Technology
Arts Sciences
TH Köln

Course Manual LSPW

Power Electronics for PV and Wind

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– General information

Long name	Power Electronics for PV and Wind
Approving CModule	LSPW_MaET
Responsible	Prof. Dr. Christian Dick Professor Fakultät IME
Valid from	winter semester 2020/21
Level	Master
Semester in the year	winter semester
Duration	Semester
Hours in self-study	78
ECTS	5
Professors	Prof. Dr. Christian Dick Professor Fakultät IME
Requirements	Fundamentals of electrical engineering power electronics Basics of electric drives Analogue signals and systems
Language	German
Separate final exam	Yes

Literature

Hau E.: Windkraftanlagen - Grundlagen, Technik, Einsatz, Wirtschaftlichkeit, Springer Verlag

Mertens, K.: Photovoltaik - Lehrbuch zu Grundlagen, Technologie und Praxis, Hanser Verlag

Sahan, B.: Wechselrichtersysteme mit Stromzwischenkreis zur Netzanbindung von Photovoltaik-Generatoren, KDEE Kassel

Final exam

Details	By means of an oral exam, the learned contents and competencies are queried
Minimum standard	Purely content knowledge defines the limit of pass
Exam Type	EN mündliche Prüfung, strukturierte Befragung

Lecture / Exercises

Learning goals

Goal type	Description
Knowledge	Overview of the different renewable energy sources and their potentials Photovoltaic, Wind power etc.
Knowledge	Principles of grid-connected as well as of idle solar inverters for photovoltaic systems Physics of the solar cell Inverter topologies System architectures: central, string and module inverters Control methods: PWM, MPP tracking etc.
Knowledge	Principles of wind turbines double-fed induction machine Plant with synchronous machine Wind power-specific control algorithms
Skills	The students will be able to explain electronic and electromagnetic structures, topologies and control methods of various renewable energy generation systems (photovoltaic, wind, etc.). The students possess the ability to dissect the entire plant-specific system technology into essential subsections, to develop or to project individual aspects and thus to carry out individual steps of a synthesis. The relationship to reality, in particular with regard to new regulatory, normative framework conditions that accompany the energy transition, is being established. This enables the student to describe the actuators as part of an intelligent network in the superordinate context in order to later select or develop the correct actuators.

Special requirements

none

Accompanying material	Lecture slides as pdf document Exercises Simulation models Literature on the topic
Separate exam	No

Skills	The students become acquainted with methods for the dynamic description and regulation of renewable energy generation plants and thereby obtain decision-making authority. The students have experience in handling power electronics, drives, classical measuring devices and are able to model actuators with a simulation tool. Students have the ability to understand, dimension and regulate electrical actuators for renewable energy generation.

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Lecture	2
Exercises (whole course)	0
Exercises (shared course)	1
Tutorial (voluntary)	0

Practical training

Learning goals

Goal type	Description
Knowledge	In a first experiment, an inverter for a photovoltaic system is modeled as an example and simulated with a simulation tool. Special attention is paid to the plant-specific regulatory procedures (MPP tracking, etc.). Thereafter, a commercial inverter is measured and analyzed.
Knowledge	In a second experiment, a double-fed induction machine including converters is being investigated as an actuator for wind turbines.
Skills	Students can handle a standard commercial modeling and simulation tool. The students understand the working behavior of power electronic actuators. The students can solve tasks in a small team. They can analyze measurement results and gain insights into the measurement object. They can model and simulate a real system.

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Practical training	1
Tutorial (voluntary)	0

Special requirements

none

Accompanying material	guide for practical training
Separate exam	No