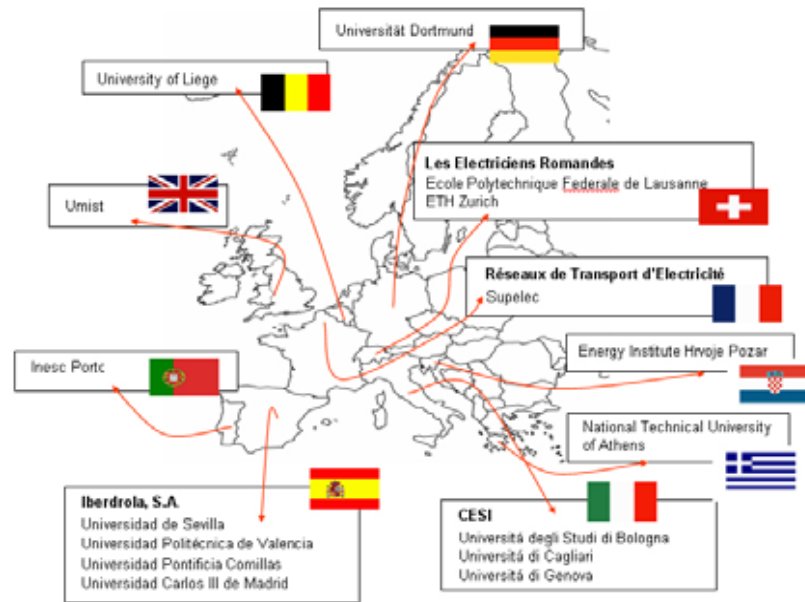


# Courses 2005



## Electric Energy Systems - University Enterprise Training Partnership



Course Program Committee  
Università degli Studi di Bologna  
Dipartimento Ingegneria Elettrica  
Viale Risorgimento 2; 40136 Bologna  
Phone: +39.051.209-3479; fax: +39.051.209-3470  
e-mail: [carloalberto.nucci@unibo.it](mailto:carloalberto.nucci@unibo.it)  
<http://www.eesuetp.unibo.it/>

# Index

|   |         |
|---|---------|
| Introduction.....   | pag. 4  |
| EES-UETP Partnership Composition.....   | pag. 4  |
| Products and Service Description.....   | pag. 5  |
| Title of Courses. Year 2005.....  | pag. 6  |
| Standard Fees.....  | pag. 7  |
| Content of Course.....  | pag. 7  |
| Course 1: Interconnections And Congestion Management<br>In Europe .....   | pag. 7  |
| Course 2: Operation Of Power Systems With Increased<br>Wind Power Penetration .....                                     | pag. 9  |
| Course 3: Integrated Planning Of Power And Natural Gas<br>System .....  | pag. 10 |
| Course 4: Wide Area Monitoring And Control In Power<br>Systems .....  | pag. 12 |
| Course 5: Price Forecasting And Simulation Tools As a<br>Mean For Assessing The Impact Of Market<br>Regulation .....    | pag.    |
| Course 6: Power System Security Assessment and Control<br>in the new Context of Liberalized Electricity<br>Market ..... | pag.    |
| Course 7:   | pag.    |
| Coordinators.....   | pag.    |

## 1 Introduction

The EES-UETP is a consortium created 13 years ago (July 1992) within the frame of the European Union program COMETT, designed to get universities and companies to join forces in achieving continuing education courses and student exchange programs in the field of Electric Energy Systems.

The EES-UETP activities were co-financed by the European COMETT Program up to 1995, when this program came to its end. From then on, the EES-UETP decided to pursue its activities on a self-supporting base, thanks to the annual membership fees from the partners.

The current EES-UETP organization was conceived under a European framework that has experienced important changes during the last few years, mainly because of the electric industry deregulation process.

In this new environment, the first question to discuss is whether the companies are still requiring training. In this sense, the consensus including both the industry and the university partners is affirmative. All of them agreed that the training will continue being a key point for the correct functioning of the utilities in the future. Moreover, training demand could even increase during the following years, as for example due to the life-long training required by professional associations.

Obviously the second question is whether EES-UETP is the valid model to develop such training activities. We believe that the answer is yes: EES-UETP can be an excellent mean for transferring knowledge.

