



# Quality of Electrical Supply

## Continuing Professional Development Course

19 – 20 April 2017, University of Wollongong

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 such as variable speed drives and renewable energy systems has in turn often increased the level of disturbances that may impact operation of customer equipment. The Quality of Electrical Supply course will give a practical understanding of the principles, practices and problems associated with electricity supply quality.

This course will cover all power quality problems including voltage sags, harmonics, transients and flicker. Attendees will learn the characteristics of power quality disturbances, 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?

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This introductory course is suitable for all individuals working in the electrical power engineering industry. This include managers, utility specialists and 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

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**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.(SECTE) 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 in SECTE. 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 SECTE. 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 Ciuffo** is an Associate Professor with SECTE. His research interests include power quality (PQ) including system harmonics, harmonic management, voltage fluctuations and unbalance.

**Dr Ashish Agalgaonkar** is a Senior Lecturer with SECTE. 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 SECTE. 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

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The course is conducted over two days commencing at 8:30 am on Wednesday 19 April 2017 and comprises lectures, computer laboratories and demonstrations. The course outline is as follows:

### Day 1

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- **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

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- **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

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### Registration enquiries:

Ms Raina Lewis  
School of Electrical, Computer and Telecommunications  
Engineering  
University of Wollongong  
Ph: 02 4221 3335  
Email: Raina\_Lewis@uow.edu.au

### Course enquiries:

Mr Sean Elphick  
Australian Power Quality and Reliability Centre  
University of Wollongong  
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Email: elpho@uow.edu.au

## Registration Form

Please enrol me in the two-day course “Quality of Electrical Supply” to be held at the University of Wollongong, NSW, Australia from 19 – 20 April 2017

**Cost per person:** AUD\$1,500 inclusive of GST (Course fee includes course notes, lunches, morning and afternoon tea). Lectures commence 8:30 am.

**Please register before 7 April 2017 (please see Note below).**

Surname..... Given Name.....  
Organisation..... Job title/position.....  
Postal Address.....  
State..... Postcode..... Country.....  
Telephone..... Fax.....  
Mobile..... Email.....  
Special dietary requirements.....

### Methods of Payment

If you wish to pay by **credit card**, please fill out the details below and **email to Raina\_Lewis@uow.edu.au**.

Please debit (circle):    Bankcard        Visa        Mastercard

Card number:

Expires: /  for the amount of

AUD\$.....

Name on card: .....

Signature: .....

Email for receipt: .....

Cheque payable to “The University of Wollongong”

**Mail to:**        PQ Course Registration  
                  School of Electrical, Computer and Telecommunications Engineering  
                  University of Wollongong NSW 2522  
                  Australia

**Note:** There is no guarantee that economic participation levels for this course can be achieved. Registrants will be notified on the 10<sup>th</sup> April 2017 if the course cannot proceed due to insufficient numbers. The program may be changed at any time due to unforeseen circumstances. If the course cannot proceed for any reason, UOW will not accept liability of whatsoever kind for expenses incurred by any person or corporation with the sole exception of the course investment, which will be refunded in full.

### Customised In-House Courses Available

We can come to you to provide customised courses on a range of topics at your location. For more information contact Raina Lewis (Raina\_Lewis@uow.edu.au)