

**TRAINING TITLE**  
**PROTECTIVE RELAYS**

**Training Duration**  
**5 day**

**Training Venue and Dates**

<b>Ref. No.</b> EE180	<b>Protective Relays</b>	<b>5</b>	<b>14-18 July 2025</b>	<b>\$5,500</b>	<b>DUBAI, UAE</b>
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In any of the 4 or 5-star hotels. The exact venue will be informed later.

**Training Fees**

- \$5,500 per participant for Public Training includes Materials/Handouts, tea/coffee breaks, refreshments & Lunch

**Training Certificate**

**Define** Management Consultants Certificate of course completion will be issued to all attendees.

**TRAINING DESCRIPTION**

The Protective Relays course is designed to provide participants with a comprehensive understanding of the operation, application, and maintenance of protective relays in electrical power systems. Protective relays are critical components in ensuring the safe and reliable operation of electrical networks by detecting faults and initiating appropriate protective actions (such as tripping circuit breakers) to prevent equipment damage and power outages. This course covers the fundamentals of relay operation, types of protective relays, and their settings, as well as troubleshooting, maintenance, and testing procedures. Participants will also gain hands-on experience with relay testing and configuration.

**TRAINING OBJECTIVES**

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**By the end of the course, participants will be able to understand**

- Understand the function and importance of protective relays in electrical power systems.
- Identify different types of protective relays and their applications (overcurrent, differential, distance, etc.).
- Set up, configure, and adjust protective relay settings based on system requirements.
- Troubleshoot and diagnose faults related to protective relays.
- Perform testing and maintenance on protective relays to ensure optimal operation.

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- Understand and apply industry standards (e.g., IEC, ANSI) for relay protection and coordination.
- Implement best practices for maintaining system reliability and protecting electrical equipment.

### **WHO SHOULD ATTEND?**

- Electrical engineers, technicians, and maintenance personnel responsible for operating and maintaining power systems and electrical equipment.
- Protection and control engineers working with relays in substations and power plants.
- Maintenance teams involved in troubleshooting and testing electrical relays and protection systems.
- Engineers and operators who want to deepen their understanding of electrical protection and fault detection.
- Supervisors and managers overseeing relay protection systems in electrical distribution networks.

### **TRAINING METHODOLOGY**

A highly interactive combination of lectures and discussion sessions will be managed to maximize the amount and quality of information and knowledge transfer. The sessions will start by raising the most relevant questions and motivating everybody to find the right answers. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.

Very useful Course Materials will be given.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Group Work & Practical Exercises
- 20% Videos & General Discussions

### **COURSE PROGRAM:**

#### **Day 1: Introduction to Protective Relays**

- Overview of the role of protective relays in electrical systems: Fault detection, isolation, and prevention.
- Key principles of protection systems: Coordination, selectivity, and reliability.
- Basic components of a protective relay: Input, processing, and output.

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- Types of faults: Short circuits, ground faults, overloads, and their impact on electrical systems.
- History and evolution of protective relays: From electro-mechanical to digital and numerical relays.
- Overview of industry standards (IEC, ANSI) for protective relays.

## Day 2: Types of Protective Relays and Their Applications

- **Overcurrent Relays:**
  - Basic operation and principles: Time overcurrent and instantaneous overcurrent.
  - Applications: Distribution systems, generators, transformers.
  - Relay settings and coordination for selective protection.
- **Differential Relays:**
  - Principles of differential protection: Current comparison.
  - Applications: Transformer, generator, and busbar protection.
  - Adjusting settings for fault detection and coordination.
- **Distance Relays:**
  - Operating principles: Impedance measurement and zone-based protection.
  - Applications: Transmission line protection and coordination.
- **Other Types of Relays:**
  - Earth fault, under-voltage, over-voltage, and reverse power protection.
  - Application of protection schemes for different types of electrical equipment (motors, feeders, etc.).

## Day 3: Relay Settings and Coordination

- **Setting Protective Relays:**
  - Principles of setting current levels, time delays, and fault detection criteria.
  - How to adjust relay settings based on system requirements (network characteristics, load flow, fault levels).
  - Calculating fault currents and determining appropriate protection settings.
- **Relay Coordination:**
  - Understanding coordination between relays to ensure selective tripping.
  - Using time-current characteristic curves for proper coordination of protection devices.
  - Setting up coordination for parallel feeders, transformers, and generators.
  - Applying backup protection strategies for enhanced system reliability.

