Electrical Engineering

Power system protection advanced Technology

Course Introduction

Power system protection

Power system protection is critical for maintaining the stability, safety, and efficiency of electrical networks. Advanced technology in power system protection helps detect and isolate faults, minimize equipment damage, and reduce downtime. It ensures a reliable supply of electricity and protects infrastructure from severe failures. Understanding advanced protection systems is essential for engineers and technicians to manage modern, complex power systems.

This training program focuses on advanced technologies in power system protection. It covers key topics like protection fundamentals, digital relays, fault analysis, communication protocols, and future trends. Each day features practical subtopics for in-depth learning. The program uses workshops, case studies, and real-world examples to help participants apply their knowledge effectively.

Training Course Methodology

This course is designed to be interactive and participatory, and includes various learning tools to enable the participants to function effectively and efficiently. The course will use sessions, exercises, and case applications, and presentation about proven-by-practice methods, new insights and ideas about the topic and its effects in a corporate world.

Target Audience

- Circuits Engineer
- Design Engineer
- Electrical Controls Engineer
- Electrical Design Engineer
- Electrical Engineer

Learning Objectives

- Understand the fundamentals of power system protection.
- Learn about advanced protection devices and technologies.
- Analyze faults and develop effective protection strategies.
- Explore communication systems used in power protection.
- Identify future trends and innovations in protection technology.

Course Outline

- **DAY 01**

  Module (01) Introduction

  - 1.1 Cable Construction
  - 1.2 Types of conductors
  - 1.3 Conductor Arrangement
  - 1.4 Cable Types
  - 1.5 Insulations
  - 1.6 Shielding and SEMICONDUCTING Tape
  - 1.7 Finishes and Jackets

  Module (02) Procedures and Techniques in Failure Analysis

  - 2.1 Stages of an Analysis
  - 2.2 Data Gathering
  - 2.3 Visual Examination
  - 2.4 Analytical Methods
  - 2.5 Determining the Failure Mechanism
  - 2.6 Actions following an Investigation

- **Day 02**

  Module (03) Failure Investigation in the Field

  - 3.1 Information Gathering
  - 3.2 Initial Actions
  - 3.3 Examination and Testing
  - 3.4 Selection of Samples
  - 3.5 Oil Sampling
  - 3.6 Handling and Transportation

  Module (04) Soil Thermal Resistivity

  - 4.1 Component Materials
  - 4.2 Density and Thermal Resistivity
  - 4.3 Water Content and Thermal Resistivity
  - 4.4 Customized Backfill
  - 4.5 Thermal Resistivity Measurements
- **Day 03**

  Module (05) Grounding System Impacts on Cables

  - 5.1 Solid Resistance Grounding
  - 5.2 Impact on Voltage During Fault
  - 5.3 Impact on Insulation Thickness
  - 5.4 Effect on Fault Current

  Module (06) Cable Failure and Their Analysis

  - 6.1 Mechanical Failures
  - 6.2 Corrosion of Sheath
  - 6.3 Moisture in The Insulation

- 6.4 Heating of Cables
- 6.5 Fire and Lighting Surges
- 6.6 Electrical Puncture
- 6.7 Inherent Causes
- 6.7.1 Sheath or Jacket Defects
- 6.7.2 Insulation Defects
- 6.7.3 Conductor Defects
- 6.8 Noninherent Causes
- 6.8.1 Corrosion of Sheath
- 6.8.2 Local Galvanic Action
- 6.8.3 Chemical Action
- 6.8.4 External Fire and HV Surges
- 6.8.5 Over Heating
- 6.8.6 Mechanical Damage
- 6.9 Other Causes
- 6.10 Failure Case Studies

- **Day 04**

Module (07) Cable and Joint Failure Modes

- 7.1 Electrical treeing
- 7.2 Water Treeing
- 7.3 Effects of DC Testing
- 7.4 Failures of Joints and Accessories

Module (08) Partial Discharge Techniques

- 8.1 What is Partial Discharge
- 8.2 PD Detection for Cable Diagnostics
- 8.3 Why Test for Partial Discharge
- 8.4 Physical Background of PD
- 8.5 Types of Partial Discharge
- 8.6 Characteristic of Discharge Patterns
- 8.7 Breakdown Cable Voltage
- 8.8 Partial Discharge Test Facility

- 8.9 Test Circuit inside Shielded Room
- 8.10 How to Calibrate the Partial Discharge System?
- 8.11 How to Measure Partial Discharge
- 8.12 Charge in Fault vs Measured Apparent Charge and Measurement Results
- 8.13 PD Measurement Methods Available
- 8.14 Importance PD for Insulation Of Old XLPE Cable Systems

- **Day 05**

  Module (09) Very Low Frequency VLF

  - 9.1 Standard for Onsite Testing Including VLF
  - 9.2 Principle of VLF Generator
  - 9.3 Dissipation Factor (Tanδ)
  - 9.4 Evaluation of Tan Δ Measurements Based On XLPE
  - 9.5 Water Treeing In Polymeric Insulation
  - 9.6 Comparison of Electrical Treeing and Water Treeing
  - 9.7 Comparison Channel Growth
  - 9.8 Simplified Dielectric Equivalent Circuit of a New Cables
  - 9.9 Examples of Water Trees
  - 9.10 Application of VLF / PD Diagnosis

  Module (10) Cable Fault Location and Tracing

  - 10.1 Introduction
  - 10.2 Cable Fault Location Procedures
  - 10.3 Cable Fault Types
  - 10.4 PD Tracks in Slip Joins For Cables
  - 10.5 Methods of Cable Fault Location
  - 10.6 Time Domain Reflectometry (TDR)
  - 10.7 Impulse Reflection Method IRM)
  - 10.8 Secondary Impulse Method (SIM)
  - 10.9 Multiple Impulse Method (MIM)
  - 10.10 Fault Distance from Cable End
  - 10.11 Bridge Method (Wheatstone)
  - 10.12 Cable Tracing
  - 10.13 Cable Locator
  - 10.14 Acoustic Fault Location

- 10.15 Propagation Time Measurement
- 10.16 Pin Pointing Set
- 10.17 Audio Frequency Twist Method
- 10.18 Cable Sheath Fault Location
- 10.19 Cable Test Va

Confirmed Sessions

FROM	TO	DURATION	FEES	LOCATION
April 7, 2025	April 11, 2025	5 days	4950.00 $	Netherlands - Amsterdam
July 7, 2025	July 11, 2025	5 days	2150.00 $	Virtual - Online
Dec. 22, 2025	Dec. 26, 2025	5 days	4250.00 $	UAE - Dubai