## 2 EES-UETP Partnership Composition

The number of partners has not changed considerably from the creation of the partnership. Nowadays there are **20 partners** (4 companies, **16 universities**) as shown in Fig. A

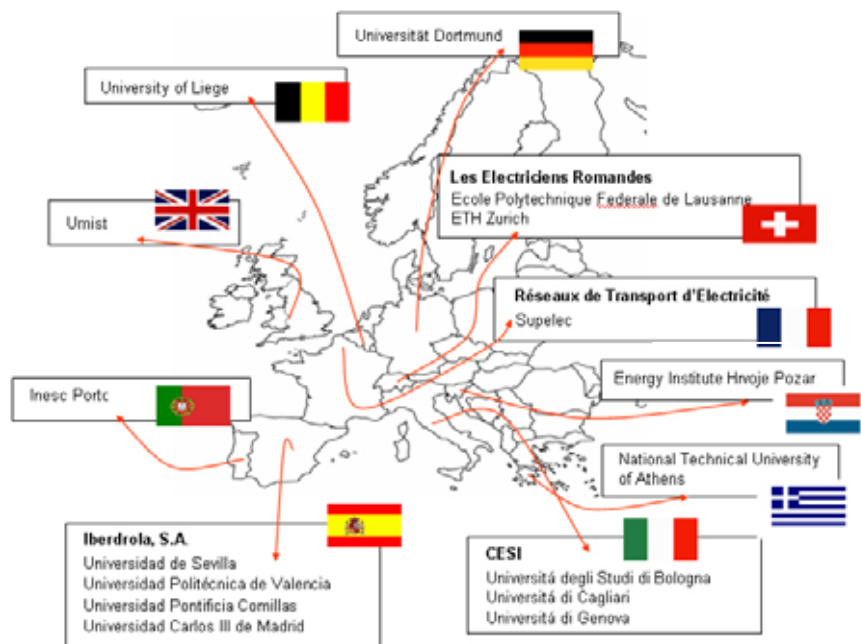


Fig. A

### 3 Products and Services Description

The products that the EES-UETP provides are:

- Annual program of International Courses (for members and/or non-members)
- Advanced consultancy (only for members)
- In-house courses (only for members)
- International meetings and workshops (for members and for non-members)

#### 3.1. Annual program of International courses

The organization of International courses is the key activity of the Network, as they provide the elementary ingredients to reach the EES-UETP objectives: industry-university co-operation, international instructors and audience, high technological contents, etc.

In order to make easier to the partners to send their staff to the courses, it would be possible to repeat some of the most demanded courses at different locations.

#### 3.2 Advanced consultancy

This is a new service that the Network could provide to its partners. In a well performing scenario where the partners are deeply involved and committed, it is possible to take advantage of the Network structure. Therefore, as the Network means information and transfer of knowledge, the EES-UETP can give quick answers to the industry partners requests.

#### 3.3 In-house courses

A new EES-UETP service to meet an increasing demand expressed by some of the existing industrial partners. The main arguments given are:

- 1 In-house courses would allow the host company to send a larger number of attendees without spending time and money for traveling
- 2 In-house courses could be tailor-made in order to fit the particular needs of the company

#### 3.4 International Meetings and Workshops

This is a service that the Network provides to its partners. It basically consists of a forum for the discussion and analysis of the most interesting and current topics. This way, the EES-UETP can offer a new vehicle for accessing to the latest ideas and trends.

### 4 Title of Courses. Year 2005

- Course 1 : Interconnections And Congestion Management In Europe.
- Course 2 : Operation Of Power Systems With Increased Wind Power Penetration.
- Course 3 : Integrated Planning Of Power And Natural Gas System.
- Course 4 : Wide Area Monitoring And Control In Power Systems.
- Course 5 : Price Forecasting And Simulation Tools As a Mean For Assessing The Impact Of Market Regulation.
- Course 6 : Power System Security Assessment and Control in the new Context of Liberalized Electricity Market.
- Course 7 :

## 5 Standard Fees

The EES-UETP activities were co-financed by the European COMETT Program up to 1995, when this program came to its end. From then on, the EES-UETP decided to pursue its activities on a self-supporting base, thanks to the annual membership fees from the partners.

