

# Short Course on Practical, Hands on Power Quality

دبي ورلد سنترال  
DUBAI WORLD CENTRAL



## How to book your seat

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	Programme	Dates	Timing	Course fee
1	Practical, Hands - on Power Quality Course	7 - 9 April 2009	Session 9.00 to 15.30 hrs (Registration on first day at 8.00-9.00 hrs)	US\$ 2100/person

## Personal Details

Title	Name (as it should appear in the certificate)	Job Title	Department/ Organisation	Email

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## Payment terms and conditions

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Bank Transfer: **Emirates Bank International**  
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Kindly make your registration before 26th March 2009. In case of cancellation, a substitute candidate can be sent. Cancellations can be made no later than 7 days prior to the event and will be subjected to a 10% cancellation fee.

Course fee includes training materials, lunch and refreshments

\*Due to unforeseen circumstances, the programme may change and DuServe reserves the right to alter the programme details including the venue and / or speakers

**Al Bustan Rotana, Al Garhoud**  
Phone +971 4 2820000

A five star hotel located close to  
Dubai International Airport  
and business centres.

\*Participants can avail special rates  
by booking through us.



**DuServe**  
(A Subsidiary of Dubai World Central)

## Announces a 3 Day Professional Advancement Course on

### Practical, Hands-on Power Quality

"This is a practical, hands-on, how-to-solve-the-problem for practicing electrical engineers, with just barely enough theory and math, but lots of real-world examples."

Power Quality is becoming an increasingly important topic judging from the frequency of problems experienced by essential public services, important business applications and critical industries. Power Disturbances are often viewed as mysterious events which can only be understood by experts and which can only be solved by inexplicable techniques. Power quality issues can be understood and addressed by rational step-by-step problem solving techniques. Power Quality Problems obey the laws of physics. Anyone with a basic background in electricity and understanding of rational trouble shooting techniques can track them down and solve them. This course is designed and conducted by an internationally known expert to build your capabilities in this direction.

## What will participants gain from attending the programme ?

- Better understanding of what Power Quality is
- Better approach to fixing problems by improving load designs.
- Using the Power Quality Teaching Toy program to visually see the changes in the power supply causing the load to ride to 90% of the most common Power Quality Problems.
- Learning about the Power Quality standards and what standard applies better to each industry
- Understanding the interaction between harmonic current and voltages, and harmonic impedances
- Gaining good knowledge on earthing /grounding systems and its world wide practices
- Measurement and monitoring of power quality

## Who should attend ?

- Utility engineers who are responsible for major commercial/industrial accounts.
- Electrical/Electronics engineers who design and operate continuous process equipment and power distribution systems in oil companies, steel industries and so on.
- Consultants who design residential, industrial and multipurpose complexes.
- Facilities engineers who are responsible for sensitive manufacturing equipment and design of new buildings.
- Power Quality engineers and personnel who are interested in power quality issues.

7-9 April 2009 (3 days)

Venue

**Al Bustan Rotana, Dubai**

Course Instructor

**Alex McEachern**

Power Standards Lab,  
California, USA

## Course Instructor



Alex McEachern is known world-wide for his practical, straightforward, good-humored seminars on power quality. He is the president of Power Standards Lab in California, the founder of BMI.

Active in drafting and approving international power standards, Alex is the Chairman of the International Electro-technical Commission (IEC) TC77A Working Group 9, which sets the standard for power quality instruments. He also participates in the drafting of the voltage dip immunity standards, IEC 61000-4-11 and IEC 61000-4-34. He is a Senior Member of the IEEE, former Chairman of IEEE 1159.1, a co-author of IEEE 519 and IEEE 1459, and a voting member of the IEEE Standards Coordination Committee on Power Quality. He is the author of the industry-standard Handbook of Power Signatures, and contributor to the Encyclopedia of Electrical and Electronics Engineering besides technical and popular articles.

He is the recipient of 2001 Mungenast Award for lifetime contributions to the power quality industry. In 2006, he was honored with the International Electrotechnical Commission (IEC) award for exceptional achievement in work fundamental to IEC electric power standards. He has been awarded 29 patents. Versions of this seminar have been taught by Alex in 17 countries.



## Certificates

The participants will receive certificate at the end of the course.

