



ADVANCED PROTECTIVE Relaying for Electrical Power Systems

Course Introduction:

Power system protection is very important for generation, transmission, distribution, utilities and industrial electrical distribution networks, because it limits the damage in electrical networks caused by short circuit and other type of faults. The course contains the different types of relays, the function of each relay, the basic requirements of the protective relays and how to protect the electrical network components including transformers, generators, motors, feeders, distribution and bus-bars.

Course Objectives:

Upon the successful completion of this course, each participants will be able to:-

- Know the basic requirements of protective relays and the different types of faults in the electrical network
- Know the different types of relays and principles of operation of each type
- To learn how to protect the generators, transformers, feeders, bus-bars, motors and distribution circuits
- To know what is the primary and secondary protection

Who Should Attend?

This course is designed for those individuals who are required to inspect, test, certificate or supervise those inspecting, testing or certificating all kinds of protection systems, also electrical power engineers and advanced operating staff of substations, generating stations, electrical distribution networks and transmission and the operating staff of distribution circuits of factories.

Course Outline:

1 - Introduction and General Philosophies

- 1.1 Introduction
- 1.2 Classification of Relays
- 1.3 Protective Relaying Systems and Their Design
- 1.4 Applying Protective Relays
- 1.5 Relays and Application Data
- 1.6 Circuit-Breaker Control
- 1.7 Comparison of Symbols

2 - System Grounding and Protective Relaying

- 2.1 Introduction
- 2.2 Ungrounded Systems
- 2.3 Reactance Grounding

- 2.4 Resistance Grounding
- 2.5 Sensitive Ground Relaying
- 2.6 Ground Fault Protection For Three-Phase, Four-Wire Systems

3 - Line and Circuit Protection

- 3.1 Introduction
- 3.2 Overcurrent Phase- And Ground-Fault Protection
- 3.3 Directional Overcurrent Phase- And Ground-Fault Protection
- 3.4 Distance Phase And Ground Protection
- 3.5 Loop-System Protection
- 3.6 Short-Line Protection
- 3.7 Distribution Feeder Protection

4 - Backup Protection

- 4.1 Introduction
- 4.2 Remote vs. Local Backup
- 4.3 Breaker-Failure Relaying Applications
- 4.4 Traditional Breaker-Failure Scheme
- 4.5 An Improved Breaker-Failure Scheme
- 4.6 Open Conductor And Breaker Pole Disagreement Protection
- 4.7 Special Breaker-Failure Scheme for Single-Pole Trip-System Application

5 - System Stability and Out-of-Step Relaying

- 5.1 Introduction
- 5.2 Steady-State Stability
- 5.3 Transient Stability
- 5.4 Relay Quantities during Swing
- 5.5 Effect of Out-Of-Step Conditions
- 5.6 Out-Of-Step Relaying
- 5.7 Philosophies of Out-Of-Step Relaying
- 5.8 Types of Out-Of-Step Schemes
- 5.9 Relays for Out-Of-Step Systems
- 5.10 Selection of an Out-Of-Step Relay System

6 - Reclosing and Synchronizing

- 6.1 Introduction
- 6.2 Reclosing Precautions
- 6.3 Reclosing System Considerations
- 6.4 Considerations For Applications Of Instantaneous Reclosing

- 6.5 Reclosing Relays And Their Operation
- 6.6 Synchronism Check
- 6.7 Automatic Synchronizing

7 - Load-Shedding and Frequency Relaying

- 7.1 Introduction
- 7.2 Rate of Frequency Decline
- 7.3 Load-Shedding
- 7.4 Frequency Relays
- 7.5 Formulating A Load-Shedding Scheme
- 7.6 Restoring Service
- 7.8 Other Frequency Relay Applications

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

