

PROTECTION RELAY MAINTENANCE, APPLICATION AND TESTING

ELC026

COURSE DESCRIPTION

Protective relays monitor circuit conditions and initiate protective action when an undesired condition is detected. When required to operate because of a faulted or undesirable condition, it is imperative that protective relays function correctly. This course covers all topics related to isolating faulted circuits or equipment from the remainder of the system so the system can continue to function, limiting damage to faulted equipment, minimizing the possibility of fire or damage to adjacent equipment, and minimizing hazards to personnel.

COURSE GOAL

To enhance the participants' knowledge, skills, and abilities necessary to perform a strong maintenance and test program in order to ensure that protective relays respond properly to normal and abnormal conditions.

COURSE OBJECTIVES

By the end of this course, the participant will be able to:

- Perform required electrical tests and adjustments on basic protective relays.
- Read relay schematics found in manufacturer instructional literature.
- Apply test connection diagrams in manufacturer instructional literature to participant's specific relay test sets.
- Use timing characteristic curves for basic protective relays.
- Understand the operation of over current, voltage and differential protective relays.
- Understand the basic and complex generation relay theory, application and components.
- Interpret wiring diagrams.
- Perform visual and mechanical inspections.
- Use of MPRT with TVI.
- Test, calibrate, repair and troubleshoot the following relays in lab:
 - Overcurrent (COV, IJCV).
 - Negative sequence (COQ, SGC).
 - Loss of field (KLF, CEH).
 - Reverse power (CW, ICW).
 - Differential (CA, CFD).

WHO CAN BENEFIT

- Technicians with relay testing experience or electrical control systems experience.
- Supervisors of engineers who are responsible for the relays testing and maintenance.
- R&D personnel and Power System Design Engineers.

COURSE DURATION

5 Working Days

COURSE OUTLINE

1. Introduction to Basic Relays

2. Current and Voltage Transformers

- Elementary Connections of Instrument Transformers
- Types of Current Transformers

3. Introduction to Protective Relaying

- The Art and Science of Protective Relaying
- Purpose of Protective Relays
- Instrument Transformers
 - Types
 - Connections
- Hazards
- One-Line Diagrams
- Identify Relay Types
- IEEE Standard Device Numbers

4. Relay Fundamentals

- Principles of Operation
 - Electromagnetic Attraction and Induction
 - Solid State
- Safety
- Shorting Devices
- Test Paddles
- Internal Schematics
- Inspection



5. Overcurrent Relay Testing

- Application
- Inspection and Maintenance Requirements
- Testing
- Review of Manufacturer Literature

6. Voltage Relay Testing

- Application
 - Overvoltage and Under voltage
- Inspection and Maintenance Requirements
- Testing
- Review of Manufacturer Literature

7. Overcurrent and Voltage Relay Labs

8. Protective Relay Maintenance/Testing

- Mechanical and Visual Inspections
- Preventive Maintenance Testing
 - Visual Check
 - As-Found and As-Left Tests
- Acceptance Testing
- Testing Techniques
- General Tests

9. Differential Relaying

- Application
- Inspection and Maintenance Requirements
- Testing
- Review of Manufacturer Literature

10. General Electric High-Speed Differential Relays (CFD)

- Applications
- Components
- Operating Principles
- Protection Scheme
- Testing
- Types of Tests
- Adjustments

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11. Reverse Power Relay (CW)

- Application
- Types of CW Relays
- Components
- Operating Principles
- Protection Scheme
- Testing
- Types of Tests
- Adjustments

12. General Electric Power Relays (ICW)

- Application
- Types of ICW Relays
- Components
- Operating Principles
- Protection Scheme
- Testing
- Types of Tests
- Adjustments

13. Negative Phase Sequence Relays (COQ)

- Application
- Components
- Operating Principles
- Protection Scheme
- Testing
- Types of Tests
- Adjustments

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