JUPITER PRIME

Consulting • Training • Advisory

جوبيتر برايم للاستشارات والتدريب

COURSE BROCHURE

Industrial Power System Protection and Arc Flash Mitigation Training Course

jupiterprime.uk

info@jupiterprime.uk

Registered in the United Kingdom and Saudi Arabia

Industrial Power System Protection and Arc Flash Mitigation Training Course

Industrial Power System Protection and Arc Flash Mitigation is a 2-week training course for electrical engineers in process plants, utilities and large facilities, centred on a plant protection and arc flash study report for one switchboard network. Plants now run more drives, onsite generation and compact switchgear, so a slow or mis-set device can stop production and expose staff to arc energy. Jupiter Prime Training delivers this course for engineers who own plant electrical safety.

Why Industrial Power System Protection and Arc Flash Mitigation Matters Now

Three forces shape industrial protection today: process owners who expect continuous operation, a workforce that must work near energised medium and low voltage switchgear, and plant expansions that raise fault levels beyond the original switchboard ratings. A site that coordinates its devices and limits incident energy keeps motors running through upstream faults and sends maintenance staff into safer conditions; one that does not faces nuisance tripping, burnt switchrooms and injured electricians. The course rests on short circuit calculation practice, incident energy analysis methods and IEC 61850 communication for fast arc detection in modern switchgear.

Who Gains Most from Industrial Power System Protection and Arc Flash Mitigation

- Engineers who specify and set protection for plant switchboards and motor control centres
- Maintenance leads who authorise live work and switching on medium voltage equipment
- Engineers who size cables, transformers and earthing systems for plant expansions
- Utility distribution engineers who supply and protect large industrial customers
- Safety specialists who label equipment and select arc-rated protective clothing

A refinery, mine, water utility or manufacturing site gains most when its electrical engineers and maintenance supervisors attend together and agree one arc flash approach.

Industrial Power System Protection and Arc Flash Mitigation Capabilities

The outcomes link fault levels on the plant single line diagram to device settings and incident energy at each switchboard.

- Calculate prospective fault currents for plant switchboards with motor contribution — equipment rating checks
- Specify current transformer class and ratio for each protection function — switchgear purchasing
- Design motor, cable and transformer protection settings for drives and feeders — production continuity
- Build discrimination studies between fuses, breakers and relays — plant outage scope
- Assess incident energy and arc flash boundaries at each switchboard — live work authorisation
- Apply arc flash mitigation such as maintenance switches and light detection — safety investment decisions

Key Industrial Power System Protection and Arc Flash Mitigation Terms

- Arc flash — a release of heat, light and pressure from an electric arc between phases or to earth in equipment
- Incident energy — the thermal energy reaching a surface at a working distance during an arc, used to choose protective clothing
- Arc flash boundary — the distance from exposed parts where incident energy falls to the level that can cause a curable burn
- Discrimination — the property of a protection system where only the device nearest the fault operates
- Thermal withstand — the short circuit current a cable or busbar can carry for a set time without damage
- Neutral earthing resistor — a resistor between transformer neutral and earth that limits earth fault current in plant networks

Industrial Power System Protection and Arc Flash Mitigation Day by Day

Day 1: Plant Networks and Protection Philosophy

- Radial, Ring and Double-Ended Switchboard Layouts — Supply Security Choice
- Process Criticality Ranking of Electrical Loads — Protection Priorities
- Onsite Generation and Utility Interface — Point of Common Coupling Protection
- Protection Philosophy Documents for Plants — Design Consistency
- Electrical Incident Records Review — Recurring Failure Patterns

Day 2: Short Circuit Studies for Industrial Systems

- Motor and Generator Contribution to Fault Current — Breaker Duty
- Peak and Breaking Current Calculation — Switchgear Rating Verification
- X over R Ratio and DC Offset — Asymmetrical Fault Ratings
- Study Software Models for Plant Networks — Data Quality Needs
- Fault Level Growth after Plant Expansion — Upgrade Triggers

Day 3: Instrument Transformers and Earthing

- Protection Class Current Transformers and Accuracy Limits — Ratio Selection
- Core Balance Current Transformers — Sensitive Earth Fault Detection
- Solid, Resistance and Unearthed Neutral Systems — Continuity versus Fault Energy
- Neutral Earthing Resistor Rating — Earth Fault Current Limits
- Earth Grid Design and Touch Voltage — Personnel Safety Margins

