Title: Control of Grid Connected Photovoltaic and Wind-Turbine Systems / Kontrol af nettilsluttede solcelle-og vindmøllesystemer

ECTS credits:
5

Prerequisites: Power electronics for single- and three-phase systems, PWM theory, basics of control design

Relevant for:
PED, WPS, EPSH, MCE, OES

Objective:
Students who complete the module should have the following knowledge, skills and competence:

Knowledge

- Understand the operation principle of most common PV and WT systems
- Have knowledge about the most important single- and three-phase inverter topologies, used in renewable energy systems
- Have knowledge of the various pulse width modulation (PWM) techniques used with different inverter topologies
- Understand maximum power point trackers
- Have knowledge about different phase-lock loop (PLL) and control methods, current, voltage and power loops used in control schemes of grid connected inverters
- Have knowledge about grid requirements, standards describing anti-islanding methods, THD limits, etc. that grid connected inverters must comply with

Skills

- Be able to implement different PWM strategies for single- and three-phase converters
- Be able to verify different PLL methods based on laboratory experiments
- Be able to design/tune a control scheme for a grid connected converter

Competence

- Be able to create mathematical models for PV cells, panels and arrays
- Be able to develop simulation models for different PV and WT converters
- Be able to implement a grid connected converter control
- Understand the purpose and methods for grid support by renewable systems.

Type of instruction:
The course will be planned and organized in close interaction with on-going research and development activities at the Department of Energy Technology and its collaborators. Project topics are accounted for when determining the course content. Guest lecturers will also be involved if this is relevant to the course aims.
All modules include exercises focusing on the presented material. Some of the exercises will be done using Matlab and Simulink. Several exercises will be performed in the GPL using experimental setups, like current control for a grid connected converter using dSPACE 1103. This way the participants will get a hands-on experience will real-life systems.

Examination format:
Each student should submit all the laboratory exercises in the form of a report. The individual oral examination will be based on the submitted report and will be held in accordance with the rules in the Examination Policies and Procedures, Addendum to the Framework Provision at Faculty of Engineering and Science, Aalborg University

Evaluation criteria:
As stated in the Framework Provisions