Protection and Relay Setting for Electrical Power System Elements

Course general description:

This intensive training presents a comprehensive and systematic description of the concepts and principles of operation and application of protection schemes for various Power System Elements. Our Protective Relay Training course begins with an overview of Power System faults, short circuit calculations, components of Power System Protection Schemes, as well as a full session on microprocessor-based protective relays and their application.

In this course, the Hardware, Software, Settings, and Application areas of the Digital and Numerical Relays are outlined but before this, the main aspects of Microcomputer Technology are summarized. Various study cases for Power System Protection Digital Relays are presented and explained in detail. Therefore, the training course designed to provide the participants with the recent and the new trend Technical Knowledge, Practical Experience, and Good Skills in the Digital Relaying Field.

This Protective Relay Training course has been specifically designed for Electric Utility Engineers, Consultants, and others involved in the selection and coordination of overcurrent protective devices used in medium-voltage Electric Power Distribution Systems. Facilities engineers engaged in the selection of devices for protecting small Power Transformers, as well as the Coordination of those devices with both source-side and load-side protective devices. This course is designed to provide the participants with complete Knowledge about Protection Principles and the Relays Application of Electrical Power System, including Generators, Power Transformers, Transmission Lines, Distribution Lines, Busbar and Motors.

Audience:

This course is designed for:

1- Electrical supervisors
2- Electrical Engineers
3- Anyone involved in the Maintenance of industrial protection relays.

Course objectives:

By the end of the training, participants will be able to:

- Enhance your Knowledge of Basic Electrical System Protection Techniques including Fault Analysis
- Techniques, Further your understanding of Protective Devices
- Understand Problems Generally faced and solutions successfully adopted by Industry
- Learn to calculate the basic Fault Currents flowing in any part of the Electrical System
- Improve your Electrical System Protection against Faults and Overvoltage
- Understanding Digital differential protections and their application for Busbar, Generator,
- Transformer and Transmission Lines
- Explain the Principles of Operation of Instantaneous and Time Delay Electromagnetic Relays for
- Differential Protective Relays, Ground Protective Relays, Over and Under Voltage Relays, Over Current Protective Relays and Distance Relays
- Learn all types of Maintenance Jobs performed on Relays

Course duration:

5 days

Course location:

Cairo-Dubai-Istanbul

Course contents:

Day-1: Introduction to Protection

- Philosophy of System Protection
- Role of Protection & Protective Relays
- Abnormalities & Faults
- Protection Terminology
- Protection Devises Numbers

Power System Faults

- Different Types of Faults
- Incidence of Faults on Power System Equipment
- Effects of Power System Faults
- The magnitude of Fault Current, Short Circuit
- Detection / Clearance of Faults

Day-2: Protection Equipment

- Fuses & Isolators
- Load Breakers
- Circuit Breakers
- Auto Reclosers
- Automatic Sectionalizer

Measuring Transformers (VT/CT)

- CurrentTransformer
  - OpenCircuitedCurrentTransformer
  - ShortTimeFactor
  - AccuracyLimitFactor
  - SpecificationofCurrentTransformer
  - SecondaryRating, WindingImpedance
  - CurrentTransformerTesting:Polarity/Ratio
- Potential Measuring Devices
  - Residual Connection
  - Capacitor Voltage Transformer
  - Ratio Check Testing
  - Polarity Check Testing
  - Magnetizing Curve

Day-3: Differential Protection

- Application of Differential Protection
- Principles of Circulating Current Differential
- Difficulties in Differential Protection
- Biased or Percent Differential Relays
- The setting of Differential Relays
- Balanced Voltage Differential Protection

Distribution System Protection

- Discrimination and Coordination
- Selective Tripping Plan, Selective Tripping Time
- Selective Tripping Times on the Low- Voltage Side
- Selective Tripping Times on the High - Voltage Side
- Protective Devices for Low Voltage Side
- ProtectiveDevicesforHighVoltageSide

Day-4: Over Current Protection

- Non-Directional Time Graded System of Feeder (Line)
- The setting of Inverse Over-current Relays for Co-ordination
- Directional Time and Current Graded System
- The setting of Directional Overcurrent Relays
- Current Graded System
- Instantaneous and IDMT Protection
- Over—Reach of Instantaneous Over Current
- Definite Time overcurrent Protection of Lines

Distance Protection

- Distance Protection of H.V and E.H.V
- Stepped Characteristic
- Single Stepped Distance, Time Characteristic
- Three-Step Distance - Time Characteristic
- Power Swings
- Carrier Assisted Distance Protection
- Carrier Transfer
- Carrier Blocking Scheme (Directional Comparison)
- Carrier Acceleration
- Distance Schemes for Single, Triple Pole Auto Reclosing
- Connection of Distance Relays
- Protection of Parallel Transmission Lines

Day-5: Bus Bar Protection

- Importance of Busbars
- Differential Protection of Buses
- Autoreclosure
- Interlock Overcurrent Protection
- Busbar Switching (Transfer) Arrangements
- Course Conclusion

Methodology:

- 50% lectures & concepts
- 10% Videos
- 10% Case studies
- 10% Exercises
- 10% Discussions
- 10% Software (if applicable or examples)

Course code: (TEEI003)