Power electronic interfaces - opis przedmiotu

Informacje ogólne

Nazwa przedmiotu	Power electronic interfaces
Kod przedmiotu	06.2-WE-ELEKTP-PEI-Er
Wydział	Wydział Informatyki, Elektrotechniki i Automatyki
Kierunek	Elektrotechnika
Profil	ogólnoakademicki
Rodzaj studiów	Program Erasmus pierwszego stopnia
Semestr rozpoczęcia	semestr zimowy 2021/2022

Informacje o przedmiocie

Semestr	6
Liczba punktów ECTS do zdobycia	4
Typ przedmiotu	obieralny
Język nauczania	angielski
Sylabus opracował	• dr hab. inż. Paweł Szcześniak, prof. UZ

Formy zajęć

Forma zajęć	Liczba godzin w semestrze (stacjonarne)	Liczba godzin w tygodniu (stacjonarne)	Liczba godzin w semestrze (niestacjonarne)	Liczba godzin w tygodniu (niestacjonarne)	Forma zaliczenia
Laboratorium	15	1	-	-	Zaliczenie na ocenę
Wykład	30	2	-	-	Zaliczenie na ocenę

Cel przedmiotu

To familiarize students with the basic systems and properties of power electronic converters working as renewable energy interfaces. Developing skills in the selection of type, topology and parameters of power electronic interfaces in distributed power distribution systems. Awareness of the importance of methods and quality of electricity conversion.

Wymagania wstępne

Fundamentals of electrical engineering, Fundamentals of power electronics

Zakres tematyczny

Lecture

Introduction. Characteristics of distributed energy sources.

Characteristics of distributed power distribution systems from renewable energy.

Coupling renewable energy sources with a distribution system. Systems cooperating with the network and autonomous systems.

Power electronic converters with MPPT algorithms for coupling DC RES (photovoltaic (PV) systems, fuel cells (FC) and others).

Power electronic converters with MPPT algorithms for coupling RES of alternating current (wind generators (WG), geothermal generators (TG) and biogas generators.

Power electronic interfaces with DC Bus coupling.

Power electronic interfaces with HFAC coupling.

Network converters for renewable energy electronic interfaces.

Renewable energy electronic interfaces with bidirectional energy flow.

Summary and development trends of renewable energy electronic interfaces.

Lab

Tests of functional and energy properties of PWM controllers for PV systems.

Tests of functional and energy properties of MPPT controllers for PV systems.

Tests of the properties of an AC / DC bidirectional converter.

Examination of the power electronics interface properties in a Grid Tied system cooperating with the power grid.

Tests of the power electronic interface properties in the Off Grid system for autonomous systems.

Examination of the interface properties in a hybrid system for energy storage and PV systems

Metody kształcenia

Lecture: conventional (multimedia) lecture, problem-solving lecture

Laboratory: laboratory exercises, work in groups

Efekty uczenia się i metody weryfikacji osiągania efektów uczenia się

Opis efektu	Symbole efektów	Metody weryfikacji	Forma zajęć
The student has basic knowledge about the functions of power electronics in distribution power systems from renewable energy.		• kolokwium	• Wykład
The student is able to determine the basic properties of power electronic couplings and is aware of their importance in distribution power systems from renewable energy		• wykonanie sprawozdań laboratoryjnych	• Laboratorium
The student is aware of the importance of methods and quality of transforming electricity in distribution power systems from renewable energy		• kolokwium • wykonanie sprawozdań laboratoryjnych	• Wykład • Laboratorium
The student has knowledge about the properties of basic power converters AC / DC, DC / DC, AC / AC and DC / AC		• kolokwium	• Wykład

Warunki zaliczenia

Lecture

The grade is determined based on the results of the tests.

Lab

The final grade is the arithmetic average of the partial grades issued for the report of each laboratory class made by students.

Final grade

The final grade is determined on the basis of grades from all forms of the subject with a weight: lecture 60%, laboratory 40%.

Literatura podstawowa

1. Kramer W., Chakraborty S., Kroposki B., Thomas H.: Advanced power electronics interfaces for distributed energy systems. Part I, Systems and topologies. NREL National Renewable Energy Laboratory, NREL/TP-581-42672, 2003. Available electronically at http://www.osti.gov/bridge.
2. Chakraborty S., Kroposki B., Kramer W.: Advanced power electronics interfaces for distributed energy systems. Part 2: Modeling, Development, and Experimental Evaluation of Advanced Control Functions for Single-Phase Utility-Connected Inverter. NREL/TP-550-44313, 2008. . Available electronically at http://www.osti.gov/bridge.
3. Mohan N.: Power Electronics: Converters, Applications, and Design. John Wiley & Sons, 1998.
4. Holms D. G., Lipo T. A.: Pulse width modulation for power converters. Principle and practice. IEEE press. New York.
5. Alfred Rufer, Energy Storage Systems and Components, CRC Press, Taylor & Francis Group, 2018.
6. Siegfried Heier, Grid Integration of Wind Energy: Onshore and Offshore Conversion Systems, John Wiley & Sons, Ltd., 2014.
7. Bimal K. Bose, Power Electronics in Renewable Energy Systems and Smart Grid: Technology and Applications, Wiley-IEEE Press, 2019.
8. Hee-Je Kim, Solar Power and Energy Storage Systems, Jenny Stanford Publishing 2019.
9. Dmitri Vinnikov, Samir Kouro, Yongheng Yang, Emerging Converter Topologies and Control for Grid Connected Photovoltaic Systems, MDPI Basel, Switzerland, 2020.

Literatura uzupełniająca

1. Kahl T. "Sieci elektroenergetyczne"; Warszawa WNT 1984
2. Mikołajuk K.: Podstawy analizy obwodów energoelektronicznych. Warszawa, PWN 1998.
3. Grażyna Jastrzębska, Odnawialne źródła energii i pojazdy proekologiczne. WNT, Warszawa, 2011.
4. Tunia H., Smirnow A., Nowak M., Barlik R.: Układy energoelektroniczne. WNT 1990.
5. Piróg S.: Energoelektronika. AGH, Uczelniane Wyd. Nauk.-Dydakt., Kraków 1998.

Uwagi

Zmodyfikowane przez dr hab. inż. Paweł Szcześniak, prof. UZ (ostatnia modyfikacja: 08-07-2021 23:47)