

9th **Successful Run** in Asia!

Qualified for 30
PDU's by PEB

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

25 – 29 SEPTEMBER 2017, SINGAPORE

Testimonial from VUKAN'S other courses

"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

Expert Course Faculty Leader



Vukan Polimac

Chartered Engineer MIET CIGRE SMEIT SAIEE

Fellow of IET, IEEE, CIGRE

Consultant in Polimac Ltd

RELAY PROTECTION in POWER SYSTEMS

25 – 29 SEPTEMBER 2017, SINGAPORE

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.

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

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

DAY 3

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

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 : Vukan

In his 30 years working experience he provided highest quality services in system planning and analysis to major transmission and distribution and transportation companies including London Underground, National Grid Company (UK), MTRC Metro in Hong Kong, West Coast Main Line connection to NG, Scottish Power, ESB-Ireland, ESKOM-South Africa, Mauritius CEB, Balkan countries - grids of Romania and former Yugoslavia, HV network ISA-Colombia, Western Power Distribution-UK, etc.

Vukan's technical expertise includes most aspects of power systems analysis, electrical asset management and railway connections to power networks where he provides solutions to technical problems and supports other field's experts in complex assignments. He has project management skills in technical and environmental projects as well as experience in short and long-strategic term planning, maintenance and asset management, power quality analysis of transmission and generation systems, distribution, transportation and other power networks. Experienced in generation and network integration, electrical component of energy master plans as well as strategic asset replacement, he was also involved in load- forecast analysis and generation dispatching. Published papers on asset management based on projects and experience in working for distribution companies in Africa and Europe.

Vukan is very experienced in design, procurement, commissioning, erection and refurbishment of major projects in transmission and distribution substations up to 420 kV and hydro and thermal power plants. Served as project manager on several major projects as well as head of the Engineering Group, Vukan was responsible for final design, equipment specifications, layouts tender evaluation and commissioning. He has carried out conceptual development of protection and control philosophy for various projects as well as reviewed and approved project drawings and documents. He has applied the latest IEC standards, various codes of practice and engineering recommendations. He has also specific experience in conceptual design of power supply for transportation and traction railway systems, defining the design principles and technical specifications for future design and privatisation process. He has analysed quality of power supply for connection of AC and DC unbalanced load to power network and published papers on practical implementation. Vukan carried out feasibility studies on reactive compensation (SVC and MSC) focusing on voltage variation and harmonic distortion issues.

Vukan has performed technical and economic evaluations, cost benefit net present value analysis, of various transmission and distribution schemes and electrical equipment. He carried out a number of asset evaluation analysis on electrical equipment and published papers on asset management, reliability and maintenance. He has performed equipment assessment and residual life prediction as part of strategic asset management analysis for a major underground transportation company in Asia. His duties have also included equipment arrangement optimisation in particular reliability aspect in terms of failure rate and financial consequences as non-supplied energy to the consumers.

RELAY PROTECTION in POWER SYSTEMS

25 – 29 SEPTEMBER 2017, SINGAPORE

	NORMAL PRICE	2 PARTICIPANTS OR MORE	IN-HOUSE TRAINING
5 Day Programme	SGD 3, 300 Per Participant (*GST Exclusive)	SGD 2, 800 Per Participant (*GST Exclusive)	Guaranteed Minimum 40% Off Normal Price
	SGD 3, 531 Per Participant (GST Inclusive)	SGD 2, 996 Per Participant (GST Inclusive)	

ATTENDEE DETAILS

Name Job title

Tel Department Email

Name Job title

Tel Department Email

Name Job title

Tel Department Email

Name Job title

Tel Department Email

Name Job title

Tel Department Email

COMPANY DETAILS

Organisation name Industry.....

Address

Postcode..... Country.....

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 Code: 7339 Branch code: 686 Account Number: 686-253386-001 Swift Code: OCBCSGSG

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 POLICY

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.

CANCELLATIONS & SUBSTITUTIONS

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 to a future POWEREDGE PTE LTD event. This credit will be available for up to one year from the date of issuance. In the event that POWEREDGE PTE LTD postpones an event, delegate payments at the postponement date will be credited towards the rescheduled date. If the delegate is unable to attend the rescheduled event, the delegate will receive a 100% credit

4 ways to Register

- Online Web Registration
- info@poweredgeasia.com
- (65) 6741 9927
- (65) 67478737

RELATED TRAINING

- ✓ [HV/LV Power System Relay Protection](#)
- ✓ [Competency Management System for the Power Industry](#)
- ✓ [EPC Contract Management for Power & Utilities](#)

ON SITE TRAINING

Can't make it for the Course? We'll make the course come to you!!

Simply let us know your preferred time and dates and we will meet you at your schedule and venue.

With a host of highly trained experts, we will be happy to customize your programme with your needs 100% fulfilled.

Contact us today at

- info@poweredgeasia.com
- (65) 6741 9927