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## Day 4: Troubleshooting, Testing, and Maintenance of Protective Relays

- **Troubleshooting Common Relay Issues:**
  - Diagnosing common faults in relay circuits and systems.
  - Troubleshooting relay malfunctions: Contact wear, coil burnout, incorrect settings, and external influences.
- **Relay Testing:**
  - Methods for testing protective relays: Injecting test signals, using secondary injection testing, and using relay test sets.
  - Practical testing techniques: Verification of relay pick-up, time delay, and reset functions.
  - Testing different types of relays (electromechanical, solid-state, numerical).
  - Understanding relay trip characteristics and verifying them under fault conditions.
- **Maintenance of Protective Relays:**
  - Preventive maintenance: Regular inspection, testing, and calibration of protective relays.
  - Identifying signs of wear and degradation (contacts, wiring, insulation).
  - Cleaning, lubrication, and ensuring relay reliability.
  - Software updates and calibration for numerical relays.

## Day 5: Advanced Topics and Industry Best Practices

- **Numerical and Digital Relays:**
  - Advanced functions and features: Communication protocols (IEC 61850, Modbus), logic programming, event recording, and fault analysis.
  - Integration of numerical relays into SCADA systems for remote monitoring and control.
  - Benefits and challenges of digital protection schemes.
- **Relay Communication and Integration:**
  - Communication between relays and automation systems.
  - Real-time monitoring and protection coordination through SCADA and other control systems.
- **Best Practices for Relay Protection and System Reliability:**
  - Developing and implementing maintenance schedules for relay protection systems.
  - Ensuring proper system design and coordination for protection.

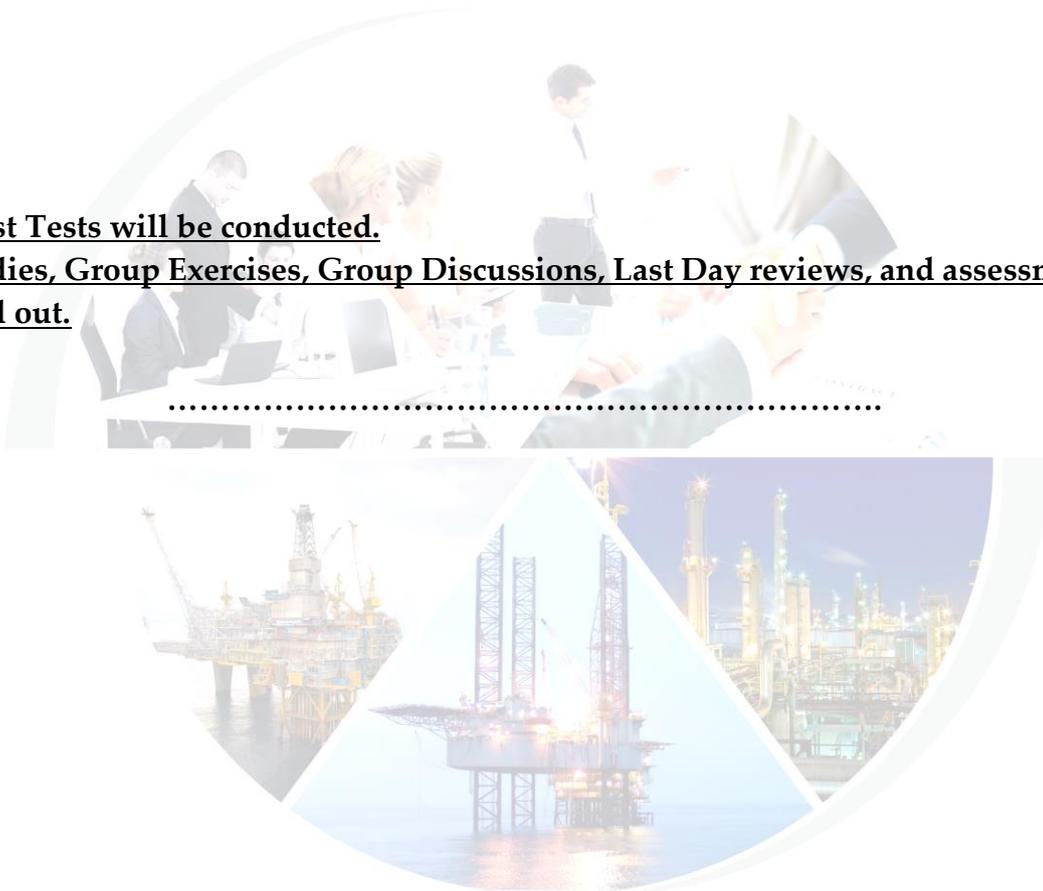
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- Case studies of relay protection failures and lessons learned.
- Future trends in protection technology: Smart grids, artificial intelligence in fault detection, and automated relay systems.
- **Course Review and Q&A:**
  - Recap of key concepts covered in the course.
  - Final questions and clarifications.

**NOTE:**

**Pre- & Post Tests will be conducted.**

**Case Studies, Group Exercises, Group Discussions, Last Day reviews, and assessments will be carried out.**



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