



**SCANDINAVIAN ACADEMY**  
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# Course: Substation Operation and Maintenance Techniques

Code	City	Hotel	Start	End	Price	Language - Hours
646	Manama (Bahrain)	Hotel Meeting Room	2024-10-20	2024-10-24	3450 €	En - 25

## Course Introduction:

Electrical Substation maintenance is a key component of any substation owner's electrical maintenance program. It has been well documented those failures in key procedures such as racking mechanisms, meters, relays and busses are among the most common source of unplanned outages. Electrical transmission, distribution and switching substations generally have switching, protection and control equipment and one or more transformers. Our electrical substation maintenance course focuses on maintenance and testing of switchgear, circuit breakers, batteries and protective relays. This course will cover the maintenance and testing requirements for common substation devices, including power transformers, oil, air and vacuum circuit breakers, switchgear, ground grid systems, batteries, chargers and insulating liquids. This course focuses on what to do, when to do it and how to interpret the results from testing and maintenance

## Course Objectives:

### On successful completion of this course, participants will:

- Know substation types, applications, components and safety procedures
- Learn maintenance and testing methods for medium-voltage circuit breakers
- Understand how to perform insulation resistance, contact resistance on air, oil and vacuum breakers, and tank loss index on oil circuit breaker and vacuum bottle integrity tests on vacuum breaker



- Understand switchgear arrangement, torque requirements, insulation systems and maintenance intervals
- Know how to perform switchgear inspection and maintenance in lab
- Know battery types, applications, systems, and components
- Perform battery maintenance and testing in lab

## Who Should Attend?

- Utility and Industrial Electrical Engineers and Engineering Technicians
- Transmission planning engineers
- Distribution planning engineers
- Substation Design Engineers
- Consulting Electrical Engineers
- Substation network management engineers
- Substation maintenance and construction engineers & technologists

## Course Outline:

### DAY ONE

- Substation Overview
- Purpose of a Substation
- Components of a Power System
- Types of Substations
- Substation Switching Configurations
- Distribution Substation Configurations
- Substation Components
- Metering in Substations
- Relaying in Substations
- Switchgear Maintenance and Testing
- Arrangement of Components



- Maintenance Intervals
- Maintaining the Insulation System
- Maintaining Auxiliary Components
- Torque Requirement for Switchgear Assemblies
- Electrical Testing of Switchgear

## **DAY TWO**

- Circuit Breaker Fundamentals
- Circuit Breaker Functions
- Ratings
- Principles of Arc Interruption
- Breaker Insulation Media
- Insulation Requirements
- Circuit Breaker Controls
- Methods of Operation
- Electrically Operated Mechanisms

## **DAY THREE**

- Circuit Breaker Maintenance and Testing
- Overall Maintenance
- Electrical Testing
- High-Potential Testing (Hi-Pot)
- Principles of Power Factor Testing
- Operation and Timing Tests
- Storage Batteries
- Systems and Components
- Applications
- Battery Types

## **DAY FOUR**



- Battery Maintenance and Testing
- Battery In-Service Operation
- Temperature and Battery Life
- Battery Safety Factors
- Safety Hazards
- Safety Equipment
- Safety Precautions
- Battery Inspections
- Corrective Actions
- Equalizing Charge (Lead-Acid Only)
- Battery Measurement Techniques

## **DAY FIVE**

- Overview of Protective Relays
- Classification of Relays
- Protective Zones
- Fundamentals of Electromechanical Design
- Relay Construction
- Time Characteristics
- Protective Relay Maintenance and Testing
- Mechanical and Visual Inspections
- Preventive Maintenance Testing
- Acceptance Testing
- Testing Techniques
- General Tests
- Relays in Substations



**The Scandinavian Academy for Training and Development employs modern methods in training and skills development, enhancing the efficiency of human resource development. We follow these practices:**

• **Theoretical Lectures:**

- We deliver knowledge through advanced presentations such as PowerPoint and visual materials, including videos and short films.

• **Scientific Assessment:**

- We evaluate trainees skills before and after the course to ensure their progress.

• **Brainstorming and Interaction:**

- We encourage active participation through brainstorming sessions and applying concepts through role play.

• **Practical Cases:**

- We provide practical cases that align with the scientific content and the participants specific needs.

• **Examinations:**

- Tests are conducted at the end of the program to assess knowledge retention.

• **Educational Materials:**

- We provide both printed and digital scientific and practical materials to participants.

• **Attendance and Final Result Reports:**

- We prepare detailed attendance reports for participants and offer a comprehensive program evaluation.

• **Professionals and Experts:**

- The programs scientific content is prepared by the best professors and trainers in various fields.

• **Professional Completion Certificate:**

- Participants receive a professional completion certificate issued by the Scandinavian Academy for Training and Development in the Kingdom of Sweden, with the option for international authentication.

• **Program Timings:**

- Training programs are held from 10:00 AM to 2:00 PM and include coffee break sessions during lectures.