Day 4: Low Voltage Devices and Discrimination

- Fuse Characteristics and Let-Through Energy — Downstream Device Protection
- Moulded Case and Air Circuit Breaker Trip Units — Setting Selection
- Energy-Based and Zone Selective Interlocking — Faster Selective Clearing
- Cascading and Back-Up Protection — Lower Rated Device Use
- Discrimination Tables and Curves — Motor Control Centre Design

Day 5: Motor and Drive Protection

- Thermal Models and Starting Curves for Induction Motors — Overload Settings
- Locked Rotor and Stall Protection — Restart Permissives
- Unbalance and Earth Fault Elements — Insulation Failure Detection
- Variable Speed Drive Internal Protection — Upstream Device Coordination
- Synchronous Motor Protection Functions — Compressor and Pump Duty

Day 6: Cables, Feeders and Busbars

- Cable Thermal Withstand and Short Circuit Rating — Conductor Sizing
- Feeder Overcurrent and Earth Fault Settings — Plant Grading Chart
- Busbar Protection in Switchboards — Fast Clearance Needs
- Capacitor Bank and Harmonic Filter Protection — Power Factor Equipment Safety
- Emergency Generator and Changeover Protection — Essential Load Supply

Day 7: Transformer Protection in Plants

- Distribution Transformer Fuse and Relay Choice — Cost versus Speed
- Restricted Earth Fault on Plant Transformers — Winding Fault Detection
- Inrush and Through Fault Withstand Curves — Overcurrent Setting Limits
- Transformer Gas, Pressure and Temperature Devices — Alarm and Trip Logic
- Unit Substation Protection Schemes — Secondary Selective Supply

Day 8: Arc Flash Hazard Analysis

- Arc Flash Incident Energy Calculation Steps — Study Method Choice
- Working Distance and Electrode Configuration — Energy Estimate Accuracy
- Arc Flash Boundary and Labelling — Equipment Warning Content
- Arc-Rated Clothing Categories — Protective Equipment Selection
- Worst Case Operating Scenarios — Study Assumption Records

Day 9: Arc Flash Mitigation and Safe Work

- Arc Flash Relays with Light and Current Detection — Clearing Time Reduction
- Maintenance Mode Switches — Temporary Setting Reduction
- Arc-Resistant Switchgear and Remote Racking — Distance from Hazard
- Electrical Permit to Work and Lockout — Live Work Control
- Protection Testing and Breaker Maintenance — Assumed Clearing Time Validity

Day 10: Practising the Plant Protection and Arc Flash Study Report

- Fault Level Table for a Plant Single Line Diagram — Rating Checks
- Motor and Feeder Settings with Discrimination Curves — Grading Evidence
- Incident Energy Results per Switchboard — Label Schedule
- Mitigation Options Ranked by Energy Reduction — Investment Priorities
- Plant Protection and Arc Flash Study Report Completion — Approval Pack

Applying Industrial Power System Protection and Arc Flash Mitigation After the Course

- Re-run fault levels for one switchboard after recent plant changes and compare them with the breaker duty and current arc flash labels
- Check motor protection settings on three critical drives against their starting curves and record any setting that risks nuisance tripping

Industrial Power System Protection and Arc Flash Mitigation Questions FAQ

What is industrial power system protection and arc flash mitigation and why does it matter now?

It is the practice of setting plant protection so faults clear selectively and quickly enough to limit arc energy. It matters now because rising fault levels, more drives and live work near switchgear raise both production and safety risk.

Which roles gain most from industrial power system protection and arc flash mitigation?

Plant electrical engineers, maintenance leads, utility engineers serving industrial customers and electrical safety specialists gain most. You benefit most if you set devices, authorise switching or choose protective clothing for staff.

How does industrial power system protection and arc flash mitigation differ from a transmission relaying course?

It focuses on plant switchboards, motors, cables and arc energy rather than transmission lines. A transmission relaying course covers distance and line differential schemes, while this one works with fuses, breakers, drives, earthing and incident energy studies.

What do you bring back from industrial power system protection and arc flash mitigation?

You bring back fault levels, motor and feeder settings, incident energy results and ranked mitigation options for a plant network. These support safer live work decisions and clearer upgrade priorities.

Industrial Power System Protection and Arc Flash Mitigation: The Way Forward

The plant protection and arc flash study report brings fault levels, device settings, incident energy and mitigation choices into one record. Its first use is deciding which switchboards need faster clearing before the next shutdown, used by electrical engineers and maintenance leads. After the first update, revisit the study whenever motors, generators or transformers are added.