



Training Course :

## Modern Electric Power Systems: Design, Modeling, Analysis & Problem Solving

Training Course For One Week In  
Jordan, Amman, Royal Hayat Amman

Which Be Held As Under Details :



Abar Solutions Petroleum Consultancy Invite Your Employee To Participate With Us In Special Training Course As Under Details:

Course Name		Modern Electric Power Systems: Design, Modeling, Analysis & Problem Solving				
Code	Period	Language	Start	End	Location	Fees
EL 23	5 Days	Bilingual (Arabic & English)	18/09/2016	22/09/2016	Jordan, Amman, Royal Hayat Amman	1750 KD  (15% For Individual Registration) & (25% For Group Registration)
			16/10/2016	20/10/2016		
			13/11/2016	17/11/2016		
			18/12/2016	22/12/2016		
			15/01/2017	19/01/2017		
			19/02/2017	23/02/2017		
			19/03/2017	23/03/2017		
			16/04/2017	20/04/2017		
			14/05/2017	18/05/2017		
			18/06/2017	22/06/2017		
			16/07/2017	20/07/2017		
			20/08/2017	24/08/2017		

**\*\* The Fees Includes : Lecturer , Training Material , Training Room With One Coffee Break Daily , Certificate Of Attendance In Last Day Training Course \*\***

*Course Description*

⇒ Protection of low, medium and high voltage power systems requires an understanding of system faults and their detection, as well as their safe disconnection from the power system. This course presents a comprehensive and systematic description of the concepts and principles of operation and application of protection schemes for various power system elements such as feeders, transformers, motors, buses, generators, etc. The course begins with an overview of power system faults and the protection scheme requirements for the detection and coordinated clearance of these faults. Protection requirements for cogeneration, non-utility generation, and interconnection with the utility power system are covered in detail. This course deals with protection systems from a practical perspective, and includes important functional aspects such as testing and coordination

of protection systems. It is specially designed for industries and utilities, which depend on proper system protection for operational efficiency and minimizing damage to equipment

### *Course Objectives*

- ⇒ To provide a practical understanding of protective schemes for electrical power systems and equipment

### *Course Content & Outlines*

- ⇒ Power System Faults
  - Different types of faults
  - Incidence of faults on power system equipment
  - Effects of power system faults
  - Magnitude of fault current
  - Detection of faults
  - Clearance of faults
  - Requirements of protective relaying systems
- ⇒ Components Of Power System Protection Schemes
  - Fault-detecting relays
  - The transition from electro-mechanical relays to electronic and digital microprocessor-based relays
  - Tripping relays and other auxiliary relays
  - The application of programmable logic controllers
  - Circuit breakers - bulk oil, air-blast, vacuum, SF6
  - Current transformers
  - Voltage transformers
  - Modern microprocessor-based relays - review types available
- ⇒ Current Transformers (CT) And Voltage Transformers (VT)
  - Various types of CTs, VTs and CVTs
  - Theory and characteristics of CTs

- Application requirements of CTs for protective relaying
  - Accuracy classifications
  - Future trends in CT design using optics
  - Testing of CTs and VTs
- ⇒ Feeder Overcurrent Protection
- Protective relaying requirements for radial systems
  - Elements of feeder protection schemes
  - High-set, low-set and inverse-timed elements
  - Coordination with other devices and fuses
  - Various types of overcurrent relays
  - Electromechanical, electronic and digital relays
  - Relay setting criteria
  - Load limitations
  - Testing of overcurrent protection schemes
  - Microprocessor-based feeder overcurrent relays - features, application and testing
- ⇒ Coordination Of Electrical Protection Systems
- Fuse to fuse
  - Circuit breaker to fuse
  - Fuse to circuit breaker
  - Computer software packages for protection coordination studies
  - Auto-reclosing of circuit breakers
  - Back-up protection
  - Limitation of fault current
  - Selective zones of protection
- ⇒ Switchboard And Bus Protection
- Types of bus protection schemes
  - Basic concept of differential protection
  - Application to various bus configurations
  - Application to switchboards

- Testing of bus protection schemes
- ⇒ Motor Protection, Starting And Control
  - Applicable motor standards
  - Methods of starting
  - Differential protection, phase unbalance, overcurrent
  - Ground fault protection
  - Canadian Electrical Code requirements
  - Microprocessor-based motor control and protection devices
- ⇒ Transformer Protection
  - Overcurrent and ground fault protection
  - Application of differential protection to transformers
  - Restricted ground fault protection
  - Gas relays, pressure and gas accumulation
  - Winding temperature and oil temperature devices
  - Testing of transformer protection schemes
  - Modern microprocessor-based multi-function relays - available functions, application and testing
- ⇒ Generator Protection
  - Differential protection
  - Reverse power, stator ground, out-of-step, loss of field, field ground, overexcitation, interturn, etc.
  - Over-frequency, underfrequency, overvoltage, undervoltage
  - Negative phase sequence or phase unbalance
  - Voltage controlled and voltage restricted overcurrent protection
  - Synchronizing systems, synchro-check relays
  - Comparison of electro-mechanical and electronic relays
  - Testing of generator protection schemes
  - Microprocessor-based multi-function generator protection relays - available relays, application and testing

- ⇒ Cogeneration And Non-Utility Generation (NUG) Protection
  - Protection requirements for non-utility generating stations
  - Requirements for the interconnection of NUGs to utility power systems
  - Typical protection schemes for non-utility generators
  - Low-cost microprocessor-based multi-function relays for small generators
  - Breaker failure protection
  - Testing utility tie protection schemes
- ⇒ Transmission Line Protection
  - Interconnected systems with two-way flow of fault current
  - Distance or impedance protection schemes
  - Phase comparison protection schemes
  - Communication channel requirements between terminals
  - Coordination and transfer-tripping between terminals
  - Modern microprocessor-based line protection relays - available relays, features, applications and testing
- ⇒ Capacitor Protection
  - Application of static capacitors on power systems
  - Description of protection schemes used
  - Testing of capacitor protection schemes
  - Microprocessor-based capacitor protection and controls relays
- ⇒ Recent Developments And Future Trends In Protective Relaying
  - Digital relays
  - Integrated microprocessor based systems for control, monitoring, and protective relaying
  - Optical current transformers
  - Fibre optic communications

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