Content Community Connection

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Protective Relay Training - Basic

View Course Details

COURSE DATES AND TIMES

May 21-22 , 2026

10:00 am - 4:30 pm ET

September 10-11 , 2026

10:00 am - 4:30 pm ET

Protective Relay Training Overview

Our Protective Relay Training course will benefit personnel at all levels of experience because it covers a range of relay scheme complexities and methods for testing and analyzing relay operations. We discuss system protection principles, measurement devices used for relaying, basic relay schemes, and the most common schemes used in the field.

This course is designed for protective relay technicians, system protection engineers, consultants, and engineers and technicians working in system protection. It provides professionals with real examples from actual system protection situations. This course is designed for protective relay technicians, system protection engineers, consultants, and engineers and technicians working in system protection.

This Protective Relay Training course covers relay theory and operation of modern digital types from two major North American relay manufacturers (GE Multilin and SEL), covering many types of functions such as phase, ground, negative sequence overcurrent, over and under voltage, over and under frequency, reverse power, distance and bus/transformer/line differential. Topics such as complete motor protection, fault-current basics, and the application of fuses, circuit breakers/contactors in industrial and distribution substations will also be covered.

Engineers who need a comprehensive understanding of the challenges and solutions for protecting electrical power systems should attend this course.

The Protective Relay Training course provides basic guidelines for relay application and settings calculation. It also reviews basic power system concepts and describes instrument transformers. This course is designed for technicians, operators, maintenance personnel and engineers who need a comprehensive understanding of the challenges and solutions for protecting industrial power systems.

This course provides guidelines for downloading and installing software packages from North American relay manufacturers, establishing communication between the laptop and the relay, and providing basic relay logic programming examples. The course provides guidelines for relay protection applications, principles and setting calculations, and an overview of relaying protection for motors, transformers, medium-voltage cables, feeders, buses, generators, transmission and distribution lines, breaker failure, and capacitor banks. This course reviews basic power system concepts and current- and voltage-transformer instruments.

Protection requirements for industrial plants, cogeneration, and interconnection with the utility power system are explained in detail. This course covers power system protection from a practical perspective, including important functional aspects such as testing and protection system coordination. This course is designed for individuals in industries and utilities that depend on proper system protection to maintain operational efficiency and minimize equipment damage.

A properly designed protection system with downstream devices (breakers/fuses/relays) should be activated before upstream devices. This minimizes the portion of the system affected by a fault or other disturbance. At the substation level, feeder breakers should trip before the main. Likewise, downstream panel breakers should trip before the substation feeder supplying the panel.

Protective relay testing is essential for ensuring accurate system protection, and modern relay test sets allow technicians to verify performance under real-world fault conditions. Testing relays regularly helps confirm proper coordination, detect hidden issues, and maintain the reliability of critical electrical equipment.

Students will learn the essentials of electrical protection design, relay coordination, fusing fundamentals, and breaker fundamentals. They will also gain an understanding of digital protective relaying as we go through practical examples of electrical protection for generators, feeders, motors, and transformers.

Learning Outcomes

- To Identify The Challenges And Solutions To Industrial And Power System Protection Problems And The Benefits Of Reliable And Fast Arc-Flash Protection.
- To Provide A Practical Understanding And Selection Of Protective Device Relay Applications And Protective Relay Schemes For Industrial And Electrical Power Systems And Equipment.
- Describe Current And Voltage Transformers And Their Impact On Protection Relay Settings And Schemes.
- Refresh Your Knowledge Of The Basic Industrial System Protection Techniques, Including Fault Analysis And Overvoltage Assessment.
- Develop Your Own Relay Settings and Thoroughly Understand the Philosophy of Protective Systems.

- Analyze Power System Faults For Balanced And Unbalanced Conditions Using Symmetrical Components.
- Study Actual Cases Illustrating Various Techniques In Present Use And Highlighting Particular Approaches Used By Experienced System Designers.
- Enhance Your Experience With Power System Protection Problems Generally Faced And Solutions Successfully Adopted By Industry.
- Understand how to apply microprocessor-based multifunction relays for the protection of various power system equipment and apparatuses.

