



Quality of Electrical Supply

Continuing Professional Development Course

A professional development course in power engineering presented by the Australian Power Quality and Reliability Centre, School of Electrical, Computer and Telecommunications Engineering, University of Wollongong

Course Objectives

The rapidly increasing installation of electronic equipment such as digital controls, computers and sensitive process control equipment has increased the susceptibility of utility customers to supply disturbances. In addition, the application of power electronic equipment with its higher energy efficiency and more effective control features has in turn often increased the level of disturbances that might affect customer equipment. Utilities are committed to be more customer-focused and to be able to give advice to customers who may have power quality concerns. The Quality of Electrical Supply course will give a practical understanding of the principles, practices and problems associated with supply quality.

This course will cover all power quality problems including voltage sags, harmonics, transients and light flicker. Delegates will learn analysis fundamentals, instrumentation techniques and methods of improving power quality by both network and plant modifications. A feature of the course will be a number of hands-on computer investigations for “what-if” scenarios. Course participants will also be presented with practical case studies of power quality problems and solutions from local industry experts.

Course Benefits

Following the course you will have gained knowledge and skills to assist you in the following:

- A systematic understanding of the various power quality problems, including the causes of power disturbances and the types of load affected.
- The estimation of the orders of magnitude of problem situations through computer simulation.
- Knowledge of the standards for particular types of disturbances and actions if standard limits are exceeded.
- Distinguishing the different types of available power quality monitoring equipment and their particular applications.
- Knowledge of how utilities and customers can improve their power quality.

Who Should Attend?

Managers, utility specialists and senior technical staff who wish to advise customers on power quality concerns, or who service large customers or who wish to understand aspects of network design, construction and maintenance techniques for maximising quality of supply. Personnel working in all areas of power system design who wish to know how the system interacts with the end-user will also gain from this course.

About the Speakers

Professor Sarath Perera is Technical Director of the Australian Power Quality and Reliability Centre and a Professor in the School of Electrical, Computer and Telecommunications Engineering. His research interests include power quality, distribution system reliability, EMC and power system simulation techniques.

Emeritus Professor Vic Gosbell is a Technical Advisor to Australian Power Quality and Reliability Centre and Emeritus Professor for the School of Electrical, Computer and Telecommunications Engineering. His current research interest is power quality with an emphasis on harmonics, PQ survey measurements and standards.

Mr. Sean Elphick is a Research Coordinator with the School of Electrical, Computer and Telecommunications Engineering. He is active in the areas of power quality monitoring and data analysis.

Professor Robert Barr is principal of Electric Power Consulting Pty Ltd and has dealt with a wide range of power quality and general electricity industry problems.

Professor Peeter Muttik is Chief Engineer with Alstom Grid and has many years experience in a wide variety of electric power projects.

Associate Professor Phil Ciufo is an Associate Professor with the School of Electrical, Computer and Telecommunications Engineering. His research interests include power quality (PQ) including system harmonics, harmonic management, voltage fluctuations and unbalance.

Dr Ashish Agalgaonkar is a Senior Lecturer with the School of Electrical, Computer and Telecommunications Engineering. His research interest include impact of renewable and distributed generation on electricity networks, power system reliability, system stability, electricity markets and smart grids

Dr Jeff Moscrop is a Senior Lecturer with the School of Electrical, Computer and Telecommunications Engineering. His research interests include Fault Current Limiter technologies, applications of high temperature superconducting technology in the power industry, linear electric motors and precision control in industrial machine-tools and robotic systems.

Course Outline

Day 1

- **Introduction:** Overview of power quality issues and their increasing significance, definitions, problems and causes.
- **Modelling and Calculations:** Review of power system analytical techniques including harmonic calculations.
- **Load Behaviour:** Typical nonlinear loads (e.g. VSDs, rectifiers, AC phase control, computers, etc.), how they affect power quality and how they are affected by power quality problems.
- **Voltage Fluctuations:** Causes, effects on loads, measurement and limits, mitigation.
- **Transient Overvoltages:** Types, causes, effects on loads, mitigation, analysis methods.
- **Long Duration Voltage Variations & Voltage Unbalance:** Effects on connected equipment, voltage regulation and its improvement by capacitors, SVCs, etc, causes of voltage unbalance and its effects.
- **Voltage sags and Interruptions:** Causes, effects, fault & motor starting considerations, customer & network solutions.

Day 2

- **Harmonics:** Relationship between voltage and current distortion, sequence properties of harmonics, causes of harmonic production, harmonic calculation methods, effects on electrical equipment, mitigation.
- **Case Studies:** Power quality case studies and solutions given by industry experts.
- **Panel Session:** Open forum for course participants to ask specific power quality questions of industry experts.
- **Standards:** Philosophy behind standards, voltage fluctuation and harmonic standards from Australia, IEC & IEEE, state codes & regulations.
- **Power Quality Monitoring:** Power quality instrumentation, surveying practices, data evaluation and power quality indices.
- **Power Quality Demonstrations:** Laboratory demonstration of different power quality phenomena and instrumentation.

Enquiries

Course enquiries:

Joanne Robson

Australian Power Quality and Reliability Centre

University of Wollongong

Ph: 02 4221 3335

Email: jrobson@uow.edu.au

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