

# Protective Device Coordination for Industry

3 Days, 2.1 CEUs

Industrial and commercial facilities are more dependent on reliable power systems than ever before. The goal of protective device coordination is to allow for normal equipment operation, ensure circuits open before equipment is damaged and limit outages to the smallest area through selectivity. These studies are used to verify correct equipment ratings and settings as well as assist in the selection of new equipment. A properly coordinated power system can prevent equipment damage and lost productivity.

This coordination study is also an essential element of an arc flash study and is intended for engineers, supervisors and relay technicians that are responsible for the protection of industrial power systems.

## Lab and Classroom Attire

AVO Training Institute is committed to the personal safety of each participant and require long pants and ANSI rated "safety-toe" work shoes for lab activities. Lecture courses may involve a tour of a work or shop area and for this reason open-toe shoes and shorts are not considered appropriate attire for the classroom.

## Learning Objectives

To receive 2.1 CEUs, participants must attend 3 days of class (21 contact hours) and attain a minimum grade of 80% on the final exam. Upon completion of this course the participant will demonstrate that he/she is able to:

- Identify and explain the application of common power studies
- Explain the application of fuses, low-voltage breakers and motor overload and overcurrent relays
- Utilize leading engineering software to create and modify one-line drawings and time current coordination curves (TCCs)
- Interpret TCCs and damage curves
- Coordinate protective devices to prevent thermal and mechanical damage to transformers, cables, and motors using leading engineering software

## SCOPE

### Day 1\* (7 contact hours)

- I. Introduction (0.5 hr)
  - A. Schedule
  - B. Course Outline
- II. Introduction To Protective Device Coordination (3.5 hrs)
  - A. Types of Power System Studies
    1. Short Circuit
    2. Load Flow
    3. Stability

4. Motor Starting
5. Harmonic Analysis
6. Switching Transient
- AM Break
7. Reliability
8. Cable Ampacity
9. Ground Mat Analysis
10. Protective Device Coordination
11. Arc Flash Analysis
- B. Purpose and Methods
- C. Examples

### Lunch

- D. Standards
- E. Computer Methods
- III. Setup (3 hrs)
  - A. Equipment Needed
- PM Break
  - B. Time Current Curve Plots
  - C. Coordination Study
  - D. Line Equipment

\*Class scheduling times may vary based on discussions and size of class

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## SCOPE (cont'd)

### Day 2 (7 contact hours)

- IV. Protective Devices (4 hrs)
  - A. Fuses
    - 1. Principles of Operation
    - 2. Renewable Link
    - 3. Fuse Characteristics
    - 4. Selection Methods
    - 5. Example Problems
  - AM Break
  - B. Circuit Breakers
    - 1. Insulated Case
    - 2. Low Voltage
    - 3. Time Delay Bands
  - C. Motor Overload Relays
  - D. Overcurrent Relays
  - E. Time Current Curves
  - F. Selection Methods

### Lunch

- V. Line Equipment (3 hrs)
  - A. Transformers
    - 1. Full Load
    - 2. Inrush
    - 3. Damage Curves
    - 4. Standards
  - PM Break
  - 5. Cables
  - 6. Motors
  - 7. Current Transformers
  - 8. Selection Methods
  - 9. Optical Current Transformers

### Day 3 (7 contact hours)

- VI. Software Exercise (6.5 hrs)
  - A. Load SKM PTW Software
  - AM Break
  - B. Present PTW Basic Procedure
  - Lunch
  - C. Hands-On PDC Exercise using PTW Software
  - PM Break
  - C. Hands-On PDC Exercise using PTW Software (cont'd)
- VIII. Conclusion (0.5 hr)
  - A. Review
  - B. Final Exam