



Electrical and Mechanical Services

4 – 8 November 2024

Dubai / UAE

Introduction

This course covers areas of mechanical services such as heating, ventilation and air-conditioning; and it details electrical services such as three-phase supply, electric shock prevention, earthing and uninterruptible power supplies. It also provides an introduction to fire safety engineering and sustainability engineering.

The aim of this module is to introduce the role of the modern building services engineer; why we need building services - what are they, what they look like and what they do. It covers areas of mechanical services such as heating, ventilation, air-conditioning and their control. On the electrical side, it covers, for example, three-phase supplies and its distribution, electric shock prevention, earthing and uninterruptible power supplies.

Objectives

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

- Understand Failure Mechanisms & Fitness for Service associated with engineering materials
- Have a sound understanding of corrosion mechanisms and protection against corrosion
- Develop their knowledge of static equipment related to piping systems and valves
- Consolidate their understanding of rotating equipment including pumps and compressors
- Appreciate topics related to condition mentoring, inspection and Non-Destructive Testing
- Model a power system by means of system parameters
- Create different load flow scenarios through different switching regimes
- How to analyze and interpret the response of the power system to different scenarios
- How to modify the power system behaviour in an area by enhancing system parameters
- Determine the location and busbar configuration of a typical substation
- Propose specifications for major substation equipment
- Create single line, layout, and schematics diagrams
- Calculate fault levels and loadings of feeders and branches
- Analyze protection logics and coordination between protection devices
- Establish communication between protection devices and controllers

Who Should Attend?

This training course is suitable to a wide range of Technical professionals but will greatly benefit:

- Technical & non-technical personnel in the chemical, petrochemical, oil & mechanical industries with a need to understand and discuss fundamental mechanical engineering issues
- Maintenance and project engineers, production engineers, trainee mechanical engineers and plant operators
- Non-experienced personnel needing a basic understanding of Mechanical Engineering concepts
- Senior / Principal Engineers
- Project Engineers / Professionals
- Intermediate Engineers
- Graduate Engineers
- Technicians and System Operators

Course Outline

Day One

Introduction & Fundamentals of Materials Selection, Types & Failures

- Engineering Material Properties and Selection
- Materials Testing
- Types of Metals
- Static Strength and Fitness For Service
- Materials Failure Mechanisms
- Mechanical Design, Standards and Codes

Static Equipment, Valves, Piping & Fitness for Service

- Valves Types and Characteristics
- Valve Selection
- Valve Actuators
- Piping Systems and Pipe Supports
- Overview of API 570 - Inspection & repair of Pipelines & Piping
- Fitness for Service, API 579 Overview

Day Two

Rotating Equipment, Pumps & Compressors

- Pump Types, Positive Displacement and Dynamic
- Pump Curves
- Pump Selection
- Types of Compressors
- Compressor Performance Curves

Corrosion & Corrosion Protection

- Corrosion Fundamentals
- Types of Corrosion
- Corrosion Inspection and Monitoring
- Corrosion Minimization
- Corrosion Protection

Mechanical Maintenance

- Strategies & Philosophies
- Code and Standards
- Condition Monitoring
- Non-Destructive Inspection Techniques

Day Three

Power System Parameters and Response

- Important power system studies

- AC power transmission
- Power system drawings
- Power stations
- Power transmission security
- Power distribution factors
- RLC equations
- Sinusoids & phasors
- Phasor relationships & equations
- Power types & formulas
- Single line diagram (SLD)
- Impedance model
- Power system symbols
- Steady-state stability
- Transient stability
- Rotor angle stability

Transmission System Design Considerations

- AC transmission
- Grid network features
- Transmission security
- Building up impedance models
- Complex power definitions
- Power factor
- Power factor compensation (PFC) techniques
- Shunt reactor compensation
- Minimum clearance distances
- Single wire earth return (SWER)
- Overhead line conductors (AAC, AAAC, ACSR)
- Bundles conductors
- Overhead line insulators
- Line supporting structure (wood & concrete poles, towers)
- Power transfer capability, current carrying capacity
- Transmission line loadability

Day Four

Distribution System Design Considerations

- Load models
- Typical characteristics of an industrial distribution system
- Distribution system types and components
- Electrical safety & power security
- Voltage classification
- Multiple voltage levels in power distribution
- Distribution configurations and redundancy
- Distribution expandability
- Distribution system planning

- Electricity demand & future growth
- Equipment sizing / ratings
- HV power cables types & sizing
- Selection of appropriate equipment
- System studies & software packages

Power System Protection

- Protection objectives
- Protection sensitivity, stability, and reliability
- Main & backup protection
- Symmetrical & asymmetrical faults
- Power system stability
- Impacts of electric faults
- Unbalanced single-phase-to-ground fault
- Unbalanced phase-to-phase fault
- Unbalanced phase-to-phase-to-ground fault
- Fault indicator
- Overcurrent protection
- Earth fault protection
- Lightning protection

Day Five

Substation Major Equipment, Earthing and Safety

- Circuit breaker types & applications
- Switchgear types, components, and applications
- Auto-reclosers
- Sectionalizers
- Disconnect switches
- RMU's
- Earthing switches
- SF6 properties
- GIS substations
- HV cables types & calculations
- Power & distribution transformers
- Batteries & battery chargers
- Power conditioner

Training Method

- Pre-assessment
- Live group instruction
- Use of real-world examples, case studies and exercises
- Interactive participation and discussion
- Power point presentation, LCD and flip chart
- Group activities and tests
- Each participant receives a 7" Tablet containing a copy of the presentation, slides and handouts
- Post-assessment

Program Support

This program is supported by interactive discussions, role-play, case studies and highlight the techniques available to the participants.

Schedule**The course agenda will be as follows:**

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|---------------------|------------------|
| • Technical Session | 08.30-10.00 am |
| • Coffee Break | 10.00-10.15 am |
| • Technical Session | 10.15-12.15 noon |
| • Coffee Break | 12.15-12.45 pm |
| • Technical Session | 12.45-02.30 pm |
| • Course Ends | 02.30 pm |

Course Fees*

- **4,600 USD**
**VAT is Excluded If Applicable*