### Companies' Annual Fee

|  |             |
|--|-------------|
| Large Sized Companies (>2.000 Employees)       | 10.000 Euro |
| Medium Sized Companies (>500 <2.000 Employees) | 6.000 Euro  |
| Small Sized Companies (< 500 Employees)        | 4.000 Euro  |

### Universities' Annual Fee

All Universities 1.000 Euro

## 6 Content of Courses

### Course 1: Interconnections And Congestion Management In Europe

|                     |   |
|---------------------|---|
| <u>Organizer:</u>   | Universidad Pontificia Comillas (IIT), Madrid – Spain.  |
| <u>Coordinator:</u> | Prof. Enrique Lobato Miguélez   |
| <u>Objectives:</u>  | <p>The ambitious challenge of the European Union to promote a unique electricity market among European countries has created an intense debate among all the involved parties. The internal opening of the Internal Electricity Market has considerable effects to cross-border exchanges of electricity, increasing the flow patterns. As a consequence, market players are faced with a lack of available capacities, causing congestion and refusal of transmission access. The topic of this course is related to technical and regulation challenges that must be solved in order to assess an adequate and fair management of the limited electricity interconnections between European countries.</p> <p>From a technical point of view, an effective European</p> |

electricity market demands the existence of common rules and standards applied by transmission system operators (TSOs) and the expansion of the existing network to increase transmission capability between countries. From a regulatory point of view, a unique electricity market among European countries should be based on non-discriminatory congestion management procedures on the interconnections setting fair prices for international exchanges.

The first day of the course is devoted to discuss the technical issues that arise within the internal European market. Special emphasis will be put on the following aspects: (a) description of the actual transmission capacities between the European countries, (b) the analysis of the actual principles, technical rules and software used by European TSOs to allocate the limited transmission capacity, and (c) analysis of costs and benefits of the new proposals of network reinforcements between European countries.

The second day of the course will be devoted to regulatory issues of the problem under consideration paying attention to: (a) theoretical background of the existing congestion management procedures, (b) analysis of the advantages and disadvantages of each method applied to the European case, (c) description of the actual methods used by European countries to manage congestions, and (d) current situation and conclusions of the Florence Regulatory Forum.

This course is intended for professionals from electricity generation and transmission companies, energy and electricity regulators, energy service providers and energy retail companies, as well as researchers and consultants in this field.

|                         |  |
|-------------------------|--|
| <u>Course contents:</u> | <ol style="list-style-type: none"><li>1 – Course presentation and congestion management background (Enrique Lobato Miguélez).</li><li>2 – Electricity network capacities and identification of congestions in Europe (Bruno Cova).</li><li>3 – Spanish Experience in congestion management at the interconnections (Marisa Llorens).</li><li>4 – French Experience in congestion management at the</li></ol> |
|-------------------------|--|

- interconnections (Yves Harmand).
- 5 – Visit to Iberdrola energy management center in Madrid.
  - 6 – A theoretical framework for congestion management and transmission pricing (Carlos Vázquez).
  - 7 – Current situation and conclusions within the Florence Regulatory Forum (Alberto Pototschnig).
  - 8 – Regulation of interconnections in The Netherlands (Gijsbert Zwart).
  - 9 – Regulation of interconnections under the Spanish experience (Carlos Solé).
  - 10 – Round table and discussion (Moderator: Enrique Lobato Miguélez).

Date and Place: Two days, from Thursday 5<sup>th</sup> to Friday 6<sup>th</sup> of May 2005. Universidad Pontificia Comillas (IIT). Alberto Aguilera 23 28015, Madrid – Spain.

## **Course 2: Operation Of Power Systems With Increased Wind Power Penetration.**

Organizer: National Technical University of Athens – Greece.

Coordinators: Prof. Nikos Hatziargyriou

Objectives: Global installed wind energy capacity has increased from 2,500 MW in 1992 to over 40,000 MW at the beginning of 2004 at an annual growth rate of nearly 30%. Over 75% of this capacity has been installed in Europe. Characteristic of the wind power growth in Europe is the fact that in 1997, the European Commission had set as a target to see 40,000 MW of capacity to be installed, as late as 2010. Industry estimates now suggest that 75,000 MW will be installed by this time, generating approximately 167 TWh per year.

Penetration levels in electricity production have reached 20% in Denmark, and about 5% in both Germany and Spain. The North-German state of Schleswig Holstein has 1,800 MW of installed capacity, enough to meet 30% of the region's total electricity demand, while in Navarra 50% of consumption is met by wind power. In

Crete, wind power penetration has exceeded instantaneously 40%. It is clear that this level of wind power penetration introduces considerable complexities in the power system operation due to the intermittent nature of wind. Economic Scheduling functions are based on the prediction of demand that has to be satisfied and the additional uncertainty in available generation capacity creates obvious difficulties with direct economic effects. This calls for new techniques in scheduling power system operation, i.e. unit commitment and economic dispatch need to be revisited. Reliability evaluation and on-line dynamic security assessment become even more important. Intermittency makes participation of wind power in open markets a challenging problem. Finally, the economic evaluation of wind power needs to be assessed.

