9th Successful Run in Asia!

RELAY PROTECTION in POWER SYSTEMS

Comprehensive and interactive course on relay protection in power systems, incorporating fault analysis, protection requirements, various protection systems up to the latest state of the art microprocessor technology

28 MARCH – 1 APRIL 2016, KUALA LUMPUR, MALAYSIA

PAST TESTIMONIALS

“Great job in explaining protection concepts”
- Engineer. Keppel FELS Ltd

“Very good training to know the basics & principles of protection”
- Project Manager, Siemens Pte Ltd

“Comprehensive, good introduction course to the fresh engineer in power system & protection industry”
- Electrical Engineer, Chiyoda Singapore Pte Ltd

“Very specific well organize material relay protection training. Most important is conducted by very experienced chartered engineer kudos to poweredge & trainer”
- Electrical Engineer, Carigali Hess Operating Company Sdn Bhd

Expert Course Faculty Leader

JELICA POLIMAC
Chartered Engineer, Msc EE, UK
RELAY PROTECTION in POWER SYSTEMS
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About This Training Course

A comprehensive and interactive course on relay protection in power systems, incorporating fault analysis, protection requirements, various protection systems up to the latest state of the art microprocessor technology.

This 5 day course offers a comprehensive understanding of relay protection and its application in practice. Beginning with fault analysis and nature of the faults in the system, specifying the relay protection objectives, explaining different protection systems and offering protection solutions for different elements of the power system. The course concludes with the latest technology in protection and numerical microprocessor relays.

Key Learning

- Fault analysis
- Current and Voltage transformers
- Overcurrent and Earth fault protection
- Transformer differential protection
- Distance protection
- Feeder unit protection
- Generator protection
- Motor protection
- Busbar protection
- Protection settings
- Numerical microprocessor protection

Who Should Attend

This training course will be valuable to participants who work in the power industry from generator companies to transmission and distribution system operators. It is also valuable to engineers in building services where protection is applied to 11kV supply points and below to the LV distribution. Engineers working in oil and gas industry who are involved in electrical aspects of the industry such as HV & LV motors and electricity equipment will gain from the course.

This training course has a limited attendance for up to 15 participants only.

Sessions commence at 9am on all days, with short intervals at 10.30am and 3.30pm respectively.
Refreshments will be provided in the short intervals.
Lunch will be provided at 12:30pm for 1 hour. Sessions will end at 5pm on all days.
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5 Day Course Outline

DAY 1
Introduction to Protection
- Basic Objectives
- Basic Requirements
- Basic Principles
- Protection History

Power System Fault Analysis
- Faults impact on system and equipment
- Types of fault
- Balanced faults
- Unbalanced faults
- Single-phase-earth faults
- Phase to phase faults
- Phase-phase-ground faults
- Three-phase faults
- Methods of fault calculation
- Fault calculation procedure
- Component representation
- Symmetrical components
- Example of a fault studies
- Use of computer programs

DAY 2
Current Transformers
- Current transformers principle
- Current transformers types
- Current transformer characteristics
- Specification of current transformers
- Earthing of current transformers
- Connections for current transformers

Voltage Transformers
- Voltage transformers principle
- Voltage transformers types
- Voltage transformer characteristics
- Specification of voltage transformers
- Earthing of voltage transformers
- Connections for Voltage Transformers

DAY 3
Overcurrent & Earth Fault Protection
- Overcurrent (OC) & Earth Fault (EF) protection basics
- OC & EF protection principle of operation
- OC & EF protection characteristics
- OC protection scheme and applications
- Directional OC protection principle
- Directional OC protection scheme and applications
- EF protection
- Impact of network earthing on EF protection
- EF protection principles
- EF protection schemes and applications
- Directional EF protection principle
- Directional EF protection scheme and applications

Transformer Protection
- Transformer faults and their causes
- Magnetizing inrush current
- Transformer protection requirements
- Transformer differential protection
- Restricted Earth fault protection
- Transformer additional protection
- Protective schemes for various types of transformer

Feeder Unit Protection
- Feeder unit protection basics
- Feeder unit protection principle
- Feeder unit protection types
- Feeder differential protection
- Pilot Wire protection

Distance Protection
- Distance protection basics
- Distance protection zones
- Distance protection characteristics
- Distance protection schemes
- Distance protection issues
- Distance protection numerical relay

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Day 4
Generator Protection
- Generator Basics, Generators in Power Systems
- Generator – Principle of Operation
- Stator, Rotor, Magnetic Field
- Generator Frequency and Stability
- Generator Considerations Steady-State Calculations
- Operating Under Fault Conditions
- Asynchronous (Induction) Generator
- Generator Earthing
- Generator Transformer Arrangement
- Generator Mechanical Protection
- Prime Mover Protection
- Stator, Rotor Protection
- Differential Protection
- Stator Earth Fault Protection
- Overcurrent Protection
- Over Excitation Protection
- Overvoltage Protection
- Frequency Protection
- Shaft Protection
- Rotor Earth Fault Protection
- Generator Transformer Unit Protection

