Remus Teodorescu received the Dipl.Ing. degree in electrical engineering from Polytechnical University of Bucharest, Romania in 1989, and PhD. degree in power electronics from University of Galati, Romania, in 1994. In 1998, he joined Aalborg University, Department of Energy Technology, power electronics section where he currently works as a professor He has more than 180 papers published, 1 book (''Grid Converters for Photovoltaic and Wind Power Systems'', ISBN-10: 0-470-05751-3 – Wiley) and 4 patents. He is an IEEE Fellow Member, Past Associate Editor for IEEE Trans on Power Electronics and chair of IEEE Danish joint IES/PELS/IAS chapter.
He is the founder and coordinator of the Green Power Laboratory at Aalborg University focusing on the development and testing of grid converters for renewable energy systems. He is the coordinator of Vestas Power Program, involving 10 PhD students and guest professors in the areas of power electronics, power systems and energy storage. His areas of interests are: design and control of power converters used in photovoltaics and wind power systems, grid integration with wind power, medium-voltage converters, HVDC/FACTS, energy storage energy systems.

Josep M. Guerrero received the B.S. degree in telecommunications engineering, the M.S. degree in electronics engineering, and the Ph.D. degree in power electronics, in 1997, 2000, and 2003, from the Technical University of Catalonia, Barcelona, Spain. He is an Associate Professor at the same university, where he teaches courses on digital signal processing, control theory, and renewable energy systems. Since 2011, he has been a Full Professor on MicroGrids at the Department of Energy Technology, Aalborg University. His research interests include distributed and hierarchical control of AC and DC MicroGrids.
Dr. Guerrero is an Associate Editor of the IEEE Transactions on Industrial Electronics, the IEEE TRANSACTIONS ON POWER ELECTRONICS, and the IEEE Industrial Electronics Magazine. He is the Guest Editor-in-Chief of the IEEE TRANSACTIONS ON POWER ELECTRONICS for the Special Issue: "Power Electronics for Microgrids". Currently, he chairs the IEEE Industrial Electronics Society Technical Committee on Renewable Energy Systems.

Tamas Kerekes obtained his Electrical Engineer diploma in 2002 from Technical University of Cluj, Romania, with specialization in Electric Drives and Robots. He received his MSc and PhD degree in 2005 and 2009, at Aalborg University. Currently he is working as an Assistant Professor at the same Department. His main interest is on PV inverter modelling, control and topologies as well as modulation techniques with focus on transformerless PV inverter systems.

Juan C. Vasquez received the B.S. degree in Electronics Engineering from Autonoma University of Manizales, Colombia in 2004 where he has been teaching courses on digital circuits, servo systems and flexible manufacturing systems. He received the PhD degree from the Technical University of Catalonia, Barcelona, Spain in 2009, where he taught courses on renewable energy systems. Currently he is working as Assistant Professor at Aalborg University, Department of Energy Technology. His research interests include modelling, simulation, and power management applied to Distributed Generation in Microgrids.

Fee

4000 DKK for PhD students/Academics outside of Denmark and 1500 DKK for PhD students in Denmark, who is not from AAU. 6.000 DKK for the Industry. If you also take the course DC MicroGrids and SuperGrids in the spring, there will be a discount. The prices for both courses will then be 6000 DKK for PhD students Academics outside of Denmark and 2000 DKK for PhD students in Denmark, who is not from AAU. 9.000 DKK for the Industry. The fee includes coffee, lunch for all days and copy of slides and simulation models on a USB key.

Industrial/PhD course on AC Microgrids in Theory and Practice

AC Microgrids

Industrial/Ph.D. Course in

AC MicroGrids

– in theory and practice

June 18 – June 20 2012

AALBORG UNIVERSITY

Department of Energy Technology
Aalborg, Denmark

Background of the course

Worldwide electrical grids are expecting to become smarter in the next future. In this sense, the increasing interest in intelligent and flexible microgrids able to operate in island or connected to the grid, which will be a keypoint to cope with new functionalities, as well as integration of renewable energy resources.

A microgrid can be defined as a part of the grid with elements of prime energy movers, power electronics converters, distributed energy storage systems and local loads, that can operate autonomously but also interacting with main grid. The functionalities expected for these small grids are: black start operation, frequency and voltage stability, active and reactive power flow control, active power filter capabilities, and storage energy management. This way, the energy can be generated and stored near the consumption points, increasing the reliability and reducing the losses produced by the large power lines.

The course starts giving some examples of microgrid in the world. The course is mainly focused on three-phase voltage source inverters. The modeling and control of these power electronics converters is presented. Concepts like frequency and voltage droop control are explained in detail, as well as the virtual impedance concept.

This course also introduces the study of the hierarchical control of AC Microgrids. Secondary control issues are introduced to regulate frequency and amplitude voltage of the microgrid. Finally, tertiary control issues, synchronization and grid interactivity between the grid and the microgrid are analyzed. Finally, voltage unbalance and harmonic compensation by using decentralized controllers is also presented.

No less than 60% of the course time will be spent in the lab

Keep yourselves updated at www.et.aau.dk

Course Program

Day 1, 08.30-16.30

L1	Microgrids Systems Overview
L2	Distributed Energy Storage Systems
L3	Control of Voltage Source Inverters (VSI) for MicroGrids
Lab I	Design of Control Inner Loops for VSI
Lab II	Experimental Evaluation of a Stand-alone VSI with Voltage Control
	Visit to Aalborg University MicroGrid

Day 2, 08.30-16.30

L4	Distributed Uninterruptible Power Systems
L5	Droop Control and Virtual Impedance Concept
L6	Hierarchical and Distributed Control in MicroGrids
Lab III	Design of Droop Control and Virtual Impedance
Lab IV	Experimental Evaluation of Grid-Interactive VSI with Droop Control
Lab V	Experimental Evaluation of an Islanded MicroGrid with Secondary Control

Day 3, 08.30-16.30

L7	Power Quality in MicroGrids
L8	Hierarchical and Distributed Control for Power Quality in MicroGrids
Lab VI	Design of Power Quality Primary Control for a MicroGrid
Lab VII	Experimental Evaluation of Primary Control for Power Quality Compensation
Lab VIII	Experimental Evaluation of Secondary Control for Power Quality Compensation

Lecturers

Remus Teodorescu, Professor, Aalborg University, Denmark, ret@et.aau.dk

Josep M. Guerrero, Professor, Aalborg Univeristy, Denmark, joz@et.aau.dk

Tamas Kerekes, Assistant Professor Aalborg University, Denmark, tak@et.aau.dk

Juan C. Vasquez, Assistant Professor, Aalborg University, Denmark, juq@et.aau.dk

Course Location

Aalborg University,
Department of Energy Technology
Pontoppidanstraede 101, Room 23
DK-9220 Aalborg East, Denmark

Accommodation and transport

For hotel, transport information and booking please check: www.et.aau.dk/phd/phd-courses

Credits 3.0 ECTS

Prerequisites

In order to be able to perform the exercises, the course participants should bring their notebooks with Matlab pre-installed (in case that it is not possible, some computers will be available).

Further information

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Registration

Please fill out the registration form available at:
http://phdcourse.aau.dk/index.php?list=29586

Registration closed on **June 6th, 2012**.