In this course the following issues will be addressed: Overview of Wind Power in Europe, Wind Power Forecasting, Dynamic Security, Unit Commitment and Economic Dispatch, Reliability, Connection Issues, Dynamic Analysis, Utility Experience, Effects on Economic Operation.

Course contents:

- 1 – Wind Energy Development in Europe: Achievements and prospects (Arthuros Zervos).
- 2 – Power System Operation with Large Wind Power Penetration – Danish experience (John Eli Nielsen).
- 3 – Operating Island Systems with Large Wind Power Penetration - Crete experience (John Stefanakis).
- 4 – Management of Intermittency (Goran Strbac).
- 5 – Wind Power Reliability (Evangelos Dialynas).
- 6 – Contribution of Wind to Network Security (Goran Strbac).
- 7 – Managing Wind with Storage (Joao Abel Pecos Lopes).
- 8 – Wind Power Forecasting (George Kariniotakis).
- 9 – Modelling, Control and Stability Analysis (Costas Vournas).
- 10 – Grid Interconnection – Overview of Technical and Protection Requirements (Stavros

Papathanassiou).

11 – Functions of the MORE CARE Control System (Nikos Hatzigiorgiou).

12 – Final Discussion and closing session.

Date and Place: Three days, from Monday 16<sup>th</sup> to Wednesday 18<sup>th</sup> May 2005. National Technical University of Athens – Greece.

### **Course 3: Integrated Planning Of Power And Natural Gas System**

Organizer: Energy Institute Hrvoje Požar, Zagreb - Croatia

Coordinators: Dr. Goran Granić

Objectives: In the past several years we are witnessing of development of different models and tools for energy system planning with the growing demand for their integration. Last practices of partial and interconnected procedure of individual planning of natural gas and power system is possible and applicable, but there is a need for rather composite procedure. In order to make this procedure more easy and also to incorporate the rest of the energy system together with the rest of economy, the integrated models becomes a reasonable solution. The application of integrated procedure is not limited on the state level, but also on interstate level or at global level in the form of multiregion case. The role of regulators in such integrated framework is important, because of inter relations between power and gas system. In the sense of new EU directives development related with progress of electric energy and natural gas markets, integrated approach can answer better to many questions that might become actual.

Course contents:

- 1 – Methods and models for long term energy system planning on global level (Gary Goldstein & Denise Van Regemorter)
- 2 – Integrated planning of power transmission network and transport natural gas network on interstate level (Gary Goldstein & Denise Van Regemorter)
- 3 – Integrated planning of power transmission network and transport natural gas network on state level

(Mladen Zeljko).

4 – Integrated planning of power distribution network and distribution natural gas network on state level – practices in Croatia (Damir Pešut).

5 – The role of regulators in common planning of power and natural gas system development (Thomas Gomez San Roman).

6 – Possible directions of legislatures development in EU related with progress of common electric energy and natural gas markets (Alejandro Alonso).

Date and Place: Two days, from Monday 30<sup>th</sup> to Tuesday 31<sup>st</sup> of May 2005. Energy Institute Hrvoje Požar, Savska cesta 163, Zagreb - Croatia.

### **Course 4: Wide Area Monitoring And Control In Power Systems.**

Organizer: Swiss Federal Institute of Technology (ETH), Zürich – Swiss.

Coordinator: Prof. Göran Andersson

Objectives: The introduction of Phasor Measurements Units (PMUs) based on GPS technology has made it possible to make synchronized measurements of important power systems quantities. This can be used to get better and more reliable information about the operating status of the power system in real time. A number of systems based on these technological developments has already been implemented and with the increasing loading of vast continental power systems the importance of these new systems will be more apparent and further installations are foreseen. A variety of completely new applications in real-time control and special protection schemes will be possible by using PMU measurements. A commonly used name for these applications is Wide Area Monitoring and Control (WAMC). The objective of this course is to give an overview of the possibilities and limitations offered by the PMU technology. Furthermore, the integration of PMU measurements in the existing control systems will be discussed and future applications of the technology. The course will also provide information about and

experiences from existing WAMC systems. Current research in the field will be presented.

Course contents:

- 1 – Synchronised Phasor Measurements and Their Use in Power Systems (A. Phadke).
- 2 – Systems for WAMC (J. Bertsch, M. Zima).
- 3 – Applications of WAMC in Western USA (C. Taylor)
- 4 – Applications of WAMC in Europe (W. Sattinger).
- 5 – Current Research in WAMC (G. Andersson, M. Zima).

