Protection fundamentals
- Relay transducers, both current and future

- System grounding principles & Overcurrent earth fault protection
- An overview of power system fault analysis & Coordination principles
- Transformer protection & Generator protection
- Bus protection & Motor protection
- Line and feeder protection & Principles of relay application

Accreditation:

BTS attendance certificate will be issued to all attendees completing minimum of 80% of the total course duration.

Course Outline

Fundamentals and Fault Analysis

- Introduction to power system protection
- Power system fault analysis
- Phase faults & Earth faults
- Manual calculation
- Use of software
- Protection fundamentals
- Definitions and terminology
- Unit and non-unit systems

Transducers and Overcurrent Schemes

- Transducers
- Current transformer equivalent circuit
- Current transformer specification
- Current transformer errors
- Current transformer characteristics
- Effect of Current transformer burden
- Overcurrent relays of control systems
- The modern relay and functions provided
- Characteristics
- Directional schemes
- High and low set instantaneous relays
- Application to earth faults
- Principles of coordination

Unit Protection

- Transformer protection
- Typical transformer faults
- Protection of small transformers
- Biased differential
- High impedance differential
- Restricted earth leakage

- Buchholz and winding temperature
- Additional earth fault
- Use of earthling transformer
- Relay settings for modern multi-functional relays
- Generator and generator unit
- Schematic layout of plant
- Generator grounding principles
- Generator earth fault
- Differential schemes
- Generator protection continued
- Asynchronous running
- Negative phase sequence
- Over and under voltage
- Over and under frequency
- Reverse power
- Excitation, Motor protection
- Motor protection principles
- Thermal considerations
- Frequent starting, Locked rotor
- Phase imbalance, Single phasing
- Phase short circuit
- Earth fault, Undercurrent
- Setting of multifunctional relays

Bus and Circuit Protection

- Principles of operation
- High impedance selective schemes
- Distance protection
- Principles of operation
- Characteristics
- Arcing faults
- Faults close to relay location
- Causes of inaccuracy of measurement
- Teed feeders