

€ TRAINING

Power System Protection and Reliability





Power System Protection and Reliability

Introduction:

This training program provides a comprehensive understanding of the principles of Digital Power System Relaying and Protection Applications. It will help the participants in testing, operating, and adjusting protective relay. Participants will understand the reliability and availability of power systems networks, proactive module to protect the power system network to work safely and efficiently.

Program Objectives:

At the end of this program the participants will be able to:

- Understand power protection devices.
- Understand faults system and types.
- Control system reliability and PD analysis.
- Load types and network availability.
- Learn Fundamental Principles of Power System Protection.

Targeted Audience:

- Electrical Power System Engineers.
- Electrical Technician.
- All engineers and tech work in substations, power systems, and electrical companies generation, transmission, dist..
- For managers to understand the effect of power factor correction with cost.

Program Outlines:

Unit 1:

Voltage Sags and Interruptions:

- Power quality definition and basics.
- Quantifying power quality.
- ITI curve.

- Causes of voltage sags.
- Causes of interruptions.
- Mitigation methods.

Unit 2:

Transient Voltage Excursions:

- Motor starting.
- Switching and traveling waves.
- Capacitor switching.
- Lightning.
- Lightning shielding and grounding
- Ferroresonance.

Unit 3:

Reliability Indices, Effects of Fault Clearing on Power Quality:

- IEEE-defined reliability indices.
- Interpreting reliability indices.
- Fault clearing.
- Reclosing strategies.
- Fuse saving philosophy.
- Fuse blowing philosophy.

Unit 4:

Insulation Coordination, Arresters, and Steady-State Voltage Regulation:

- Basic impulse level.
- Insulation systems.
- Insulation testing.
- Arrester selection and application.

- Load tap changers and voltage regulators.
- Effects of steady-state voltage on system operation.

Unit 5:

Harmonics:

- Fundamentals of harmonics.
- Causes and effects of harmonics.
- AC power and power factor.
- Mitigating harmonic effects.
- K-factor transformers.
- Harmonic filters.

Unit 6:

Symmetrical Components and Sequence Networks:

- Protection introduction.
- Phasor math.
- Per-unit calculations.
- Symmetrical components.
- Sequence networks.
- Fault modeling.

Unit 7:

Electromechanical and Digital Relays, Relay Schemes for Radial Systems, Time-Coordinated Overcurrent Protection:

- Electromechanical relay operating principles.
- Microprocessor-based relay implementation.
- Instantaneous and time overcurrent relays.
- Reclosers and sectionalizers.

- Time-current curves.
- Device coordination.

Unit 8:

Relay Schemes for Networked Systems and Device Protection:

- Distance relays.
- Distance relays with pilot protection.
- Differential relays.
- Differential relays for bus protection.
- Differential relays for generator protection.
- Differential relays for transformer protection.

Unit 9:

Effect of Protection on Reliability:

- Reliability indices.
- Fault clearing time and reclosing.
- Effects of nearby faults.
- Fuse saving strategy.
- Fuse blowing strategy.
- Intelligent protective devices.

Unit 10:

Arc Flash Hazard and a Look to the Future:

- Shock hazard versus burn/blast hazard.
- IEEE 1584 and NFPA 70E.
- Personal protective equipment.
- Hazard labeling.
- A look to the future: communication-based overcurrent protection.



- A look to the future: intelligent sectionalizing.