Date and Place: Three days, from Tuesday 30<sup>th</sup> August to Thursday 1<sup>st</sup> September 2005. Swiss Federal Institute of Technology (ETH) Zürich - Switzerland.

### **Course 5: Price Forecasting And Simulation Tools As a Mean For Assessing The Impact Of Market Regulation.**

Organizer: CESI S.p.A., Milano - Italy.

Coordinator: Dr. Gianluigi Migliavacca

Objectives: The West-European energy scenario has seen a fast evolution in the last years. The vertically integrated state-owned companies have been unbundled. Transmission network management has retained its original monopoly nature but has been assigned to independent operators in every Country, while competition has developed in generation and distribution, also in consequence of the sale to private investors of portions of the old generation park.

Unbundling has been then followed in many countries by the development of competitive energy markets and of the power-exchange organizations in charge to manage competitive sale of energy. New problems have arisen (e.g. exploitation of market power by incumbent producers and uncertainty on future revenue due to price volatility) that required constant intervention of the regulatory Authorities in order to maintain conditions of level play field among the participants while ensuring an adequate level of hedging from price volatility.

Beyond the national perspective, the growth of interest

for the international exchanges of energy, the so-called “cross-border trade”, has generated in the last years the necessity to regulate competition among the EU countries. Hence the European directive 1228/03. The sensibility to the necessity to develop a common Europe-wide Internal Energy Market has become stronger. The Florence Regulatory Forum has been created to discuss a common perspective in the Electricity field. The path towards a progressive tightening of the bounds between the European markets has been traced by the strategy paper on mid-term strategy of the EC.

A similar process of integration is now being implemented in the Energy Community of South East Europe, where a CBT mechanism has been introduced, coordinated auction of interconnection capacity are currently experimented and there is an already outlined Standard Market Design proposal for a future regional electricity market.

In this fast changing framework, that risks to generate uncertainties and frustration, simulation tools have an important role to play in order to assess the mid term and long term impact of possible regulatory changing.

A noteworthy research field that has seen in the last years a constantly growing interest from the academic world is the utilization of the so-called “games theory” to study market equilibrium in presence of complex regulatory frameworks.

The course is aimed at clarifying the most important ideas concerning games theory applied to electricity market simulation. To provide a more concrete view, two real simulators based on games theory will be treated in detail and hand-on sessions will allow to make the course participants aware of the complexity of the simulation studies that can be carried out with reference to real markets.

- Course contents:
- 1 – Evolution perspectives of the electricity markets belonging to the Internal Electricity Market (IEM) of the European Union and the countries belonging to the Energy Community of South-East Europe area (ECSEE). Focus is particularly on the Mediterranean countries (Migliavacca, Coulondre, Capros).
  - 2 – Necessities to harmonize the market rules both for the countries belonging to the IEM area and for those included in the ECSEE, in order to facilitate integration and provide a level playing field for competition (Coulondre, Capros, Tambone).
  - 3 – Key role of simulation tools in price forecasting and, in particular, for assessing the impact of envisaged regulatory provisions on the bidding strategies of those players that have market power in the mid and long-term (Migliavacca, Beccarello).
  - 4 – Classification of market simulators in dependence from the kind of investigations they are employed for (Migliavacca).
  - 5 – Market simulation models using concepts of game theory: a theoretic overview will be followed by the detailed description of two simulators, illustrating also their different scope (Migliavacca, Bompard, Barquin).
  - 6 – Hands-on sessions for the two simulators described in detail, allowing the participants to catch an idea of their features and potentialities. The examples will use data from specific national markets, but the flexibility features will be highlighted allowing an easy adaptation to different regulatory context (Bompard, Barquin).

Date and Place: Three days, from Monday 19<sup>th</sup> to Wednesday 21<sup>st</sup> of September 2005. CESI S.p.A., via Rubattino, 54, 20134, Milano - Italy.

**Course 6: Power System Security Assessment and Control in the new Context of Liberalized Electricity Market.**

Organizer: Electrical Engineering Department, University of Genova – Italy.

