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Electrical Engineering

Applied Protection Techniques & Devices in Power Systems

Course Introduction

Protection of low-, medium-, and high-voltage power systems requires an understanding of system faults and their detection, as well as their safe disconnection from the power system. This course presents a comprehensive and systematic description of protection schemes for various power system elements such as feeders, transformers, motors, buses, and generators.

Protection scheme requirements

Beginning with an overview of power system faults and protection scheme requirements for the detection and coordinated clearance of these faults, the course then covers protection requirements for cogeneration, non-utility generation, and interconnection with utility power systems.

This course deals with protection systems from a practical perspective, including important functional aspects such as the testing and coordination of protection systems. Specially designed for industries and utilities, the seminar relates proper system protection to operational efficiency and the minimization of equipment damage

Target Audience

- Electrical Engineers
- Design Engineers
- Electrical Technicians
- Field Technicians
- Electricians
- Plant Operators

Learning Objectives

- Understand basic industrial and utility system protection techniques including fault analysis
- Enhance the knowledge of protective devices being used in your organization
- Determine your own relay settings
- Identify various current techniques used by experienced system designers
- Apply and approve protection schemes
- Solve common power system protection problems
- Calculate the basic fault currents flowing in any part of the electrical system
- Improve electrical system protection against faults and overvoltage

Course Outline

- **DAY 01**

Module (01) Power System Faults 1.1 Different types of faults

1.2 Incidence of faults on power system equipment

1.3 Effects of power system faults

1.4 Magnitude of fault current

1.5 Detection of faults 1.6 Clearance of faults

1.7 Requirements of protective relaying systems

Module (02) Components of Power System Protection Schemes

2.1 Fault-detecting relays

2.2 The transition from electro-mechanical relays to electronic and digital microprocessor-based relays

2.3 Tripping relays and other auxiliary relays

2.4 The application of programmable logic controllers

2.5 Circuit breakers: bulk oil, air-blast, vacuum, SF6

2.6 Current transformers

2.7 Voltage transformers 2

2.8 Modern microprocessor-based relays: review of types available

- **Day 02**

Module (03) Current Transformers (CT) and Voltage Transformers (VT)

3.1 Various types of CTs, VTs, and CVTs

3.2 Theory and characteristics of CTs

3.3 Application requirements of CTs for protective relaying

3.4 Accuracy classifications

3.5 Future trends in CT design using optics 3.6 Testing of CTs and VTs

Module (04) Feeder Overcurrent Protection

4.1 Protective relaying requirements for radial systems

4.2 Elements of feeder protection schemes

4.3 High-set, low-set, and inverse-timed elements

4.4 Coordination with other devices and fuses

4.5 Various types of overcurrent relays

4.6 Electromechanical, electronic, and digital relays

4.7 Relay setting criteria

4.8 Load limitations

4.9 Testing of overcurrent protection schemes

4.10 Microprocessor-based feeder overcurrent relays: features, application, and testing

- **Day 03**

Module (05) Coordination of Electrical Protection Systems

5.1 Fuse to fuse

5.2 Circuit breaker to fuse

5.3 Fuse to circuit breaker

5.4 Computer software packages for protection coordination studies

5.5 Auto-reclosing of circuit breakers

5.6 Breaker failure protection

5.7 Back-up protection

5.8 Limitation of fault current

5.9 Selective zones of protection Module

Module(06) Bus Protection

6.1 Types of bus protection schemes

6.2 Basic concept of differential protection

6.3 High-impedance relays for bus differential protection

6.4 Application to various bus configurations

6.5 Bus protection for radial systems

6.6 Testing of bus protection schemes

- **Day 04**

Module (09) Generator Protection

9.1 Differential protection

9.2 Reverse power, 100% stator ground fault, out-of-step

9.3 Loss of field, field ground, overexcitation, inter-turn, etc.

9.4 Over-frequency, underfrequency, overvoltage, undervoltage

9.5 Negative phase sequence or phase unbalance

9.6 Voltage controlled and voltage restricted overcurrent protection

9.7 Synchronizing systems, synchro-check relays

9.8 Comparison of electro-mechanical and electronic relays

9.9 Testing of generator protection schemes

9.10 Microprocessor-based multi-function generator protection relays: available relays, application, and testing

- **Day 05**

Module (10) Capacitor Protection

10.1 Application of static capacitors on power systems

10.2 Description of protection schemes used

10.3 Testing of capacitor protection schemes

10.4 Microprocessor-based capacitor protection and controls relays

Confirmed Sessions

FROM	TO	DURATION	FEES	LOCATION
May 26, 2025	May 30, 2025	5 days	4250.00 $	UAE - Dubai
Dec. 22, 2025	Dec. 26, 2025	5 days	4250.00 $	UAE - Dubai
Aug. 25, 2025	Aug. 29, 2025	5 days	4950.00 $	Austria - Vienna