Motor Protection
- Motor Basics, Motor Types
- Imposed External Conditions
- Thermal Considerations
- Contribution to Fault Level
- Motor Protection Requirements
- Differential protection
- Overcurrent protection
- Overload protection
- Underload protection
- Earth fault protection
- Under-voltage protection
- Successive start protection
- Speed variation protection
- Loss of supply protection
- Out of synchronism protection
- Numerical Relay for Induction Motors
- Numerical Relay for Synchronous Compressors
- Numerical Relay for Asynchronous Electric Fans

Day 5
Busbar Protection
- BB protection basics
- BB protection requirements
- BB protection schemes
- High impedance BB protection
- Low impedance BB protection

Protection Settings
- Protection Settings Basics
- Setting Calculations Basics

Numerical Relays summary
- Numerical relay concept
- Numerical relay characteristics
- Numerical relays for transmission system
- Numerical relays for distribution system
- Managing numerical relays

Your Expert Faculty
Jelica Polimac has extensive experience in the design, erection, and refurbishment of transmission and distribution networks, HV substations and power plants with a particular expertise in protection, control and auxiliary supply systems. She has managed electrical projects from transmission level of 420kV to 11kV in urban areas with particular emphasis on technical side of the contracts including writing specifications, tender evaluation, design and design review, liaison with contractors, commissioning and computer aided design. She acted as a Protection & Control Engineer, Plant Engineer, and Commissioning Officer Advanced for many transmission National Grid projects.

Working for well know companies such as Kennedy & Donkin, Parsons Brinkerhoff, Mott Mc Donald, London Underground and London Electricity she was also involved in power plant, distribution and transportation projects.

Jelica gained experience in Asset management, and reliability assessment working on London Underground’ projects, such as strategy and assessment of reliability in the 22/11/0.4kV underground railway network, Age profile for key assets in LU network, and Renewals and Upgrades of assets in the London Underground network.

Jelica has also been responsible for developing new computer applications for the design of HV and MV projects. The applications included standardising design procedures, standardising symbols, creating a package of commands written in the relevant computer languages and providing user manuals. She was involved in the implementation of the software package for automatic processing cable connections and wiring diagrams from CAD schematic drawings. In addition, she has had responsibility for standardising general design, design methods, procedures, calculations, symbols, and an item identification system in electrical engineering, as well as the naming convention of all documents in transmission & distribution companies.
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OTHER AVAILABLE COURSES

- 4 Pillars of Transformer Condition
- Advanced Project Finance for Power
- Advanced Technical Report Writing & Presentation Skills
- Advanced Turnaround Shutdown & Outage Management
- Ancillary Services in Competitive Electricity
- Asset Management for the Power Industry
- Best Practice Renewable Energy Capital & Project Management
- Biomass Power Generation
- CFB Combustion for Boiler Operations
- Clean Development Mechanism and Carbon Markets
- Coal Contracts
- Combined Cycle Power Plants Operation
- Combined Heat & Power (CHP) and Co-Generation Plant Operations
- Competency Management System for the Power Industry
- Design & Operations of Circulating Fluidized Bed Boiler
- Developing & Structuring Public-Private Partnership (PPP) for Infrastructure
- Effective Tender Process Management for Power & Utilities
- Electrical Hazop (eHazop) Studies for the Power Industry
- Electricity Demand-Side Management
- Electricity Industry Design
- Electricity Network Planning
- Electricity Retail Contracts
- Electricity Theft
- Electricity Trading Essentials
- Energy Efficiency
- EPC Contract Management for Power & Utilities
- Essentials of Coal Markets and Trading
- Essentials of Power Trading
- Excitation Systems
- Feed-In Tariffs for PV Systems
- Finance for Non-Finance Professionals in Power & Utilities
- Financial Modelling for Project Finance in Power & Utilities
- Fitness-For-Service AP1 579 & High Energy Piping Life Management
- Fundamentals of Geothermal Energy
- Fundamentals of Power Generation
- Gas & LNG Contract Negotiation
- Gas Turbine Generator Selection, Operation & Maintenance
- Gas Turbine Hot Gas Paths, Rotors & Failure Analysis
- Gas Turbine Major Inspection & Overhaul
- GE Gas Turbine Operations Simulation Based
- HRSG Design, Operations & Understanding, Controlling of HRSG Damage
- Mechanisms
- HV Substation Design & Construction
- IEC for Utilities
- Integration of Distributed Generation
- Introduction to Carbon Capture & Storage
- Introduction to Clean Coal Technology
- Introduction to Power Systems
- Keeping Electrical Switchgear Safe
- Leadership & Team Dynamics for Power & Utilities
- LNG Fundamentals
- LNG Markets & SPOT Trading
- Maintenance Planning & Scheduling
- Making IPP & Renewable Energy Projects Contract
- Frameworks Bankable
- Managing Complex Projects for Power and Utilities
- Professionals
- Medium Voltage & High Voltage Switchgear
- Metallurgy for Engineers
- Mechanical Engineering for Non-Mechanical Engineers
- Mini Hydro Project Analysis
- MKV Speedtronic Control System
- MK VI Speedtronic Control System
- Nuclear Energy Project Planning & Economics
- Nuclear Power
- Offshore Platforms Electrical Systems Design & Illustrations
- Operations of Coal Fired Power Plants
- Power Generation Commissioning, Operations & Maintenance
- Power Generation Operation, Protection & Excitation Control
- Power Plant Chemistry for Chemist & Chemical Engineers
- Power Purchase Agreements
- Process Control Methods
- Programmatic CDM
- Project Management for Power and Utilities
- Risk Based Inspection
- Risk Management in Power Markets
- Root Cause Analysis
- Rotating Equipment Maintenance & Reliability Excellence
- SCADA & Power Systems
- Smart Grid
- Solar Energy & Photovoltaic Power
- Spare Parts Optimisation
- Supercritical and Ultra-Supercritical Coal-Fired Power Plant
- Technical Report Writing & Presentation Skills for Power & Utilities Professionals
- Ultra Low NOx Gas Turbine Combustion
- Uninterruptible Power Supply
- Vibration Analysis & Condition Monitoring
- Waste to Energy Plant Operations
- Water Treatment and Corrosion Control for Steam Generation and Power Production
- Writing Effective Standard Operating Procedures (SOP) for Power & Utilities Professionals & Engineers
1. Does PowerEdge have other programmes than those listed?
We have more than 200 programmes that we are capable of running. All we need is for you to contact us and request for the preferred programme and we will able to develop it.