Related Courses

- Utility Relay Protection Fundamentals
- Substation Relay Protection Training
- Power System Protection and Coordination

WHO SHOULD ATTEND

- Industrial, commercial, institutional electrical engineers, and electrical maintenance personnel
- Consulting Electrical Engineers
- Project engineers
- Design engineers
- Field technicians
- Electrical technicians
- Plant operators
- Plant engineers
- Electrical supervisors

- Managers in charge of plant communication infrastructure

STUDENTS RECEIVE

- Basic Protective Relay Certificate of Course Completion
- 1.2 Continuing Education Unit (CEU) Credits (12 Professional Development Hours)
- Latest Electrical Protection and Control Handbook!! (Value $20)
- $100 Coupon Toward any Future Electricity Forum Event (Restrictions Apply)
- FREE Magazine Subscription (Value $25.00)
- Course Materials in PDF Format

COURSE OUTLINE

Basic Protective Relay Training Course Outline

DAY ONE

SESSION 1: Power System Faults and Components of Power System Protection Schemes

- Different types of faults
- Detection of faults and fault-detecting relays
- Clearance of faults
- Requirements of protective relaying systems
- Modern microprocessor-based relays
- Current transformers
- Voltage transformers
- Various types of CTs, VTs and CVTs
- Application requirements of CTs for protective relaying
- Accuracy classifications of CTs and VTs
- Testing of CTs and VTs

SESSION 2: Microprocessor-based relays

- North American relay manufacturers and their software needed for settings and communications
- Modern microprocessor-based multi-function relays
- Available functions, applications, and testing
- Downloading the relay manufacturer's software packages
- Basic steps to establish communication with microprocessor-based relays
- Initial steps to create the relay-mandatory setting files.
- Initial steps to set the setting values in the relay.
- Basic concept of differential protection

SESSION 3: Feeder Overcurrent Protection

- Protective relaying requirements for radial and looped systems
- Elements of feeder protection schemes
- High-set, low-set, and inverse-timed elements
- Various types of overcurrent relays
- Relay setting criteria
- Load-shedding schemes
- Testing of overcurrent protection schemes
- Microprocessor-based feeder overcurrent relays - features, application, and testing.

SESSION 4: Coordination of Electrical Protection Systems

- Computer software packages for protection coordination studies
- Auto-reclosing of circuit breakers
- Breaker Failure Protection
- Back-up protection

DAY TWO

SESSION 5: Bus Protection

- Types of bus and bus-bar protection schemes
- High impedance relays for bus differential protection
- Low impedance relays for bus differential
- Application of differential protection to buses
- Bus blocking schemes
- Application to various bus configurations
- Testing of bus protection schemes

SESSION 6: Transformer Protection

- Overcurrent and ground fault protection
- Application of differential protection to transformers
- Restricted ground fault REF protection

- Gas relays, sudden pressure, and gas accumulation
- Winding temperature and oil temperature devices
- Testing of transformer protection schemes
- Modern microprocessor-based multi-function Transformer relays
- Available functions, applications, and testing of Transformer relays

SESSION 7: Generator Protection

- Differential protection
- Reverse power, 100% stator ground fault, out-of-step
- Loss of field, field ground, overexcitation, inter-turn, etc.
- Over-frequency, under-frequency, overvoltage, Undervoltage
- Negative phase sequence or phase unbalance
- Voltage-controlled and voltage-restricted overcurrent protection
- Synchronizing systems, synchro-check relays
- Testing of generator protection schemes
- Microprocessor-based multi-function generator protection relays - available relays, applications, and testing

SESSION 8: Motor Protection and Starting

- Applicable motor standards
- Methods of starting
- Thermal protection
- Differential protection, phase unbalance, and overcurrent
- Ground fault protection
- Transfer Schemes
- Microprocessor-based motor control and protection devices
- Example: Complete protection relay setting

COURSE SCHEDULE:

Both days:

Start: 10 a.m. Eastern Time
Finish: 4:30 p.m. Eastern Time