Content Community Connection

United States
The Electricity Forum Inc.
742 Pre Emption Road
Geneva, NY 14456
Tel 289-387-1025

Canada
The Electricity Forum
1885 Clements Rd, Unit 218
Pickering, ON L1W3V4
Tel 905-686-1040
Fax 905-686-1078
Toll Free 855-824-6131

Substation Relay Protection Training

Course details: https://electricityforum.com/electrical-training/substation-relay-protection-training

COURSE DATES AND TIMES

November 7-8 , 2024

10:00 am - 4:30 pm ET

Substation Relay Protection Training - This 12-Hour, instructor-led, live online course is designed for engineers and technicians from utilities or industries who participate in the design, installation, or maintenance of protective relays and substation controls. Participants will increase their knowledge of protection concepts and how those concepts apply in a variety of situations. The common protective relay types applied to lines (transmission and distribution), transformers, busses, generators, and motors are described, noting important considerations for typical applications.

SUBSTATION PROTECTION – COURSE LEARNING OBJECTIVES

The course objectives are:

- Provide an understanding of system protection concepts
- Understand operation of batteries, chargers, trip/close, and control circuits
- Develop skills to apply protective relays to lines (transmission and distribution), transformers, busses, generators, and motors.
- Gain knowledge of overcurrent, directional, impedance (distance), differential, underfrequency, and generation relays
- Gain awareness of tradeoffs and constraints involved with system protection
- Know benefits of modernizing system protection equipment with data networking capability

WHO SHOULD ATTEND

This Substation Relay Protection Training course is recommended for engineers and technicians from utilities or industries who participate in the design, installation, or maintenance of protective relays and substation controls. Job classifications include:

- System Protection Engineers
- Substation Design Engineers
- Relay Technicians
- Substation Construction Technicians
- Control System Engineers
- Consulting Engineers
- Testing & Commissioning Engineers
- Maintenance Engineers & Technologists
- Substation Operation/Maintenance Engineers & Technologists
- Transmission & Distribution Engineers

STUDENTS RECEIVE

- This Course Includes Our Latest Protection And Control Electrical Handbook!! (Value $20)
- **$100 Coupon** Toward Any Future Electricity Forum Event (Restrictions Apply)
- 1.2 Continuing Education Unit (CEU) Credits (12 Professional Development Hours)
- **FREE** Magazine Subscription (Value $50.00)
- Course Materials In PDF Format

COURSE OUTLINE

SUBSTATION RELAY PROTECTION TRAINING – COURSE OUTLINE

DAY ONE

What is a protection system?

- What is being protected and why? NERC definition
- Protective relays
- Instrument transformers (VT’s and CT’s)
- DC Protection and control circuits

Substation DC Systems

- Purpose for DC systems in substations
- Batteries, different types and comparison
- Battery capacity, battery installation
- Battery chargers
- Trip circuits
- Close circuits
- DC circuit monitoring

Voltage Transformers

- Electro-magnetic Voltage Transformers (EMVT)
- Capacitive Coupled Voltage Transformers (CCVT)
- VT accuracy

Current Transformers

- Types of current transformers
- CT ratios & polarity
- CT accuracy, burden, and saturation
- Shorting CT secondary circuits
- Open-circuit CT voltage and safety considerations
- CT magnetization
- CT Connection in ring bus / breaker & a half schemes

Protective Relay Types

- Dependability, security, selectivity, speed
- IEEE device numbers
- Electromechanical, Electronic, & Microprocessor
- History, Comparison of types

Transformer Protection

- Fuses - Good for small transformers, difficulties coordinating with downstream devices
- Overcurrent – simplicity but limited mainly as backup protection
- Differential – single & multiple slope, harmonic inrush restraint
- Delta-wye transformer connection considerations
- Sudden Pressure & Bucholz relays
- Voltage controller (90)

DAY TWO

Bus Protection

- Bus differential
- Bus configurations and CT connections
- Breaker failure protection

Distribution Line Protection

- Fusing
- Reclosers & sectionalizers
- Overcurrent relays
- Directional, negative sequence settings

Transmission Line Protection

- Directional Overcurrent
- Distance (Impedance) and mho characteristic
- Load encroachment settings
- Pilot Relaying (communications assisted)

- DCB - Directional Comparison Blocking
- POTT - Permissive Overreaching Transfer Trip
- Line Current Differential

Reclosing (79)

- Pros and cons of reclosing on line faults
- Distribution circuits, reclosing considerations
- Transmission circuits, reclosing considerations

Underfrequency Load Shedding

Generation Protection

- Stator grounding, high resistance or low resistance
- Stator protection, generally differential
- Accidental energization - generator acts as a motor and produces high current in the rotor
- Start-up protection
- Loss of field
- Out-of-step protection and pole slip

Relay Data Communication

- Digital communication concepts
- Protocols, DNP, IEC 61850
- Relay event reports & COMTRADE
- Data concentrator
- SCADA communication

COURSE TIMETABLE

Both days:
Start: 10:00 a.m. ET
Finish: 4:30 p.m. ET