

## Electrochemical Impedance Spectroscopy

### Registration Form

Photocopies of this form may be used for registrations.  
You can also register online at [www.corrosionclinic.com](http://www.corrosionclinic.com)

Please register the following person(s) for the above course (please TYPE or PRINT clearly):

1. Dr/Mr/Ms \_\_\_\_\_  
Designation \_\_\_\_\_
2. Dr/Mr/Ms \_\_\_\_\_  
Designation \_\_\_\_\_
3. Dr/Mr/Ms \_\_\_\_\_  
Designation \_\_\_\_\_

\*delete where inappropriate

Enclosed is a cheque / bank draft No. \_\_\_\_\_  
for S\$ \_\_\_\_\_ (payable to "WebCorr Corrosion Consulting Services") being Registration Fee for the above person(s).

Organization \_\_\_\_\_  
Contact Person \_\_\_\_\_  
Contact Dept \_\_\_\_\_  
Telephone \_\_\_\_\_ Fax \_\_\_\_\_  
Email \_\_\_\_\_

Crossed cheques should be made payable to "WebCorr Corrosion Consulting Services" and mailed together with the registration form to:

### WebCorr Corrosion Consulting Services

Toa Payoh Central., PO Box 225,  
Singapore 913108  
Tel: (65) 64916456 Mobile: (65) 97110759  
Fax: (65) 64916456  
Email: [webcorr@corrosionclinic.com](mailto:webcorr@corrosionclinic.com)  
<http://www.corrosionclinic.com>

## Course Details

**Date:** 18 July 2008  
**Time:** 9:00 am to 5:00 pm  
**Venue:** 1 Science Park Drive  
**Course Fee:** S\$595 (GST not applicable)  
**Closing Date:** 2 weeks before course date  
**Discount:**  
**Group:** (3 or more people): 10%  
**Early-bird:** N% **if paid** "N" months  
before the course  
commencing date

### Withdrawal/Refund Policy:

Withdrawal or replacement should be conveyed to the organizer in writing (email or fax). An administration charge of 50% of the course fee will be levied if the withdrawal notice is received less than 7 working days before the course commencing date. No refund will be made for withdrawal notice received 3 working days and less.

### Certificates:

Certificate of attendance will be given to participants with at least 75% attendance of the course.

### Cancellation:

WebCorr reserves the right to cancel the course and fully refund the participants should unforeseen circumstances necessitate it.

## Electrochemical Impedance Spectroscopy

- Measurement, Modeling, Data Interpretation and Applications

*Conducted by*

**Dr. Qiu Jianhai** BEng PhD CEng MIM FICorr  
*NACE Certified Corrosion Specialist*

*Date*

**18 July 2008**

*Venue*

**1 Science Park Drive  
Singapore 118221**

*Organized by:*



## Course Overview:

This course thoroughly and systematically covers the fundamentals of electrochemical impedance spectroscopy, the procedures/steps involved in EIS measurements, equivalent circuit modeling, data interpretation and practical applications in corrosion testing and monitoring. Participants of this course will gain hands on experience in operating the state-of-the-art EIS equipment to collect impedance data. The participants will also gain hands on experience in using EIS modelling softwares such as ZView and Boukamp's Equivcrt. The detailed procedures for equivalent circuit modeling using both ZView and Boukamp's Equivcrt software will be a major part of this training course.

This course is available for in-house training, online and distance learning worldwide. It can also be customized to meet the specific needs of your organization.

## Course Contents

This corrosion short course covers a wide range of testing and monitoring techniques from conventional weight loss coupons, ER and LPR to advanced electrochemical impedance spectroscopy (EIS) for routine applications such as rapid screening of corrosion inhibitors, materials selection, failure analysis, corrosion rate measurement, life prediction, evaluation of paints, coatings, electroplating, on-line monitoring of industrial processes, determination of resistance to pitting and crevice corrosion, and the degree of sensitization of stainless steels and alloys.

1. Fundamental concepts in electrochemistry
2. Fundamentals of Electrochemical Impedance Spectroscopy

3. Equivalent Circuits for Common Corrosion Processes
  - 3.1 General corrosion
  - 3.2 Localised corrosion
  - 3.3 Corrosion inhibitors
  - 3.4 Anodized coatings, chromating, phosphating
  - 3.5 Electrodeposit and electroless plating
  - 3.6 Polymer paints on metals, alloys
  - 3.7 Steels in soils and concrete structures
  - 3.8 Batteries and fuel cells
4. EIS Modeling Software: ZView and Boukamp's Equivcrt
  - 4.1 Overview of EIS modeling software
  - 4.2 Capabilities and functionalities
  - 4.3 Step-by-step guide to the use of Boukamp's Equivcrt
  - 4.4 Step-by-step guide to the use of ZView
  - 4.5 Practical tips on EIS modeling
5. EIS Data Interpretation and Applications
  - 5.1 Corrosion rate measurements
  - 5.2 Evaluation of anodized coatings, chromate/phosphate coatings
  - 5.3 Evaluation, testing, monitoring and life-prediction of paints
  - 5.4 Materials selection
  - 5.5 Corrosion inhibitor screening
  - 5.6 Corrosion testing and monitoring of structures above or under ground
  - 5.7 Corrosion of reinforcing steel in natural rocks, buildings, bridges and other concrete structures

## Who Should Attend

This course is suited for anyone who is interested in EIS or who wishes to gain hands on experience in the use of EIS modeling software, data interpretation and practical applications of EIS.

## Course Lecturer

**Dr. Qiu Jianhai** *BEng PhD CEng MIM FICorr*

Dr Qiu has 25 years industrial, teaching, research and consulting experience in the field of corrosion. He has been working closely with both local and overseas companies and has been an active consultant to governmental agencies, multinational companies and private organizations on corrosion and materials related issues such condition assessment, process optimization, quality control, corrosion testing and monitoring, life predictions, trouble-shooting and corrosion failure analysis. Dr. Qiu is also experienced in providing expert witness and assistance in litigation and arbitration matters related to corrosion and materials. He has authored about 120 technical papers and reports. Dr. Qiu was an invited contributing author to the latest edition of ASM Handbook Vol.13C Corrosion: Environments and Industries. His biographical profile was included in the 7th edition of Marquis Who's Who in Science and Engineering.

Dr. Qiu is a NACE certified Corrosion Specialist (USA) and a Fellow Member of the Institute of Corrosion (UK). He is a Chartered Engineer registered with the Engineering Council (UK), a professional member of the Institute of Materials, Minerals and Mining (UK), and a member of ASM International (USA). He is the Vice Chairman of the Corrosion Association of Singapore, and the Singapore representative in the International Corrosion Council (ICC).