



Content
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Protective Relay Training

Contact us Today for a FREE quotation to deliver this course at your company's location.

<https://www.electricityforum.com/onsite-training-rfq>

Our Protective Relay Training course will benefit personnel of all levels of experience because it covers a range of complexity of relay schemes, methods of testing relays and of analyzing relay operations. We discuss system protection principles, measurement devices used for relaying, basic relay schemes used, and the most common schemes used in the field. This course provides professionals with real examples from actual system protection situations.

This Protective Relay Training course will cover 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 application of fuses and 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 training 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 training course provides guidelines how to download and install North American relay manufacturers software packages, guidelines how to establish communication between laptop and relay as well as basic relay logic programming examples. Course provides guidelines for the relay protection application, principles and setting calculation and an overview of the principals of the relaying protection for motors, transformers, medium voltage cables, feeders, buses, generators, transmission and distribution lines, breaker failure and capacitor banks. This training course also reviews basic power system concepts and current and voltage instrument transformers. Protection requirements for industrial plants, cogeneration, and interconnection with the utility power system are explained in detail. This course covers the subject of power system protection from a practical perspective, and includes important functional aspects such as testing and coordination of protection systems. This course is designed for individuals who are involved with industries and utilities which depend on proper system protection for operational efficiency and minimizing damage to equipment.

A properly designed protection system has downstream devices (breakers/fuses/relays) should activating 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.

Power System Protection And Coordination of various electrical equipment and apparatus requires a good understanding of phase and ground short circuit currents, detection, and safe clearing of the faulted equipment.

- Gain valuable experience in utility and industrial electrical system analysis, protection, control, communication, and automation
- Learn the latest trends in evolving electrical protection standards, design methods, and new technologies
- Gain Valuable knowledge of electrical power system analysis and short circuit calculations, time current coordination curves, fusing fundamentals, and more!!

- Learn how to keep your electrical system engineers, operators and project managers on track by using the latest relay protection techniques

Large or small, each and every industrial, commercial and institutional organization needs to understand how to protect their investment in their electric power systems. To do this properly, companies need to know how to perform an electrical protection analysis of all the parts of their power system: such as analyse fault data, come up with protection settings, then get all of the components of their plant to be controlled by the operators who are responsible for integrating their power system into communication and data acquisition modes.

Students will be learn the essentials of electrical protection design, relay coordination, and fusing fundamentals, breaker fundamentals. Students will be provided with an understanding of digital protective relaying, as we go through practical examples of generator, feeder, motor, and transformer electrical protection.

Note: It will be beneficial if students will have own laptop.

COURSE OBJECTIVES

- 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.
- Apply and calculate settings for motor, generation, industrial distribution and transmission lines, transformer, bus, breaker failure protection schemes, load shedding, power source transfers and arc-flush mitigation.
- 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 apparatus.

COURSE BENEFITS

The Electrical Protection Coordination Training Course:

- Will Reduce Unnecessary Downtime!
- Provide Recommended Settings For Adjustable Trip Circuit Breakers And Relays.
- Will Increase Coordination (Selectivity) Between Devices.
- Identify Deficiencies In System Protection.
- Will Provide Recommended Solutions To Help Correct Your Problem Areas.

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

- This Course Includes Our Latest Electrical Protection and Control Handbook!! (Value \$20)
- **\$100 Coupon** Toward any Future Electricity Forum Event (Restrictions Apply)
- 1.4 Continuing Education Unit (CEU) Credits
- **FREE** Magazine Subscription (Value \$25.00)
- Forum Presentation Materials in Paper Format

COURSE OUTLINE

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 communication**
- **Downloading relay manufacturers software packages**
- **Basic steps to establish communication with microprocessor-based relays**

SESSION 3: Arc-flash protection and mitigation

- **Maintenance mode**
- **Instantaneous overcurrent protection**
- **Fast bus bar protection**
- **Fiber optic protection**
- **Arc-flash mitigation**

SESSION 4: 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 5: 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 6: Bus Protection

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

SESSION 7: Motor Protection and Starting

- **Applicable motor standards**
- **Methods of starting**
- **Thermal protection**
- **Differential protection, phase unbalance, overcurrent**
- **Ground fault protection**
- **Transfer Schemes**
- **Microprocessor-based motor control and protection devices**

SESSION 8: Transformer Protection

- **Overcurrent and ground fault protection**
- **Application of differential protection to transformers**
- **Restricted ground fault protection**
- **Gas relays, pressure and gas accumulation**
- **Winding temperature and oil temperature devices**
- **Testing of transformer protection schemes**
- **Modern microprocessor-based multi-function relays - available functions, application and testing**

SESSION 9: Generator Protection

- **Differential protection**
- **Reverse power, 100% stator ground fault, out-of-step**
- **Loss of field, field ground, overexcitation, inter-turn, etc.**
- **Over-frequency, underfrequency, 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, application and testing**

SESSION 10: Cogeneration and Non-Utility Generation (NUG) Protection

- **Protection requirements for non-utility generating stations**
- **Requirements for the interconnection of NUGs to utility power systems**
- **Typical protection schemes for non-utility generators**
- **Low-cost microprocessor-based multi-function relays for small generators**
- **Testing utility tie protection schemes**

SESSION 11: Transmission Line Protection

- **Distance or impedance protection schemes**
- **Line current differential protection schemes**
- **Communication channel requirements between terminals**
- **Coordination and transfer-tripping between terminals**
- **Modern microprocessor-based line protection relays - available relays, features, applications and testing**

COURSE SCHEDULE:

Both days:

Start: 8:00 a.m.

Coffee break: 10:00 a.m.

Lunch: 12:00 noon

Finish: 4:30 p.m.

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