Coordinator: Prof. Stefano Massucco  
in cooperation with Prof. Thierry Van Cutsem and Louis Wehenkel

Objectives: Power systems have traditionally been operated based on a background of previously performed studies and on the experience of dispatcher operators. Such practice usually leads to conservative limits and cannot often comply with market requirements to fully exploit power system equipment, plants and facilities and with transparency criteria in case of conflictual decisions imposed by regulating bodies. On the other hand, the operator may have to face new operating conditions brought about by the restructured power market and may lack adequate experience to operate the system, the current trend being to operate power systems closer and closer to their limits. This results in increased risks of instability, both of the transient and of the voltage type. These considerations emphasise the need for accurate evaluation of security, performed on different phases of power system operation and in particular made available to the control room operator for on-line assessment and preventive action implementation. The tremendous advances in computer science and technologies have permitted significant application of methodologies concerning Dynamic Security Assessment (DSA) that have been developed in the last decades and that have recently found the technical support and environment for on-line applications. In the DSA context, a research project partially supported by the European Union within the aims of the Framework V- Energy scheme and named OMASES – Open Market Access and Security Assessment System has produced interesting results. OMASES developed an integrated DSA tool that attempts to cope with the above mentioned challenging requirements. The course focuses on DSA functions like Transient Stability Assessment (TSA), Voltage Stability Assessment, Training Simulator. An overview and a

detailed though synthetic presentation of analytical methods, technologies and experimentations are presented. The aim is to generate a basic although comprehensive knowledge of security assessment and control problems for potential attendees that are typically PhD students, researchers, junior transmission system operators.

- Course contents:
- 1 – New trends and perspectives in research funding for Large Power Systems Operation and Security (invited speaker, EU).
  - 2 – Power System Operation and Control: current problems and perspectives (Stefano Massucco, University of Genova).
  - 3 – The electricity market: an overview of structure and new constraints to power system operation (Massimo Gallanti, CESI).
  - 4 – EMS - Energy Management Centers: actual situation and possibilities offered by emerging technologies (Rafael Lopez, Areva).
  - 5 – Transient Security Assessment and Control: methodologies and tools for preventive and emergency control (Mania Pavella, Louis Wehenkel, University of Liege).
  - 6 – Voltage Stability Assessment: methodologies and tools (Thierry Van Cutsem, University of Liege; Costas Vournas, Technical University of Athens).
  - 7 – Dynamic Security Assessment in EMS environment: the Italian situation for normal and emergency operation (Marino Sforza, GRTN).
  - 8 – Power System Simulators: models and tools for analysis and for training (Massimo Pozzi, CESI; Marc Stubbe, Tractebel).
  - 9 – Example of DSA analysis (Thierry Van Cutsem, Louis Wehenkel, University of Liege).
  - 10 – Conclusion and comments

Date and Place: Two and half days, from Monday 21<sup>st</sup> to Wednesday 23<sup>rd</sup> November at Electrical Engineering Department, University of Genova, via Opera Pia 11a, 16145 Genova – Italy.

## Course 7: Grounding Analysis and Techniques: from Industrial to High Frequencies and Lightning

- Organizer: EPFL, University of Cagliari  
Coordinator: Dr. Fabrizio Pilo, Dr. Farhad Rachidi  
Objectives: Guidelines for the design of grounding systems are usually based on their low frequency resistances. This is essentially because such resistances to ground may be easily measured or estimated analytically. However, recent studies have shown the importance of better understanding of the high frequency behaviour of such groundings. And therefore, the modelling of grounding systems and possibility of their optimization for high frequencies and transients is attracting a great deal of interest among engineers. Such interest stems from a number of actual problems, such as radio base stations in HV towers, lightning protection of wind turbines, power quality, but also from problems of longer-term interest, some of which are: EMC in power plants and substations, transients in complex grounding systems consisting of different conductors such as: cables, pipes, etc., and especially lightning protection of the power and communication systems, buildings and critical installations.
- The course is aimed at providing
- a) state-of-the art knowledge of the modelling of grounding systems, from industrial frequencies to high frequencies (about 10 MHz);
  - b) practical indications, simplified models and equations, based on the theory presented in a), and software methods, useful for solving grounding problems;
  - c) review of grounding techniques for EMC protection of cabling and wiring and lightning protection of buildings;
  - d) impact of grounding systems on lightning protection of power systems.
- The course will comprise, in addition to above, half a day of workshop on computer simulations of grounding systems.

- Course contents:
- 1 – Overview the Grounding Techniques at Industrial Frequencies (J. Hoeffelman).
  - 2 – Characteristics of Lightning Relevant for Analysis of Grounding Systems (F. Rachidi).
  - 3 – Modelling of Grounding Systems for High Frequencies and Transients: Simple Grounding Arrangements (L. Grcev).
  - 4 – Modelling of Grounding Systems for High Frequencies and Transients: Complex Grounding (L. Grcev).
  - 5 – Grounding Techniques for EMC Protection of Cabling and Wiring (A. Van Deursen).
  - 6 – Grounding and Lightning Protection in Power Systems (C.A. Nucci, F. Pilo).
  - 7 – Grounding and Bonding in Buildings for Protection against Lightning Effects (E. Montandon).
  - 8 – Grounding Systems Measurements at High Frequencies (P. Zweiacker).
- Computer simulations and workshop (L. Grcev).