## About Dubai World Central and DuServe

Dubai World Central (DWC) is a prestigious project envisioned to develop a 140 square kilometer of urban aviation community around the world's largest international airport in Jebel Ali, Dubai, UAE. DWC creates a new era in Urban Planning and Living Destination designed to support Dubai's Aviation, Tourism, Commercial and Logistics requirements until 2050. This is a multibillion dollar project comprises six specialized clustered zones: Al Maktoum International Airport, Dubai Logistics City, Aviation City, Residential City, Commercial City, Humanitarian City and the Golf Resort.

DuServe is the total engineering and services solution provider to DWC through its multi-disciplinary technical force/ DuServe also organizes a number of technical training programmes in association with international experts. These training programmes will imbibe the unique experience and wealth of knowledge of all DWC projects from conception to implementation, operation and maintenance.



## Course Plan

### Practical power quality – a brief hands-on introduction

- Voltage sags and swells – real-world examples
- High frequency impulses – real-world examples
- Frequency variations – real-world examples
- Harmonic voltages and currents – real-world examples
- High-frequency noise – real-world examples
- Earth / ground problems – real-world examples
- Problems that were incorrectly blamed on power quality

### A deeper understanding, using free Power Quality Teaching Toy program

- Fundamental power flow
- Three-phase sequence vectors (unbalance)
- Voltage sag/dip effects on electronic equipment
- Harmonic concepts, power flow, and sequence
- Source impedance – what it is, and how to estimate it

### Power quality standards

- Immunity-based standards – the basic idea of compatibility
- Voltage dip/sag immunity – SEMI F47, IEC 61000-4-11, IEC 61000-4-34, CBEMA, ITIC
- Which standard should you use?
- Unbalanced vs. balanced sags on 3-phase systems
- Pass-fail criteria – some practical problems
- Planned revisions to these standards
- Revenue meter standards and power quality
- The power-factor definition debate
- Planned revisions

### Voltage sags / dips

- Why sags and dips happen – the practical explanation
- Why it is impossible for electric power companies to fix the problem
- Brief discussion: impedances on the power grid
- Typical characteristics of sags and dips
- How to fix the problem
- Figure out exactly what the "problem" is
- Sag correction devices
- Increased immunity solutions
- How to use a voltage sag generator

### Harmonics

- Practical introduction to harmonic concepts
- Causes of harmonic currents
- Causes of harmonic voltages
- Interaction between harmonic currents and voltages, and harmonic impedances
- Effects of harmonic currents
- Effects of harmonic voltages
- Practical solutions to harmonic problems
- Is it a problem?
- Reducing impedance
- Eliminating resonances
- Harmonic filters – active and passive

### Earthing and grounding

- World-wide practices – surprisingly different from country to country
- Typical industrial and commercial problems
- The physics of earth/ground connections
- Searching for earth problems (almost never shown on drawings)
- Simple solutions

### DC power distribution – serious proposal for data centers

- Brief history of AC and DC power distribution
- Typical 48 Vdc distribution systems
- Proposed 400 Vdc distribution systems – data centers
- Supporters – IBM, Sun, etc.
- Advantages
- Disadvantages
- Impedances and interesting power quality issues

### The economics of power quality

Studied by CIGRE/CIREDC  
JWG C4.104 and C4.110

- Challenges in measuring economic effects
- Data required on power and economics
- The lack of data at end-use points
- The "top-down" approach
- The "bottom-up" approach
- Uncertainties in economic measurements
- Expected reports

### Power consumption and power quality

- Harmonics and power consumption
- Watts, volt-amperes, and VAR's – not as simple as they told you in school
- Harmonics and metering – definitions and errors

### Power quality measurement and monitoring

- Common mistakes and problems
- Practical rules of thumb:
  - How long should you monitor?
  - How do you choose thresholds?
  - What should you do with the data?
- IEC 61000-4-30 – Power quality measurement methods
- Why PQ measurements often don't agree
- How -4-30 fixes this problem
- Practical difficulties with -4-30
- Planned revisions to this standard
- Big changes coming in power quality monitors – cheaper, easier, and simpler

### Discussion and questions about specific local problems

Day 1

Day 2

Day 3

\* Each session will be delivered from one to two hours