Training Course on Substation Operation and Maintenance

Professional Development Training Course Outline

Category	Development	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

The Substation Operation and Maintenance Training Course is a highly specialized and practical program designed for power system professionals seeking expertise in modern substation technologies. With the integration of smart grid systems, predictive maintenance, and digital substations, the training aims to enhance technical proficiency and operational reliability. Participants will gain in-depth knowledge in switchgear systems, power transformers, circuit breakers, and protection relays, ensuring a comprehensive understanding of asset management and safety protocols.

Training Course on Substation Operation and Maintenance is tailored to address the growing demand for energy efficiency, grid modernization, and real-time diagnostics in substations. By the end of this program, participants will be able to manage substation operations effectively, reduce downtime, and implement robust maintenance strategies. The training uses hands-on learning, real-world case studies, and expert guidance, making it ideal for both new and experienced engineers and technicians.

Programme Curriculum

Training Course on Substation Operation and Maintenance

Introduction

The Substation Operation and Maintenance Training Course is a highly specialized and practical program designed for power system professionals seeking expertise in modern substation technologies. With the integration of smart grid systems, predictive maintenance, and digital substations, the training aims to enhance technical proficiency and operational reliability. Participants will gain in-depth knowledge in switchgear systems, power transformers, circuit breakers, and protection relays, ensuring a comprehensive understanding of asset management and safety protocols.

Training Course on Substation Operation and Maintenance is tailored to address the growing demand for energy efficiency, grid modernization, and real-time diagnostics in substations. By the end of this program, participants will be able to manage substation operations effectively, reduce downtime, and implement robust maintenance strategies. The

training uses hands-on learning, real-world case studies, and expert guidance, making it ideal for both new and experienced engineers and technicians.

Course Objectives

1. Understand key components and operations of electrical substations.
2. Learn advanced maintenance strategies using predictive and preventive approaches.
3. Apply safety protocols and operational best practices in substation environments.
4. Master the functionality of protection relays and switchgear systems.
5. Analyze high-voltage equipment failures and diagnostics.
6. Interpret substation SCADA systems and remote control technologies.
7. Implement real-time fault monitoring and isolation techniques.
8. Gain insights into digital substations and IEC 61850 protocol.
9. Optimize energy efficiency and reduce operational costs.
10. Troubleshoot complex substation equipment failures.
11. Integrate condition-based maintenance tools into daily practices.
12. Understand substation commissioning and decommissioning processes.
13. Build action plans for asset lifecycle management and reliability improvement.

Target Audience

1. Electrical Engineers
2. Substation Technicians
3. Utility Supervisors
4. Power System Operators
5. Grid Maintenance Personnel
6. Energy Consultants
7. Renewable Energy Engineers
8. Safety & Compliance Officers

Course Duration: 5 days

Course Modules

Module 1: Substation Fundamentals & Equipment Overview

- Introduction to substations and grid interface
- Main types: transmission, distribution, and collector substations
- Key equipment: transformers, CTs, VTs, switchgear
- Substation layout and bus configurations
- Equipment ratings and operational limits
- **Case Study:** Analysis of a power outage due to transformer overloading

Module 2: Switchgear Operation & Maintenance

- Overview of high-voltage switchgear types
- Inspection and testing procedures
- Common switchgear faults and remedies
- SF6 vs. vacuum circuit breakers
- Life cycle management and replacement planning
- **Case Study:** Arc flash incident caused by switchgear insulation failure

Module 3: Power Transformers – Inspection, Testing & Diagnostics

- Transformer construction and classification

- Oil analysis and dissolved gas analysis (DGA)
- Load tap changer maintenance
- Thermal imaging techniques
- Condition assessment and failure prediction
- **Case Study:** Transformer failure due to moisture ingress and poor DGA readings

Module 4: Substation Protection Systems

- Protection relays and control logic
- Overcurrent, differential, and distance protection
- Relay coordination and settings
- Fault current analysis
- Testing and commissioning of relays
- **Case Study:** Relay malfunction leading to extended fault clearing time

Module 5: Substation Automation & SCADA Systems

- SCADA architecture and interface
- Data acquisition and remote monitoring
- Communication protocols: IEC 60870, IEC 61850
- Alarm and event analysis
- Human-machine interface (HMI) training
- **Case Study:** Automation upgrade improves fault response time by 40%

Module 6: Predictive and Preventive Maintenance Techniques

- Infrared thermography and partial discharge testing
- Time-based vs. condition-based maintenance
- Vibration and ultrasonic analysis
- Maintenance scheduling tools
- Documentation and compliance
- **Case Study:** Scheduled maintenance prevents catastrophic circuit breaker failure

Module 7: Safety Procedures and Compliance

- Substation safety standards (OSHA, NFPA 70E)
- Lockout/tagout (LOTO) procedures
- PPE and hazard identification
- Emergency response planning
- Compliance audits and reporting
- **Case Study:** Safety breach leads to incident – lessons and corrective action

Module 8: Substation Commissioning, Testing, and Asset Management

- Pre-commissioning checks and acceptance testing
- Energization procedures and synchronization
- Asset tagging and lifecycle planning
- Documentation and performance benchmarking
- Root cause analysis for asset failures
- **Case Study:** Commissioning delays due to incomplete control wiring – resolved through proper testing protocols

Training Methodology

- Interactive classroom sessions with subject matter experts
- Hands-on demonstrations and simulated fault scenarios
- Real-world case studies and group discussions

- Access to digital substation tools and testing kits
- Pre-assessment and post-assessment evaluations

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

Ready to enroll or request a customized program? Book online or contact us:

Register Online Now

Email: info@fineskilltrainingcenter.com | Website: www.fineskilltrainingcenter.com