



Electrical Engineering

# Advanced Fault Diagnosis in Electrical Systems

# Course Introduction

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## Electrical Faults

This Electrical Faults training course teaches practical electrical faults detection and how the team can depend on the available equipment tools and the modern updated technology for make a good detection and analysis for the faults and how can in future minimize or / and decrease the values of repeated cited electrical faults

Also the attendees will have a good understanding of faults types with the calculation of fault currents in electrical power systems. Moreover the attendees will subject to types of Comprehend Fault Awareness and Analysis.

Effective power system faults detection and troubleshooting is consider one of the goals where the speed / rapidly detection for the faults and solve it is consider one the key features for the power system quality and reliability, this fault detection depending in the right methodology of thinking and catching the points of faults using the right tools as (instrument transformers, thermograph survey, vibration, metering devices, protection system,....)

**This training course** includes the preparation of the system for analysis, by manual calculation and by the use of computer analysis software program ETAP. Participants will be introduced to the various fault analysis software programs.

Depending on the Promote Proactive Measures and Compliance is consider of the course target to reduce the faults repeated and increase electrical power system reliability.

In summary, at the end of the course, the attendees will have a solid background in the Electrical Faults reasons & Causes, How can conduct a good analysis for the root cause, and how can make a detection & Remedies .

## Target Audience

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- Electrical Engineers
- Electrical Supervisors
- Maintenance Technicians
- Managers in-charge of Instrument Installations
- Project Engineers

# Learning Objectives

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- Identification of power system component
- Types of electrical faults and Understand causes, risks, and implications of electrical faults.
- Analyze the root causes of various fault types comprehensively, gaining insights into their effects.
- Explain the predictive methods for detecting electrical faults.
- Explain the different methods of diagnosing the electrical faults.
- Explain the new technology of practical strategies to address, minimize/ prevent disruptions caused by faults.
- Emphasize safety protocols when dealing with electrical issues, ensuring participant well-being.
- Illustrate real-world case studies, applying theoretical knowledge to practical scenarios.
- Advocate for proactive approaches to prevent electrical faults and encourage a preventive mindset.
- Inform about relevant regulations and compliance standards, ensuring adherence to legal requirements.
- Enrich professionals' and students' electrical knowledge and expertise.
- Explore emerging trends for future advancements, fostering industry awareness and growth

# Course Outline

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- **DAY 01**

- **Module (01): Comprehend Fault Awareness and Analysis.**

- Pre-assessment
    - Power system Configuration & Component
    - Power system Fundamentals & theory
    - Standard Nominal System Voltages and Voltage Ranges
    - IEC 60038
    - IEEE 141-1993
    - Effects Of Electrical Current In The Human Body (Health & Safety)

- Electrical faults Protection system
- Protection system Functions
- Power System Protection – Qualities
- Power System Protection Reliability
- Power System Protection Dependability
- Power system Protection Security
- Common fault statistics of electrical equipment
- Symmetrical faults
- Unsymmetrical faults
- Source of fault current in an electrical installation
- Fault Isolation Timing
- Short-circuit rating of equipment
- X/R Ratio for Electrical Equipment
- Fault types according to its effects (Active & Passive Faults )
- ( Overloading, Over current, Under frequency, Power swings, Transients, Sag / Under-voltage, Swell / Over-voltage, Voltage fluctuations, Frequency variations , Harmonic distortion )
- Causes of short circuit in power system
- Selective Coordination is defined by NEC Article 100

## • Day 02

### **Module (02): Effective Detection and Troubleshooting.**

- Instrument transformer
- Current and Voltage
- Rating of CT & PT
- Difference between CT/PT used for protection and Measurement
- Installation and Inspection
- Consideration of phase shift in two-winding transformers

## • Day 03

### **Module (03): Prioritize Safety and Practical Application (industrial case studies).**

- Steps to perform a Fault Analysis in a Power System
- Converting the System to Base Values:
- Type of Fault
- Constructing Sequence Networks
- Make a Faulted Sequence Network Diagram
- Hand Calculation
- Convert per unit value into three phase current and voltage quantities
- Fault calculation
- Introduction to ETAP software
- Common network faults
- Industrial standards namely ANSI, NEC & NFPA 70 compliance

- Practical training On Case study of faults in a power system network
- LL
- LLG
- 3Phase
- 3Phase To Ground
- Short circuit study using ETAP
- Load flow study using ETAP
- Selectivity and coordination study using ETAP

#### • Day 04

##### **Module (04): Promote Proactive Measures and Compliance.**

- Key Features of Innovative Diagnostic Tools
- Real-time monitoring
- Data logging and analysis
- Fault locating
- Predictive testing
- Thermograph survey
- Vibration survey
- PD ( partial discharge )
- IR (insulation Resistance )

#### • Day 05

##### **Module (05):Thermography survey using a thermal imaging camera can be used on different types of equipment including:**

- Motors
- Drives
- Distribution boards and fuse boards
- High voltage systems
- Transformers
- Control panels
- UPS systems
- Switchgears and switchboards
- Troubleshooting tools
- General Discussion

# Confirmed Sessions

FROM	TO	DURATION	FEES	LOCATION
June 16, 2025	June 20, 2025	5 days	4250.00 \$	UAE - Dubai
Oct. 26, 2025	Oct. 30, 2025	5 days	4250.00 \$	KSA - Riyadh
Sept. 1, 2025	Sept. 5, 2025	5 days	4950.00 \$	Norway - Oslo