

About the Speakers:

Dr. Nelson Martins (FIEEE)

Assistant to the General Director of CEPEL and Research Consultant on Electrical Power Systems

Dr. Martins received the B.Sc. (1972) Elec. Eng. from Univ. Brasilia, Brazil; M.Sc. (1974) & Ph.D. (1978) degrees from UMIST, Manchester, UK. He works in CEPEL, the Brazilian Electrical Energy Research Center located in Rio de Janeiro, since 1978, developing methods and computer tools for power system analysis and control and as consultant or project manager to various R&D projects and engineering studies.

He was a Member of the Brazilian Ministry for Energy Working Group GCE-103 "The January 21, 2002 Blackout: Analysis of its Causes and Means for Reducing the Impact of Future Disturbances", whose report was published in June 2002. He is the past convener of the CIGRE TF 38.02.16 on "Interaction among Power System Controls" (CIGRE Brochure 166, August 2000), and of the CIGRE TF C4.602 on "Coordinated Voltage Control in Transmission Networks" (CIGRE Brochure 310, February 2007), received the award "Distinguished Member of CIGRE" in 2002. He is the Technical Committee Chairman of the X SEPOPE conference, Florianopolis 2006, and of the XI SEPOPE conference, scheduled for March 2009. He is also the past-chair of the Power System Stability Controls Subcommittee, IEEE-PES Power System Dynamic Performance Committee, for the term July 2003 – July 2007; past-chair of the Small Signal Stability Focus Group, Power System Dynamic Performance Committee; Fellow of the IEEE, in 1998, "for fundamental developments in eigensolution algorithms and small signal stability analysis for the control of large-scale power systems"; member of the IEEE-PES Fellow Committee for the term 2002 – 2004; convener of the ongoing Restoration Dynamics task force, Power System Dynamic Performance Committee. He supervised, in association with renowned professors of Brazilian universities, a total of 10 PhD students and 20 MSc students. He was also one of the recipients of the 2007 CIGRE Technical Committee Award.

Dr Martins published over 160 technical papers, 28 of these in the IEEE Transactions of Power Systems and Power Delivery, and SIAM Journal on Scientific Computation; was a panelist to 35 panel sessions of major international conferences and workshops and lecturer to brief courses on "Advanced Computer Methods for Small Signal Stability Analysis and Control" in Brazil, Chile, USA, Canada, UK, Norway, Sweden, France, Germany, Japan, Finland and Colombia. Publications by Dr. Nelson Martins may be found at: <http://www.nelsonmartins.com/>

Dr. C.Y. Chung (SenMIEEE)

Associate Professor, EE Department, HKPolyU

Dr. Chung received the B.Eng. degree (with first-class honors) and the Ph.D. degree in electrical engineering from The Hong Kong Polytechnic University, Hong Kong, China, in 1995 and 1999, respectively. After his Ph.D. graduation, he worked in Powertech Labs, Inc., Surrey, BC, Canada. His duties include research and development of stability simulation packages, and provision of consultancy services to power utilities. His research interests include power system stability/control, computational intelligence applications, renewable energy and power markets. He has published over 130 journal and conference papers. He is now the Chairman of "Joint Chapter of Power Engineering, Industry Applications, Power Electronics and Industrial Electronics Societies (PES/IAS/PELS/IES), IEEE (Hong Kong)".

A one-day workshop on small signal stability and oscillation damping control

Registration Form

(please copy this form for additional registrations or download it from website <http://www.ee.polyu.edu.hk>)

Delegate details (Please use block letter):

Title: Mr./Mrs./Ms./Dr./Prof./

Surname: _____ First name: _____

Organization: _____

Tel. No.: _____ Fax No.: _____

Email: _____

Postal Address: _____

Registration fee (Please X as appropriate):

- HKIE/IET/IEEE Members
(Membership No.: _____)
- Registered before 10 October: HK\$800/US\$100
- Registered after 10 October: HK\$1,000/US\$130
- Other Participants:
- Registered before 10 October: HK\$1,100/US\$140
- Registered after 10 October: HK\$1,300/US\$170

Registration fee covers a copy of lecture notes, a lunch, and refreshments.

Payment methods (Please X as appropriate):

- Cheque
- Bank draft

(Please return the completed registration form to Ms Canary Tong, Department of Electrical Engineering, The Hong Kong Polytechnic University, Hong Kong, together with a bank draft or a crossed cheque made payable to "The Hong Kong Polytechnic University")

Please also email or fax the completed form to Ms Canary Tong (Email: eccanary@polyu.edu.hk; Fax: 23301544)

Enquiry: Please contact Dr. C.Y. Chung, Tel: 2766 6165, Email: ecychung@polyu.edu.hk



A ONE-DAY WORKSHOP ON SMALL SIGNAL STABILITY AND OSCILLATION DAMPING CONTROL

Speakers: Dr. Nelson Martins and Dr. C.Y. Chung

Date: 7 November 2008 (Friday)

Time: 9:00 am – 5:30 pm

Venue: Room AG712, The Hong Kong Polytechnic University, Hung Hom, Hong Kong



This course is organized by Department of Electrical Engineering, The Hong Kong Polytechnic University

Sponsored by:

CLP Power Hong Kong Ltd.

