



INTEGRATED POWER

and Control System for Electrical Substation

Course Introduction:

Take your understanding of the electric substation to a higher level. In this course, you will learn about the equipment that makes up an electric substation, including the equipment's operation, control, and wiring.

You'll also learn how to read trip and close schematics, and control system wiring diagrams. Understanding how these schematics relate to their corresponding wiring diagrams will help you design straightforward control system schematics, and make you more effective on the job.

Course Objectives:

Upon successful completion of this course, the delegates will be able to:

- Understand the construction, operation, and control of power transformers, load tap changers, voltage regulators, power circuit breakers, circuit switchers, and capacitor banks
- Enumerate the types and purpose of power systems
- Discuss protective relays, trip schematics and wiring diagrams, auxiliary equipment and systems, metalclad switchgear, substation automation and integration, batteries, and battery charges
- Explain schematics, voltage regulations, power circuit breakers and prepare wiring diagrams
- Carryout substation commissioning

Who Should Attend?

This course is intended for Substation design engineers and technicians, Industrial, utility, or plant engineers, Substation operations specialists, Power system dispatchers and Project managers.

Course Outline:

- **Substation Types and Purposes**
 - Fundamentals of power system operation
 - Primary substation equipment
- **Power Transformers and Controls**
 - Major components¹
 - Construction and operation
 - Connections and ratings
 - Fixed taps and LTCs
- **Introduction to Schematics and Wiring Diagrams**
 - Control logic
 - Converting control schematics to wiring diagrams
 - Example transformer control and wiring diagrams
- **Voltage Regulators**
 - Construction and operation
 - Ratings
- **Disconnect Switches**
 - Types and applications
 - Manual and motor-operated switches; control schematics
- **Power Circuit Breakers**
 - Purpose and types
 - Construction and operation
 - Schematics and wiring diagram examples
- **Circuit Switchers and Other Special Application Switches**
 - Purpose and major components
 - Construction and operation
 - Schematics and wiring
- **Reclosers**
 - Purpose and applications
 - Major components
 - Types and ratings
 - Construction and operation
- **Power Fuses**
 - Types and applications

- Operation
- **Instrument Transformers**
 - Voltage and current transformers
 - Principles of operation
 - Burden, saturation, and accuracy
 - Ratings and connections
- **Protective Relay Systems**
 - Purpose and types
 - DC trip and close schematics
 - AC voltage and current schematics
 - Wiring diagrams
- **Battery Systems**
 - Purpose and ratings
 - Chargers and charging control systems
- **AC Station Power Systems**
 - Station power requirements
 - Back-up supplies/sources
- **SCADA**
 - Purpose and functions
 - SCADA overview
 - RTUs and IEDs
- **Integrated/Automated Substation Control**
 - Integration/automation defined
 - Communication systems and interfaces
- **Capacitor Banks**
 - Purpose
 - Construction and operation
 - Switching and protection control schemes
- **Metalclad Switchgear**
 - Advantages and applications
 - Construction and operation
 - Protection and control
- **Wave Traps**
 - Purpose and applications
 - Major components
 - Tuning and operation

- **Substation Commissioning**
 - Acceptance testing equipment
 - Start up procedures
 - Energizing equipment
 - Substation and transmission line examples

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

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Course Fees:

To be advised as per course location. This rate includes participant's manual, and-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee / Tea
08:20 - 10:00	First Session
10:00 - 10:20	Coffee / Tea / Snacks
10:20 - 12:20	Second Session
12:20 - 13:30	Lunch Break & Prayer Break
13:30 - 15:00	Last Session