LK Technical Pty Ltd

COURSE DETAILS

2 day Mitigation Methods for Power System Power Quality Problems Using PSCAD/EMTDC

Cost AUS $2,000 excluding GST

Venue University of Wollongong, Wollongong, Australia

Dates Thursday 2nd and Friday 3rd October (inclusive)

ATTENDEE DETAILS

Name _____

Job Title _____

Address _____

_____

Telephone _____ **Fax** _____

Mobile _____ **Email** _____

NOTEBOOK AND PC SOFTWARE

I hereby confirm that I will provide a notebook PC with the following software installed and configured with the required keys drivers for stand alone operation with the hardware key that will be provided for the duration of the training course.

PSCAD V4 ☒ ☐ ☐ ☐ ☐

METHOD OF PAYMENT

Master Card ☐ **VISA** ☐ Please send me an invoice ☐

Card No _____ Order no: _____

Expiry date _____

Name on card _____

Signature _____

Cheque payable to LK Technical Pty Ltd

EFT to: Account Name: LK Technical Pty Ltd
Bank: St George
Account No: 137355021
BSB: 112 879

PLEASE COMPLETE AND RETURN TO

L K Technical Pty Ltd
6 Birchgrove Drive
Wallsend NSW 2287 Australia
Tel: (02) 4955 5481
Fax: (02) 4955 5402
Email: lynn.kendrick@lktech.com.au

Other Software Packages, Products and Services available from LK Technical

Software

- PTW Powertools for Windows (www.skm.com)
- CAPE Computer Aided Protection Engineering (www.electrocon.com)
- GMAT Ground Mat (www.skm.com)
- WAVEWIN Comtrade file organiser, viewer (www.softstuf.com)

Products

- KIGG RT series secondary injection protective relay test sets (www.kigg.com)

Engineering Services

- Training courses associated with the above software packages (Lynn Kendrick at lynn.kendrick@lktech.com.au)
- Power System Protection audits, reviews, design, setting, configuration, training, testing and commissioning (Patrick Arendse at parense@lktech.com.au)

LK Technical Pty Ltd

PS CAD

MITIGATION METHODS FOR POWER SYSTEM POWER QUALITY PROBLEMS USING PSCAD/EMTDC

COURSE OBJECTIVES

The workshop will provide graduate power system engineers with practical insight into power quality aspects of power system operation and design. For experienced power engineers and designers, the workshop will serve as a refresher course and also provide in-depth exposure to the analysis of power system disturbances.

At the end of the workshop, the participant will have a good understanding of power system phenomena that impact on power quality and the relevance of simulation studies in the design and operation of modern power systems.

The knowledge gained will enable better communication between power system operators, designers, consultants and suppliers, thus increasing the overall efficiency of power system operation and design.

WHY YOU SHOULD ATTEND THIS COURSE

If you are involved in modern utility or industrial power system operation and if you are not aware of the answers to the following, you must attend this course.

- How power system faults can result in voltage interruptions, sags and swells
- How voltage fluctuations are produced
- The requirements of IEEE 519 and IEC 61000-3-6 standards
- How FACTS devices improve power quality
- How to simulate ARC Furnace loads
- How to simulate cyclic motor loads
- How to simulate a variable speed motor drive
- How active filters work
- How to simulate a DVR
- How to simulate Induction Generators as used in Wind Farms

The workshop is designed for persons with practical involvement in power system operation and design. Hence it is relevant for power system operators, engineers and consultants.

All topics are presented starting from the basic level and in a logical sequence. The emphasis is on the concepts and practical aspects of power system power quality problems, and how to simulate/solve them using PSCAD/EMTDC.

Graduate level Electrical Engineering knowledge of AC power system modeling or theory is assumed. Basic computer keyboard skills are essential.

