EE019: Advanced Circuit Breakers & Switch Gears
**Training Description:**

Circuit breakers play an important role in the safe distribution of electrical power. The equipment needs to be operated, maintained and installed in a safe manner securing continuity of supply to consumers.

**This following are important aspects of the circuit breakers:**
- Electric power systems are designed to be as fault free as possible through appropriate network design, equipment design, proper installation and on-going maintenance
- The Circuit breaker and its associated fault detection equipment, protective relaying, is an extremely important device, through its role of clearing short-circuit currents, disconnecting faulty elements from the power network, and thus maintaining the overall integrity of the power network.
- If faults are not controlled they can cause unnecessary loss of electricity service with all of its many ramifications
- The circuit breaker selection and arc extinction methods are of great importance
- Minimising downtime by proper and systematic maintenance program
- The course focuses mainly on the operation and maintenance of circuit breakers, with reference to auxiliary equipment incorporated for its reliable and safe operation
- The importance of preventive maintenance check and servicing of the various types of circuit breakers
- Implementation of safe systems of work and operations
- Co-ordination of maintenance activities and maintaining system safety
- To be able to understand the component functionalities of the gas and vacuum circuit breakers
- Methods of arc extinction for MV HV circuit breakers
- Routine inspections and the functions of the microprocessor component in the circuit breakers

**Training Objectives:**

**By the end of the training, participants will be able to:**
- Learn the importance of preventive maintenance check and servicing of the various types of circuit breakers
- Gain a detailed information on implementation of safe systems of work and operations
- Co-ordination of maintenance activities and maintaining system safety
- Understand the component functionalities of the gas and vacuum circuit breakers
- Familiarize with the methods of arc extinction for MV HV circuit breakers
- Familiarize with the routine inspections and the functions of the microprocessor component in the circuit breakers

**Training Designed for:**

This course is intended for all Electrical Staffs.
Training Program:

**DAY ONE:**
- PRE-TEST
- Introduction - reasons for faults - and classification of faults
  - Distinction between load and fault current
  - Sources of short-circuit current
  - Introduction to fault calculations
  - Balanced and unbalanced faults

**DAY TWO:**
- Overview of Power System Protection
  - Measurement - voltage and current transformers
  - Protective device characteristics
  - Types of protection systems
  - The role and importance of the circuit breaker in power systems

**DAY THREE:**
- General principles of arc extinction
- Overview of types of circuit breaker
  - Air-Break
  - Vacuum
  - Gas
  - Other related switching devices
  - The single-line diagram
  - Substation layouts
- Air-break
  - Principles of arc extinction
  - D.C. circuit breaking
  - A.C. circuit breaking
  - Contacts and arc initiation
  - Arc chutes
  - Performance characteristics
  - General construction Principles
- Vacuum
  - History – The early years
  - The vacuum arc – An overview
  - Current interruption in vacuum
  - Methods of keeping the arc diffuse
  - Current chopping – general implications
  - Vacuum interrupters in series
  - Design of vacuum switchgear
  - Maintenance and testing requirements
DAY FOUR:
❖ SF6 Gas
   • Properties of SF6
   • Principles of arc extinction
   • Features of construction
   • Mechanism principles
   • Insulation principles
   • Gas leak problems
   • Specific supervision requirements
   • Circuit power factor considerations
   • Maintenance and testing requirements
❖ International Standards
   • Importance and relevance to specifications
   • ANSI and IEEE
   • IIEC and IEE

DAY FIVE:
❖ Circuit breakers and power system
   • Circuit breaker failure and the effects on power system operation
   • Circuit breaker inspection, testing and maintenance program
   • The Principles of modern substation control systems
   • Power circuit breaker maintenance
❖ Course Conclusion

POST-TEST and EVALUATION

Training Requirements:

“Hands-on practical sessions, equipment and software will be applied during the course if required and as per the client’s request”.

Please note that the above topics can be amended as per client’s learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

• 30% Lectures, Concepts, Role Play
• 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Software & General Discussions
• Pre and Post Test
Training Certificate(s):

Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Fees:

As per the course location - This rate includes participant’s manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:
- 07:45 - 08:00  Morning Coffee / Tea
- 08:00 - 10:00  First Session
- 10:00 - 10:20  Recess (Coffee/Tea/Snacks)
- 10:20 - 12:20  Second Session
- 12:20 - 13:30  Recess (Prayer Break & Lunch)
- 13:30 - 15:00  Last Session

For training registrations or in-house enquiries, please contact:
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Training & Career Development Department