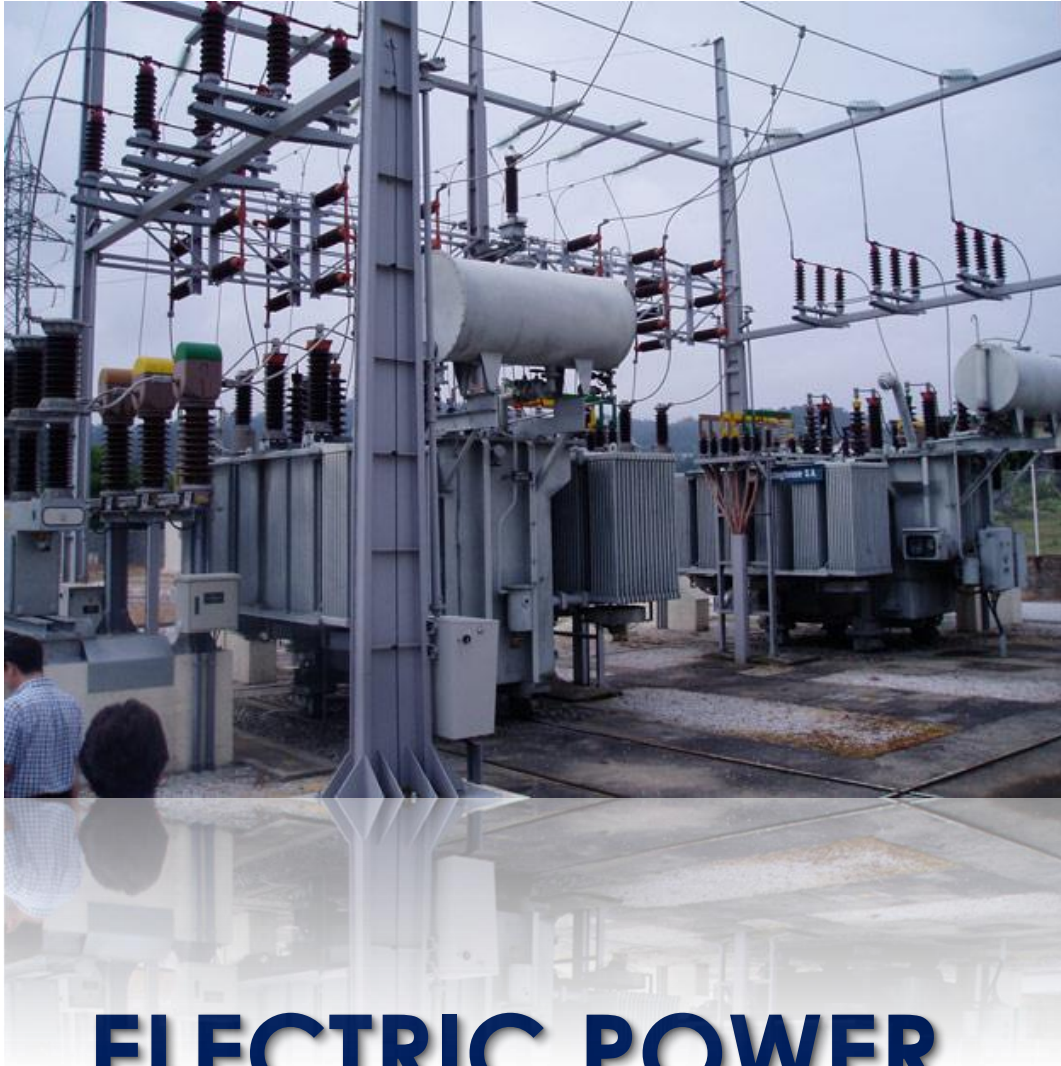




ELECTRIC POWER

Distribution Engineering: Planning and Automation

Course Introduction:

Provides engineers with a fundamental understanding of electric circuit analysis with application to power distribution systems. Presents an introduction to the various types of distribution system configurations, equipment and loads. Discusses concerns such as: reliability, power quality, voltage drop, voltage regulation, power factor correction and capacitor applications. Reviews the fundamental methods used in the steady state analysis of AC circuits as applied to power distribution systems including: linear circuit elements, complex numbers, matrices, network solution methods, three-phase power systems, the per unit system, symmetrical components and fault currents. The main objective of this course is to improve participants' understanding of distribution system insulation coordination and surge arrester applications that provide overvoltage protection from events such as switching and lightning surges.

