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COURSE BROCHURE

Advanced Electrical Faults Analysis and Detection Training Course

26 July – 6 August 2027
Munich

Advanced Electrical Faults Analysis and Detection Training Course

Ref: 224_6921 **Date:** 26 July – 6 August 2027 **Location:** Munich **Fees:** 11100 GBP

Electrical Faults Analysis and Detection is a 2-week training course for electrical engineers, maintenance supervisors and protection technicians who trace faults from first symptom to root cause, and who leave with a Fault Investigation Dossier for one real incident. Ageing insulation, heavier loads and tighter outage windows make every unexplained trip costly. Jupiter Prime Training delivers this course on electrical faults analysis and detection.

Why Electrical Faults Analysis and Detection Matters Now

Three pressures shape electrical faults analysis and detection today. Much installed switchgear, cable and transformer insulation is reaching the end of its design life, so incipient faults appear more often. Digital relays and disturbance recorders now capture rich fault records, yet many sites never read them beyond the trip flag. Arc flash incidents keep raising expectations from insurers, safety managers and workers themselves. A site that diagnoses faults well restores supply quickly and removes the cause; one that does not resets breakers, replaces fuses and waits for the same failure to return. The course rests on symmetrical component theory and on recognised international practice for short-circuit calculation and insulation testing.

Who Gains Most from Electrical Faults Analysis and Detection

- Engineers who calculate fault levels and verify switchgear ratings for plants, substations and buildings
- Maintenance supervisors who schedule insulation tests, thermography rounds and corrective work orders
- Protection technicians who read relay event logs and disturbance records after a trip
- Reliability specialists who investigate repeat failures on cables, motors and transformers
- Safety coordinators who assess arc flash exposure before energised work

A utility maintenance section or an industrial plant electrical department gains most when its engineers and technicians attend together and bring one unresolved fault case.

Electrical Faults Analysis and Detection Capabilities

Participants learn to connect waveforms, test readings and site evidence into one fault story that stands up to scrutiny.

- Calculate three-phase, line-to-ground and line-to-line fault currents using symmetrical components — switchgear rating checks
- Analyse relay event logs and oscillography to classify fault type and location — restoration decisions
- Apply insulation resistance, polarisation index and partial discharge testing — cable and winding replacement priorities
- Assess earth fault paths and earthing system performance — personnel safety and protection sensitivity
- Build an arc flash exposure profile for a switchboard — energised work permits
- Specify corrective and preventive remedies with clear accountability — plant managers and asset owners

Key Electrical Faults Analysis and Detection Terms

- Symmetrical components — a method that splits unbalanced three-phase quantities into positive, negative and zero sequence sets for easier fault calculation.
- Bolted fault — a short circuit with negligible impedance at the fault point, giving the highest possible fault current.
- Polarisation index — the ratio of insulation resistance readings taken at two times, showing moisture or contamination in windings.
- Partial discharge — a small localised breakdown inside insulation that does not bridge the conductors but signals progressive deterioration.
- Incident energy — the thermal energy reaching a worker at a set distance during an arc flash, used to choose protective clothing.
- Disturbance record — the voltage and current waveforms a relay stores before, during and after a fault event.

Electrical Faults Analysis and Detection Day by Day

Day 1: Fault Landscape and Failure Mechanisms

- Fault Classification by Type and Duration — Transient Versus Permanent Response
- Failure Mechanisms in Cables and Terminations — Moisture, Heat and Mechanical Stress
- Switchgear and Busbar Failure Modes — Tracking, Loose Joints and Contamination
- Fault Statistics from Maintenance Records — Pattern Spotting Across Assets
- Consequence of Faults on Production and Supply — Outage Cost Framing

Day 2: Symmetrical Components and Sequence Networks

- Phasor Notation and Per-Unit System — Consistent Base for Calculations
- Positive, Negative and Zero Sequence Networks — Building Equivalent Circuits
- Transformer Vector Groups — Zero Sequence Paths Through Windings
- Unbalanced Fault Connections — Line-to-Ground and Line-to-Line Cases
- Sequence Impedance Data Sources — Nameplate, Test Reports and Typical Values

Day 3: Short-Circuit Calculation

- Three-Phase Bolted Fault Calculation — Maximum Duty on Breakers
- Motor and Generator Contribution — Initial and Decaying Fault Current
- Minimum Fault Current Cases — Protection Sensitivity at Remote Ends
- Fault Level Software Studies — Checking Inputs and Interpreting Outputs
- Switchgear Making and Breaking Ratings — Equipment Adequacy Verdict