Hongkong Electric Co. Ltd.

Supported by:

The Hong Kong Institution of Engineers, Electrical Division.

The Institution of Engineering and Technology, Hong Kong

The Joint Chapter of Power Engineering, Industry Applications, Power Electronics and Industrial Electronics Societies, IEEE (Hong Kong).

A ONE-DAY WORKSHOP ON SMALL SIGNAL STABILITY AND OSCILLATION DAMPING CONTROL

The aim of the course is to provide the basic theoretical and practical knowledge on small-signal stability and oscillation damping control of power systems. Poorly damped electromechanical oscillations occur spontaneously following gradual generation/load increases or after sudden system changes such as the tripping of a line. If the damping is not sufficient, the system may end up with a split or a breakdown. In the Nordic power system it is the damping that sets the limits for power transfer in certain power flow situations.

OUTLINE OF THE COURSE

1. Power System Modeling

- Power System Modeling for Stability Analysis
- Linear Model of Synchronous Generator and Controllers
- State Space Modeling of Linear Systems
- Descriptor (Algebraic-Differential) Models

2. Modal Analysis

- Modal Analysis of Power Systems
- Modal Analysis for Control
- Sparse Eigensolution Methods
- Transfer Function Dominant Pole Algorithms

3. Feedback Control Systems

- The Hephron-Phillips Generator Model
- The Torque-Angle and Excitation Control Loops
- Frequency Domain Analysis
- Synchronizing and Damping Torque Concepts-I
- Using Nyquist and Bode Plots for Design
- Pre- and Post-Controllers to Damp Oscillations

4. Alternative Methods for Tuning Power System Stabilizers

- Synchronizing and Damping Torque Concepts-II
- GEP Method (simulations and field tests)
- Frequency Response of Exciter Reference Voltage to Generator Rotor Speed
- Transfer Function Residues (Departure Angle of Root Locus)
- Pole Location Method

5. Adverse Impacts of Stabilizers (PSSs)

- PSS Derived from Terminal Power Signal
- PSS Derived from Rotor Speed Signal
- PSS Derived from Integral of Accelerating Power Signal
- PSS Adverse Impacts on Intra-Plant Modes
- Testing the Robustness of AVR and PSS Designs
- Comparing Field Tests with Simulations

6. FACTS and HVDC Controls with Multiple Functionalities

- The SVC Test System
- The TCSC Test System
- The HVDC Test System

7. Inter-Area Oscillations in Large Power Systems

- Major Oscillation Events
- The Decentralized Control Problem
- Mode Shapes, Participations and Residue Ranking Methods
- Validation Tests for Generator Models with Associated Controls
- Factors that Impact Simulation Results of Inter-area Oscillation

8. Damping Coordinated Tuning of PSSs for Single and Multiple Operating Scenarios

- Problem Statement
- Results for Brazilian System, one scenario
- Results for Brazilian System, 11 scenarios

9. Practical Engineering Studies for Damping Inter-Area Oscillations in Large Systems

- Argentina
- NORDEL
- Brazil (North-South Oscillations and the Existing TCSC Damping Controllers)
- Europe & Eastern USA
- Peru & Mexico
- Small Signal Simulations Validated against Field Tests and Nonlinear Time-Domain

10. Simulators

- Comparing Performance and Robustness of Alternative POD Signals with Multiple Methods, including Nonlinear Time-Domain Simulations

11. Advanced Methods for Enhanced Damping Control Analysis & Synthesis

- Modal Equivalents of SISO Transfer Functions
- Modal Equivalents of MIMO Transfer Functions
- Balanced Model Reduction of MIMO Transfer Functions
- Practical Use of Transfer Function Zeros
- Multi-parameter Root Locus Plots
- Hopf Bifurcation Methods
- System Identification Methods
- Optimal and Robust Control Techniques

12. Sub-Synchronous Resonance

- Problem Statement
- First Benchmark System
- Results and Comparison with PSCAD Simulations
- Other Higher Frequency Phenomena of Interest

13. Recent Results and Ongoing HKPolyU R&D on Coordinated Damping Control Design

- Probabilistic Theory Applications in Eigenvalue Analysis and Damping Control Design
- Advanced Optimization Techniques for Control Coordination