2. Where is PowerEdge based?
PowerEDGE is headquartered in Singapore but we run our training programmes in different venues around Asia.

3. What does PowerEdge do?
We are a Power & Utilities Training Specialist.

4. Can this course be done in our city?
It absolutely can. Get in touch with us to request for a training programme to be carried out in your city.

5. Can you reduce the price of our preferred course?
While our price has been reduced before it is even launched, we are always happy to help you with further discounts.

6. Can you change the dates of the course?
If you have a special requested date, let us know and we will arrange another session for you.

7. Who are the companies that will be participating?
This varies from a diversity of Power Operators, Regulators, Financiers, to Vendors in the Power & Utilities industry.

8. Where is the venue for the course?
We usually engage a 4 to 5 star hotel meeting room to ensure the comfort of our participants.

9. How many delegates should we expect for each course?
This varies from 15 to 20 participants. Class sizes are kept small to allow trainers to focus better on each participant.

10. What are the different payment modes?
We accept Visa/MasterCard, cheques, bank transfers and cash on site.

11. Is accommodation included when I sign up for a course?
Accommodation is not included in the course fee but we are always happy to advise on available accommodations.

12. Can I get a cheaper accommodation through PowerEdge?
We will be pleased to help you negotiate a better rate with hotels.

13. Is lunch provided during the course?
We provide lunch and 2 tea breaks every day during our training programmes.

14. Are the training materials included once I have signed up for a course?
Yes, training and course materials are included in the course fee.

15. Will there be a certificate for the course?
Yes, there will be a certificate of participation upon completion of a course.

16. Who are PowerEdge trainers?
They are expert consultants and practitioners with many years of experience in the subject matter that they deliver on.

17. Are PowerEdge trainers competent?
We have received numerous favourable feedbacks on our trainers from past participants.

18. Can PowerEdge assist with Visa travel applications?
We can assist in advising you on the relevant procedure(s) and embassies/consulates that provide Visa for travel purposes.

19. Can we purchase training materials without attending a course?
Unfortunately this option is not available as training materials are specially developed for courses.

20. Can course content be tweaked to cater to our needs?
Of course! Just let us know your request and we will get the trainer to assist in carrying it out.
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ATTENDEE DETAILS

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COMPANY DETAILS

Organisation name ............................................................................................... Industry .................................................................................................
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Tel ............................................................................................................................ Fax .................................................................................................................

PAYMENT METHODS

By Cheque/ Bank Draft: Make Payable to PowerEdge Pte Ltd.
By Telegraphic Transfer: Please quote AE1 with the remittance advise
Account Name: PowerEdge Pte Ltd.
Bank Address: 65 Chulia Street OCBC Centre, Singapore 049513
All bank charges and payment in Singapore dollars (SGD) to be borne by payer. Please ensure that PowerEdge Pte Ltd receive the full invoiced amount.

PAYMENT TERMS

Payment is due in full at the time of registration. Full payment is mandatory for event attendance. I agree to PowerEdge Pte Ltd. payment terms
* GST: Exclusive price is only applicable for overseas corporate customers subject to qualifying conditions.

You may substitute delegates at any time. POWEREDGE PTE LTD does not provide refunds for cancellations. For cancellations received in writing more than seven (7) days prior to the training course you will receive a 100% credit to be used at another POWEREDGE PTE LTD training course for up to one year from the date of issuance. For cancellations received seven (7) days or less prior to an event (including day 7), no credits will be issued. In the event that POWEREDGE PTE LTD cancels an event, delegate payments at the date of cancellation will be credited towards the rescheduled date. If the delegate is unable to attend the rescheduled event, the delegate will receive a 100% credit

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