Course Objectives:

The Electric Power Distribution Engineering Planning and Automation course covers basic concepts, equipment models, performance analysis methods and tools, planning, automation, protection, reliability and economic analysis.

The course is designed to:

- Comprehensively cover electric power distribution systems
- Provide distribution system designers, planners, and operators a basis for arriving at cost-effective solutions and strategies
- Enable an engineer or a practicing individual in a utility or an industrial environment to design, plan and operate a system

The course material serves as a useful reference in day-to-day functions and allows self-paced, in-depth learning with the aid of practical examples. The topics covered include latest developments occurring in the industry.

Who Should Attend?

This course is ideal for those who have a basic understanding of power systems and need practical training in the field. The course can also be taken by engineers who do not specialize in power systems.

The course is intended for the following professionals:

- Electric utility system planners, operators, and designers
- Personnel in manufacturing companies of distribution equipment
- Electric power industry consultants
- University professionals

Upon Completion, participants will understand the basics, models, and methodologies to design, operate, and maintain efficient and cost-effective distribution systems.

Course Outline:

DISTRIBUTION SYSTEM FUNDAMENTALS AND MODELS

Basic Concepts of Power and Distribution Systems Overview

- Single-phase and three-phase analysis
- Per-unit systems
- Different power, power factor, and losses definitions
- Delta /Wye transformation
- Balanced vs. unbalanced analysis
- A single feeder example: Loss and efficiency calculations and interpretation
- Components in distribution systems
- Equipment ratings and ANSI standards
- Primary distribution schemes
- Secondary distribution schemes
- Distribution substation arrangements
- Power devices: Lines cables, and transformer ratings

Equipment and Models

- Overhead (OH) and underground (UG) line models
- Characteristics of conductors
- Examples on OH and UG line models
- Line loading characteristics
- Different transformer connections
- Single-phase residential analysis with unbalanced loads
- Three-phase transformers analysis with under balanced loads
- Auto-and three-winding transformer analysis
- Single-and three-phase auto-transformer analysis
- Examples of transformers analysis

SYSTEM PLANNING AND DESIGN

Steady-State Performance Analysis

- System modeling using network analysis
- Single-phase, three phase, and multiphase models
- Three-phase power flow analysis
- Practical example on 10-feeder power flow analysis
- Control Devices: Capacitors, reactors, transformers and tap changers
- Voltage regulation with fixed and switched capacitors
- Example of voltage regulation with fixed and switched capacitors
- Motor starting and flickering

System Planning

- Review of methods
- Urban, suburban, and rural load characteristics
- Load and demand models
- Examples of demand and load models
- Load evaluation and demand forecasting
- Design criteria and standards (voltage, equipment)
- Design of substations, primary, and secondary systems
- Design evaluation
- Asset management
- Practical example on a simple substation and plant design

DISTRIBUTION SYSTEM PROTECTION AND AUTOMATION

System Protection

- Three-phase source models
- Fault characteristics
- Short-circuit analysis
- Practical example of fault analysis philosophy and architecture
- Protective devices: Fuses, reclosers, sectionalizer, circuit breakers
- Relays, surge arrestors
- Time-current curves for protective devices
- Protective device rating and selection
- Feeder and transformer protection
- Practical examples on fuse/fuse coordination, recloser/fuse
- Coordination

Distribution Automation

- Automation functions
- Advanced metering infrastructure
- Demand Side Management (DSM)
- Case studies of economic & technical feasibility
- Trouble call analysis
- Outage management
- Substation, feeder, and customer restoration
- DA trends and technologies
- DSCADA and DMS architecture
- Geographic Information Systems (GIS) application
- Practical case study on restoration

ECONOMIC AND RELIABILITY

Economic Analysis

- Background
- Basic methods: Net present worth, rate of return methods
- Selection of devices: Lines and transformers
- Tariffs and pricing
- Cost-benefit analysis
- Example on transformer selection
- Performance-based regulation and manifestation

System Reliability

- Overview of distribution reliability
- Reliability indices
- Component models
- FMEA and Monte Carlo methods
- Practical example on a two-feeder system
- Reliability optimization
- Maintenance techniques
- Regulatory issues

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

Course Certificate:

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

Course Fees:

To be advised as per course locations. This rate includes participant's manual, Hand-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

