XCELERATE TRAINING INSTITUTE

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ELECTRICAL ENGINEERING

Fundamentals of Electrical Substation and Switchyard Design, Safety and Maintenance

DURATION	LANGUAGE	FORMAT
5 days	English	Classroom / Online

Upcoming dates

Dates	Venue	Format	Fee
1 – 5 ???? 2027	Live online	Online (live)	€1?200
13 – 17 ?????? 2027	Live online	Online (live)	€1?200
11 – 15 ?????? 2027	Cairo	Classroom	€4?800

Register or ask a question

Online: x8ti.com/course/fundamentals-of-electrical-substation-and-switchyard…

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Fundamentals of Electrical Substation and Switchyard Design, Safety and Maintenance

Introduction

The Electrical Substation and Switchyard Design course focuses on fundamental safety standards and practices in designing substations and switchyards. An electrical substation is a key component in a power system, responsible for transforming voltages for transmission, distribution, and switching of power. A switchyard operates at a single voltage level without transformers. Understanding and designing these components are crucial for modern power systems. This program covers essential aspects, including electrical, chemical, and personal safety threats in environments containing substations and switchyards.

Learning Objectives

Upon completing this Fundamentals of Electrical Substation and Switchyard Design, Safety and Maintenance course by Xcelerate Training Institute, participants will be able to:

- Understand the basic purposes of electrical substations and switchyards.
- Differentiate various types of electrical substations and switchyards.
- Grasp different elements in the design of switchyards and electrical substations.
- Learn fundamental rules and guidelines for generating, transmitting, and distributing electric power.
- Identify and operate key equipment used in substations and switchyards.
- Train in various layout options for switchyard apparatus.
- Analyze earthing methods and lightning protection mechanisms for switchyards.
- Use case studies and practical examples to plan switchyard resources.

Training Methodology

This interactive training program includes:

- Lectures
- Group Discussions
- Videos
- Expert Seminars
- Individual Assignments
- Practical Demonstrations
- Case Studies (e.g., Siemens) Following the ‘Do-Review-Learn-Apply’ model.

Benefits for Your Organisation

Organizations can benefit from:

- Gaining skilled professionals to manage electrical substations and switchyards effectively.
- Achieving a competitive advantage with more efficient processes.
- Equipping employees to prevent issues related to substation and switchyard design.
- Increasing employee satisfaction through professional development.

- Optimizing operations management to reduce maintenance costs.
- Creating greater investment opportunities with reduced costs and higher profits.
- Tailoring content to meet the organization's specific needs.

Benefits for You

Participants will gain:

- Improved knowledge and understanding of basic systems and theories related to electrical substations and switchyards.
- A broader perspective to foresee technical issues and plan mitigations.
- Enhanced capability and skills to assume critical roles associated with substations and switchyards.
- Personal gratification in preventing and handling critical issues.
- Increased confidence to achieve a competitive edge.
- Practical knowledge from case studies to excel in the workplace.

Who Should Attend

This course is ideal for:

- Substation design engineers and technicians
- Switchyard design engineers
- Manufacturing, utility, or plant engineers
- Substation operators
- Power system correspondents
- Project managers and supervisors
- Any roles requiring a basic understanding of substations and switchyards

Course Outline

The Role of Substations in an Electrical Network

- Introduction to networks
- Different voltages in a network
- Types and configurations of substations
- Optimizing the location of substations
- Outdoor, GIS, and indoor substations
- Substations as network nodes
- Types of substations based on network placement
- HV substation configurations based on bus layout
- Load assumptions for residential and commercial consumers
- Conservation issues and recovery methods for switchyard layout

Overview of Switchyard Equipment and Specifications

- Primary equipment
- Layout options

- Busbars
- Disconnectors
- Structures
- Sectional and security clearances and their layout effects
- Design of busbars (strung/tubular) and equipment interconnections
- Interconnecting cables and marshalling kiosks

Protection Design for Substations

- Protection overview
- Protection coordination
- Transformer protection
- Busbar safety
- Feeder safety
- Current transformer requirements for protection
- Substation automation equipment requirements

Substation Equipment for Fault Limiting

- Static VAR compensators
- Harmonic filters
- Fault limiting reactors
- Power factor compensation equipment
- Equipment design and ratings
- Apparatus layout in switchyards

Earthing System and Lightning Protection for Switchyards

- Basics of functional and protective earthing
- Touch and step voltages in substations
- Importance of switchyard fences in the earth grid
- Safety mesh at operating points
- Purpose of the earth grid in conductor sizing and mesh spacing
- Role of shield wires and lightning masts
- Pros and cons of incorporating control buildings within the switchyard earth grid
- Transferred voltage hazards
- Scheduling isolation of outgoing services to avoid transfer voltage
- Typical configurations for lightning protection in switchyards
- Hazard investigation using cone of protection and rolling sphere techniques
- Selecting lightning arrestors - types, class, and ratings

Switchyard Control and Interlocking

- DC equipment configuration and specifications
- DC distribution for switchyard equipment
- Planning battery installation areas and facilities
- AC auxiliary power for switchyard systems and loads

- Possible source options
- Basis for battery calculations
- AC auxiliary circulation for switchyard gear and support systems
- Control schemes for disconnectors and circuit breakers
- Control interconnection approaches
- Optical fiber-based control schemes
- Role and location of marshalling kiosks in different bays

Switchyard Facility Planning

- Site preparation and leveling
- Earth resistivity measures and importance in switchyard design verification
- Civil mechanisms such as equipment grounding, cable trenches, control buildings, storm drains, and transformer oil collection pits
- Switchyard structures and design prerequisites
- Substation fence and physical security
- Surveillance
- Water requirements and supply arrangement planning
- Fire protection, illumination, and ventilation for relevant areas and equipment

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Registration Form

Fundamentals of Electrical Substation and Switchyard Design, Safety and Maintenance

Preferred dates: ..... Venue or online: .....

Duration: 5 days Language: .....

Please complete and email this form to us, or register online. We confirm your place and send the invoice within one working day.

Delegate information

Full name (Mr / Ms / Dr / Eng): .....

Position: ..... Telephone / mobile: .....

Official email: ..... Personal email: .....

Company information

Company name: .....

Address: .....

City / country: ..... VAT / tax number: .....

Person responsible for training & development

Full name (Mr / Ms / Dr / Eng): .....

Position: ..... Telephone / mobile: .....

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