Date and Place: University of Cagliari, date: to be defined

## 7 Coordinators

### **Prof. Enrique Lobato Miguélez**

Universidad Pontificia Comillas (IIT), Madrid – Spain  
Tel.  
Fax  
enrique.lobato@iit.upco.es



Enrique Lobato Miguélez is a professor of Electrical Engineering at the Engineering School of Universidad Pontificia Comillas (UPCo) in Madrid, Spain and he is a consultant on the electricity field at Instituto de Investigación Tecnológica (IIT) at the same university. His areas of interest include analysis, planning, operation and economics in electric power systems. He has participated in several research projects for different firms related with

the energy industry in collaboration with Spanish, Latinoamerican and European utilities. He has a wide experience in congestion management issues, having developed the mathematical algorithms used by Spanish TSO to solve Spanish power system constraints and is member of CIGRE Working-Group C1-2: “Maintenance of Acceptable Reliability in an Uncertain Environment by the Timely Provision of Network Capacity and Management of Constraints”.

### **Prof. Nikos Hatziargyriou**

National Technical University of Athens – Greece.  
Tel.

### **Dr. Goran Granić**

Energy Institute Hrvoje Požar, Zagreb - Croatia  
Tel. +385 1 6326 144  
Fax. +385 1 6040 599  
ggranic@eihp.hr



Goran Granić was born in Baška Voda in 1950. He graduated in Faculty of Electrical Engineering at the University of Zagreb in 1972, where he received the M.Sc. degree and Ph.D. degree in electrical engineering, in 1976 and 1979 respectively. From 1973 to 1987 he was the Head of research team and leader of feasibility study units in Institute of Electric Power Industry and Development Manager and member of Development Management Board in Community of Electric Power Industry Organisations of Croatia from 1987 to 1990. From 1990 to January 1991 he was CEO of Croatian Power Utility, an advisor in Institute for Electric Power Research from 1991 to 1992, President of the Parliamentary Committee for Zoning and Environmental Protection from 1992 to 1995. In 1996 he had position of Lord Mayor in Zagreb City Hall, advisor for energy issues in Prime Minister’s cabinet from

1997 to 1999 and Vice-president of Croatian Government from 2000 to 2003. From 1994 to 1999 he had the position of General Manager in Energy Institute Hrvoje Požar. From January 2004 to present he is a Director of Energy Institute Hrvoje Požar.

His research interests concern operation planning of both energy and electric energy systems, power system construction planning and scheduling, energy sector organization and management, energy supply cost calculation and the creation of energy cost policy and implementation of new technologies for electric power production.

He is a chairperson of the Croatian Energy Society – WEC National Committee and member of the Studies Committee of WEC, member of the Croatian Academy of Engineering and of the Technical Advisory Body of Croatian Academy of Sciences and Arts.

#### **Prof. Göran Andersson**

Swiss Federal Institute of Technology (ETH),  
Zürich – Swiss.  
Tel.  
andersson@eeh.ee.ethz.ch



G. Andersson (M'86-SM'91-F'97) received his M.S. and Ph.D. degrees from the University of Lund, Sweden, in 1975 and 1980, respectively. In 1980 he joined ASEA's HVDC division and in 1986 he was appointed professor in Electric Power Systems at the Royal Institute of Technology, Stockholm, Sweden. In April 2000, he was appointed to his current position as a professor at the Power Systems Laboratory at the Swiss Federal Institute of Technology, Zurich, Switzerland. His research interests are in power system analysis and control. He is a member of the Royal Swedish Academy of Engineering Sciences and Royal Swedish Academy of Sciences.

#### **Dr. Gianluigi Migliavacca**

CESI, Milan - Italy  
Tel. +39-02-2125-5489  
Fax +39-02-2125-5843  
migliavacca@cesi.it



Gianluigi Migliavacca was born in 1965, received his degree in Electronic Engineering from the Politechnic University of Milan in 1991. In 1994 he was engaged in the Automation Research Center of ENEL where he has been responsible of research activities in the field of mathematical modeling and numerical methods for the dynamic simulation of thermal power plants. In 2000 he joined CESI in Milan where he works, now, on methodologies and studies on issues regarding energy markets and cross border trade. During the year 2003 he gave a significant contribution to a study on the implementation of locational signals in the frame of the evolution of the Internal Electricity Market of the European Community, carried out on behalf of EURELECTRIC. At present he is also involved in a consultancy to the Italian Energy and Gas Regulatory Authority about the so called Athens process, aiming at setting up a common competitive market for energy and gas in all the Countries of South East Europe.