Day 4: Earth Faults and Earthing Systems

- Solidly, Resistance and Isolated Earthing — Fault Current Magnitude Choice
- Earth Fault Loop Impedance Testing — Disconnection Time Assurance
- Touch and Step Potential — Substation and Plant Safety Margins
- Restricted and Sensitive Earth Fault Protection — Winding Fault Detection
- Earth Electrode Resistance Measurement — Earthing Grid Condition Decisions

Day 5: Insulation Failure and Diagnostic Testing

- Insulation Resistance and Polarisation Index — Winding Dryness Verdict
- Tan Delta and Capacitance Testing — Cable and Bushing Ageing Trend
- Partial Discharge Measurement Online and Offline — Early Warning of Breakdown
- Dissolved Gas Analysis for Transformers — Internal Arcing and Overheating Signs
- Very Low Frequency Cable Testing — Withstand Versus Diagnostic Approach

Day 6: Fault Records and Waveform Reading

- Relay Event Logs and Sequence of Events — Reconstructing the Trip Timeline
- Oscillography Reading — Fault Inception, Clearance and Reclose Patterns
- Distance-to-Fault Estimation — Impedance and Travelling Wave Methods
- Power Quality Recorder Data — Sags, Swells and Harmonic Clues
- COMTRADE Record Exchange — Sharing Fault Files Between Teams

Day 7: Thermography and Field Detection

- Infrared Thermography Surveys — Hot Joint Severity Ranking
- Ultrasonic and TEV Detection — Discharge Activity in Switchgear
- Cable Fault Location with TDR and Thumper — Excavation Point Decision
- Motor Current Signature Analysis — Rotor Bar and Eccentricity Faults
- Visual Inspection and Forensic Evidence — Burn Marks and Debris Patterns

Day 8: Arc Flash and Fault Energy

- Arc Flash Hazard Calculation Inputs — Fault Current and Clearing Time
- Incident Energy and Boundary Distances — Protective Clothing Category Choice
- Arc-Resistant Switchgear and Remote Racking — Exposure Reduction Options
- Maintenance Mode Relay Settings — Faster Clearing During Energised Work
- Arc Flash Labelling and Permit Records — Workforce Communication

Day 9: Root Cause and Remedies

- Root Cause Analysis with Fault Trees — Separating Trigger from Underlying Cause
- Corrective Action Prioritisation — Repair, Replace or Redesign Choice
- Protection Setting Review After Faults — Coordination Gap Closure
- Condition Monitoring Programme Design — Test Intervals by Asset Criticality
- Fault Lessons Learnt Bulletin — Sharing Findings Across Sites

Day 10: Practising the Fault Investigation Dossier

- Applying Sequence Network Calculation — Selected Incident Fault Current Check
- Applying Waveform and Event Log Reading — Incident Timeline Reconstruction
- Applying Insulation and Thermography Evidence — Failed Component Confirmation
- Applying Arc Flash Review — Exposure Finding for the Incident Board
- Fault Investigation Dossier — Root Cause and Remedy Case for Peer Review

Applying Electrical Faults Analysis and Detection After the Course

- Download and read the disturbance records of the last three trips on one feeder, then classify each fault and confirm or challenge the recorded cause.
- Rank switchboard hot joints from the latest thermography survey by severity and issue corrective work orders for the top items.

Electrical Faults Analysis and Detection Questions FAQ

What is electrical faults analysis and detection, and why does it matter now?

Electrical faults analysis and detection is the discipline of calculating, locating and explaining short circuits, earth faults and insulation failures. It matters now because ageing assets fail more often while fault recorders hold evidence that most sites leave unread.

Which roles gain most from electrical faults analysis and detection training?

Electrical engineers, maintenance supervisors, protection technicians and reliability specialists gain most. You benefit if you verify fault levels, read relay records, test insulation or decide whether a failed cable, motor or transformer is repaired or replaced.

How does electrical faults analysis and detection differ from a protection relay settings course?

A relay settings course concentrates on coordinating protective devices before a fault happens. Electrical faults analysis and detection works after and around the event, combining calculations, waveform reading, insulation diagnostics, thermography and root cause methods to explain why the fault occurred.

What do you bring back from electrical faults analysis and detection training?

You bring back a documented investigation of one real fault, from current calculation and event timeline to test evidence and remedy. It gives your department a repeatable method for the next unexplained trip on any feeder or motor.

Electrical Faults Analysis and Detection: The Way Forward

The Fault Investigation Dossier first informs whether a failed asset is repaired, replaced or redesigned. Maintenance supervisors and protection engineers use it to agree remedies with plant management. After its first use, revisit the test intervals and thermography routes it recommends, since early detection evidence improves as recorders and condition monitoring spread across the network.