Automation for renewable energy supply - course description

General information

Course name	Automation for renewable energy supply
Course ID	06.0-WE-AutD-AfRES-Er
Faculty	Faculty of Computer Science, Electrical Engineering and Automatics
Field of study	Automatic Control and Robotics / Computer Control Systems
Education profile	academic
Level of studies	Erasmus programme
Beginning semester	winter term 2017/2018

Course information

Semester	2
ECTS credits to win	2
Course type	optional
Teaching language	english
Author of syllabus	• dr hab. inż. Marcin Jarnut, prof. UZ

Classes forms

The class form	Hours per semester (full-time)	Hours per week (full-time)	Hours per semester (part-time)	Hours per week (part-time)	Form of assignment
Lecture	15	1	-	-	Credit with grade
Laboratory	15	1	-	-	Credit with grade

Aim of the course

To familiarize students with unconventional techniques for generating electricity and heat. To familiarize students with issues related to the automation of systems with renewable energy sources. Developing skills in the use of renewable energy sources in buildings and industry.

Prerequisites

Physics, Fundamentals of electrical engineering

Scope

Introduction. Energy resources and energy demand. Renewable energy sources. Wind energy. Wind energy conversion systems. Solar radiation energy. Types and construction of solar collectors. Solar cells and systems. Water energy. Hydroelectric power stations. Geothermal energy. Basics of operation and construction of heat pumps. Biogas, biomass and waste heat. Fuel cells. The use of electrolysis and hydrogen. Energy storage. Primary and secondary cells. Acid, alkaline and lithium batteries. Flow accumulators. Supercapacitors. Containers with superconducting coils. Kinetic, gravitational containers. Heat energy storage tanks. Coupling and control systems in systems with renewable energy sources. Control in photovoltaic systems. Automation of wind farms. Heat pump automation systems. Solar collector control systems. Control in systems using biomass and biogas. Methods and systems for charging energy storage. Energy management systems in intelligent buildings. Energy management in industry.

Teaching methods

Lecture: conventional lecture

Laboratory: laboratory exercises

Learning outcomes and methods of theirs verification

Outcome description	Outcome symbols	Methods of verification	The class form
Has basic knowledge of renewable energy sources		• a check work	• Lecture
Is able to use methods and devices enabling the analysis of the properties of systems with renewable energy sources		• carrying out laboratory reports	• Laboratory
He can work individually and in a team		• an ongoing monitoring during classes	• Laboratory
Knows the theoretical foundations regarding control systems and methods as well as the use of renewable energy sources in buildings and industry		• a check work	• Lecture

Assignment conditions

Lecture: the condition for passing is obtaining positive grades from written or oral tests carried out at least once in a semester.

Laboratory: the condition for passing is obtaining positive grades from all laboratory exercises, planned to be implemented under the laboratory program.

Components of the final grade = lecture: 50% + laboratory: 50%

Recommended reading

1. S. Heier, R. Waddington, Grid Integration of Wind Energy Conversion Systems, John Wiley & Sons, 2006

2. A. Luque, Handbook of Photovoltaic Science and Engineering, John Wiley & Sons, 2003

3. R. O'Hayre, Fuel Cell Fundamentals, John Wiley & Sons, 2006

Further reading

1. E. Klugmann, E. Klugmann-Radziemska, Alternatywne źródła energii. Energetyka fotowoltaiczna, Wydawnictwo Ekonomia i Środowisko, Białystok, 1999

2. W. Lewandowski, Proekologiczne źródła energii odnawialnej, WNT, Warszawa, 2001

3. J. Marecki, Podstawy przemian energii, WNT, Warszawa, 1995

4. G. Benysek, M. Jarnut, Energooszczędne i aktywne systemy budynkowe. Techniczne i eksploatacyjne aspekty implementacji miejscowych źródeł energii elektrycznej, Oficyna Wydawnicza Uniwersytetu Zielonogórskiego, 2013

Notes

Modified by dr hab. inż. Wojciech Paszke, prof. UZ (last modification: 29-04-2020 09:42)