Renewable Energy Online
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Grid Integration of Renewable Energy

Modulbeschreibung

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GEFÖRDERT VOM
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School of Mathematics and Science, Institute of Physics,

Module: Grid Integration of Renewable Energy

This module is associated to the following degrees
Master > Renewable Energy Online> Specialisation Module

Abstract:

After successful completion of the course, students will understand the existing structures and technical fundamentals of energy systems for the generation, transmission and distribution of electrical energy and their interaction and dependencies. They should develop an understanding of the necessary information and control technology components and processes for the management and operation of electrical energy systems, and can assess and evaluate problems and challenges, in particular for information and communication technologies (ICT) and for computer science through the expansion and integration of unpredictably fluctuating decentralized producers into the existing system.

Duration:	1 semester	Teaching form:	Theoretical – practical seminar. e-learning.
Cycle:	Winter semester	Language:	English
Type of module:	Elective	Attainable credit points:	6 ECTS
Level:	MM (master module)	Workload:	180 hours
Pre-requisites:		Max. No. of students:	30 students

Lecturer(s):	Mentor(s):
Designer(s) of the module: Sebastian Lehnhoff	Examiner(s):

Objective of the module /learning outcomes:

After successful completion of the module students should be able to:

- assess the influence of distributed control concepts
- assess algorithms for distributed generators and consumers in the so-called smart grids on the operation of electrical energy systems
- analyse them with regard to operational safety, reliability, real-time capability and flexibility.

Content of the module:

- Organization of the European energy market (regulatory framework, responsibilities in the liberalized electrical energy system)
- Design and operation of electrical power supply networks (grid topologies, utility, network usage, supply quality / system services, incidents and protection systems)
- Grid calculation (complex pointer representation, active / reactive power, mathematical power models / network models, illustrations: node power for node voltages / currents, calculation of line currents, power flow calculation, fixed pointiteration method, Newton- Raphson method, voltage drop)
- Intelligent network management (smart grids), aggregation forms, approaches to machine learning

Forms of learning:

The learning process will be predominantly based on reading material (self-learning). Practical exercises are designed to complement the knowledge of each chapter of the module.

Of course, the aim of the developers and lecturers of this module is to have constant contact with the students, in order to address any type of difficulties. This is the reason why online discussion Webinars and forums are going to be available for active discussions. Furthermore, the students can contact the staff directly, in order to have personal guidance.

Helpful previous knowledge:

Web link:

Associated module(s)

- Renewable Energy Basics

Comments:

Requirements for awarding the credit points

Presentation of the solutions of the calculation exercises and tasks in due time. Each set of tasks will be graded. The average of the grades obtained during its duration will be calculated, giving the final grade.

Examination periods:

Tasks corresponding to each chapter will be given to the students. The tasks are designed to be solved in 2 weeks' time frame. Deadlines to deliver the tasks will be at the end of each month.

Useful literature:

- Konstantin, P.; Praxisbuch Energiewirtschaft, Springer 2006
- Schwab, A.; Elektroenergiesysteme, Springer 2009
- Kirtley, J.L.; Electric Power Principles, John Wiley & Sons, 2010
- Gremmel, H.; ABB Schaltanlagen-handbuch, Cornelsen 2007
- Lehnhoff, S.: Dezentrales vernetztes Energiemanagement, 2010
- Sutton, R.S.; Barto, A.G.: Reinforcement Learning, MIT Press 1998

Registration procedure:

C3LLO

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