TOPICS COVERED

- Overview of Power Quality phenomena
- Introduction to PSCAD/EMTDC
- Modeling power networks in PSCAD/EMTDC for power quality analysis
- Voltage dips, swells and interruptions
- Voltage fluctuations and flicker
- Harmonic distortions
- Voltage imbalance
- FACTS
- Wind Farm induction generators
- 13 hands-on example tutorials using PSCAD/EMTDC

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We look forward to seeing you at our booth at ICHQP 2008

ICHQP 2008 - 13th International Conference
HARMONICS AND QUALITY OF POWER
University of Wollongong 28th September - 1st October 2008

COURSE STRUCTURE
2 Day course

1. Overview of Power Quality Phenomena

- Definitions
  - Voltage sags, swells and interruptions
  - Voltage fluctuations and flicker
  - Voltage unbalances
  - Harmonics
  - Switching transients
- Standards
  - IEEE 519, IEC 61000-3-6

2. Introduction to PSCAD/EMTDC and the Fundamentals of Power System Transient Simulation

- Introduction to Electro-magnetic transients in power networks
- Introduction to Electromagnetic transient simulations programs – (PSCAD/EMTDC in particular)
- Creating a small simulation case using PSCAD
  - Building the power system
  - Data entry
  - Results, graphs, plots and meters
  - Interactive control features of PSCAD (sliders, push buttons, dials and switches)
- Fundamental theory of transient simulation
  - Representation of power system components and control system elements
  - Selection of the simulation time step
  - Studies that requires simulation tools like PSCAD
  - Advance features of PSCAD for fast and accurate solutions
- Brief look at the models and examples available in PSCAD

3. Modeling power networks/equipment in PSCAD/EMTDC for power quality analysis

Tutorial 1: Simple example to illustrate transformer inrush related transients, fault induced voltage sags and swells
Tutorial 2: Building a simple case for Distribution Capacitor Bank Switching study

- Fundamentals of capacitor switching, high frequency transients, resonance issues and possible mitigation methods
- Using PSCAD to model capacitor switching
  - Plotting
  - Control system blocks
  - Batch mode
  - Interactive controls
  - Meters
  - Simulation start up methods
  - Initialization
  - Output files

4. Voltage dips, swell and interruptions

- Misapplication of grounded Y-D transformers
- Unbalanced faults
- Motor starting
- Natural Grounding over voltages

Tutorial 3: Voltage dips due to induction motor starting

- Direct on line starting, thyristor based soft starting and variable speed drives

Tutorial 4: Application of a FACTS device to reduce voltage sags at critical loads

5. Voltage fluctuations and flicker

a. Arc furnace modeling
b. Flicker due to cyclic motor loads
c. Flicker evaluation
   i. PST

Tutorial 5: Simulation of flicker due to an arc furnace load

Tutorial 6: Simulation of flicker due to a cyclic synchronous motor load

MEET THE INSTRUCTOR

Dr. R.P. Jayasinghe (M'91) obtained his B.Sc. (Eng) degree from the University of Moratuwa, Sri Lanka in 1987 and Ph.D. degree from the University of Manitoba in 1997. He is currently with the Manitoba HVDC Research Centre. As a Development Engineer he plays a major role in the current development of the PSCAD/EMTDC simulation program. He is a Registered Professional Engineer in the Province of Manitoba. Dr. Jayasinghe also serves as an adjunct professor at the University of Manitoba.

6. Harmonic distortions

a. Modeling of converters
b. Motor drives
c. Passive/Active filters

Tutorial 7: Modeling of harmonics due to a variable speed drive

Tutorial 8: Application of active filtering to mitigate harmonics

Tutorial 9: Application of 'network harmonic impedance scanning' methods to identify possible voltage distortion issues

7. Voltage Imbalance

Tutorial 10: Modeling of harmonics due to a variable speed drive

Tutorial 11: Application of active filtering to mitigate harmonics

8. FACTS

a. Modeling of converters and control systems
b. Common devices
    i SVC
    ii STATCOM
    iii DVR
    iv Others

Tutorial 12: Modeling and application of a DVR

9. Wind power and related issues

a. Start-up example of a wind turbine coupled to an induction generator
    i Illustrative PSCAD example
b. Pitch control of wind turbines and issues due to wind fluctuations
    i Illustrative PSCAD example
c. Introduction to Doubly-fed induction generator concept
    i Reactive power control
    ii Power and speed control
    iii Power quality concerns

Tutorial 13: Modeling and application of a Wind Farm Generator