At the same time he is also acting as a consultant for the Italian Energy and Gas Regulatory Authority about the issues regarding Cross Border Trade and congestion management issues in multi-national energy markets.

He is also member of the technical committee power plants and power systems of IFAC and involved in the evaluation process of the papers presented both to the IFAC World Congresses and to the Power Plants and Power systems Symposia.

#### **Prof. Stefano Massucco**

Electrical Engineering Department  
University of Genova  
Tel. +39-010-3532-718  
Fax +39-010-3532-700  
massucco@epsl.die.unige.it



Stefano Massucco has been active for 25 years in the field of large and industrial power system management and control. The experience he gained both at University and at the industry (Enel Electric Research Center and Ansaldo S.p.A.) has dealt with modelling and control of production,

transmission and distribution systems, power system stability and dynamic security evaluation by the operator in network control centers and industrial plant control rooms. He covered issues regarding power system automation by means of such innovative techniques as artificial intelligence, development of models for turbogas and combined-cycle generating units, load shedding strategies to face emergency conditions in power systems. Over the last years he has dealt with liberalized energy market, definition of ancillary service technical and economical features, role of load in power system security and economics. Prof. Massucco is involved, also as a promoter, in research and development projects financed by European Union, MIUR, CESI, private companies. He participated in CIGRE and IEEE workgroups and task forces. He is a member of AEI, IEEE, CEI 11 D Committee for the definition of power plants-network interface.

Prof. Massucco is author of several scientific publications in power systems. He is official referee for IEEE Transaction on Power Systems, on Energy Conversion, on Automatic Control and of IEE Proceedings on Generation Transmission and Distribution. He is a member of the Scientific Committees of a number of International Symposia and Session chairman.

He is Full Professor of Power System Automation at the University of Genoa and coordinator of PhD courses in Electrical Engineering.

**Prof. Fabrizio Pilo**

Dept. of Electrical and Electronic Engineering  
(*DIEE*), University of Cagliari, Italy  
Tel. +39-70-675-5883  
pilo@diee.unica.it



Fabrizio Pilo is Associate Professor of Electrical Power Systems at the Department of Electrical and Electronic Engineering (*DIEE*) of the University of Cagliari since November 2001. He was born in Sassari, Italy, 1966. He graduated in Electrical Engineering at the University of Cagliari in 1992 (*magna cum laude*), and since then he has been a research collaborator of the Power System Group in the same University. In 1996 he became Assistant Professor at the *DIEE*. In 1998 he earned the Ph.D. degree from the University of Pisa. He has been responsible for several research contracts in the field of Power Distribution Optimization funded by CESI, ENEL, MIUR, and by the Sardinian Regional Government. He is member of the IEEE and AEIT, and Special Reporter of the CIRED Technical Committee. He is author of more than 60 papers published on international journals or presented in various national and international conferences. Current research interests are in the field of distribution planning and optimization, distributed generation, power quality and AI applications in Power Systems.

**Dr. Farhad Rachidi**

Swiss Federal Institute of Technology  
Power Systems Laboratory  
Lausanne, Switzerland  
Tel. +41-21-693-2620  
Fax +41-21-693-4662  
farhad.rachidi@epfl.ch



Farhad Rachidi was born in Geneva in 1962. He received the M.S. degree in electrical engineering and the Ph.D. degree from the Swiss Federal Institute of Technology, Lausanne, in 1986 and 1991 respectively. He worked at the Power Systems Laboratory of the same institute until 1996. In 1997, he joined the Lightning Research Laboratory of the University of Toronto in Canada and from April 1998 until September 1999, he was with Montena EMC in Switzerland. He is currently *Maitre d'Enseignement et de Recherche* and head of the EMC group at the Swiss Federal Institute of Technology, Lausanne, Switzerland. His research interests concern EMC, lightning electromagnetics and electromagnetic field interactions with transmission lines. He is a member of various IEEE, CIGRE and CIRED working groups dealing with lightning electromagnetic effects. He is the convener of the Joint CIGRE-CIRED Working Group on Protection of MV and LV Lines against Lightning, and is member of the scientific committee of various International Conferences in EMC/lightning. Farhad Rachidi is author or co-author of more than 100 scientific papers published in reviewed journals and presented at international conferences.