Distributed energy sources and electric transport - course description

General information

Course name	Distributed energy sources and electric transport
Course ID	06.2-WE-ELEKTP-DESandET-Er
Faculty	Faculty of Computer Science, Electrical Engineering and Automatics
Field of study	Electrical Engineering
Education profile	academic
Level of studies	First-cycle Erasmus programme
Beginning semester	winter term 2021/2022

Course information

Semester	5
ECTS credits to win	5
Course type	optional
Teaching language	english
Author of syllabus	

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
Project	15	1	-	-	Credit with grade
Class	15	1	-	-	Credit with grade
Laboratory	15	1	-	-	Credit with grade
Lecture	30	2	-	-	Exam

Aim of the course

To familiarize students with issues related to distributed sources of electricity and heat as well as with electric vehicles and charging infrastructure.

Prerequisites

Fundamentals of electrical engineering, Physics

Scope

Sun energy. Flat, vacuum and air solar collectors. Photovoltaic installations, parabolic, with central belief and Stirling motors.

Wind energy. Wind generators with vertical, horizontal axis of rotation and kite generators. Offshore wind energy.

Geothermal energy. Basics of operation and construction of heat pumps.

Biogas, biomass and waste heat. Fermentation as a way of obtaining biogas.

The use of electrolysis and hydrogen. Fusion.

Ways to control the output power of distributed sources. Impact of distributed sources on the system network.

Electricity storage technologies.

Hybrid vehicles: serial and parallel hybrid. Range extenders. Battery electric vehicles. Electric vehicle charging standards. Hydrogen vehicles. Electric and hydrogen vehicle charging infrastructure. Impact of charging infrastructure on the system network.

Teaching methods

Lecture: conventional lecture, problem lecture, discussion

Exercises: consultations, project method, accounting exercises

Laboratory: work in groups, laboratory exercises

Project: project method, discussions and presentations

Learning outcomes and methods of theirs verification

Outcome description	Outcome symbols	Methods of verification	The class form
Knows the properties of distributed energy sources, electricity storage, charging infrastructure and battery vehicles.		• an ongoing monitoring during classes • carrying out laboratory reports	• Laboratory

Outcome description	Outcome symbols	Methods of verification	The class form
Is able to estimate the impact of distributed sources on the power system. He can choose the elements of distributed systems and energy storage. Is able to estimate construction costs and payback time of investments in distributed energy sources.		• activity during the classes • an evaluation test • an ongoing monitoring during classes	• Class
Is able to design distributed energy sources systems, storage systems.		• a project	• Project
Characterizes distributed energy sources and energy storage technologies. Characterizes types of electric vehicles.		• an exam - oral, descriptive, test and other	• Lecture

Assignment conditions

Lecture - the condition of passing is obtaining a positive grade from the exam.

Exercises - the condition for passing is passing 3 tests on problem solving skills.

Laboratory - the pass condition is to obtain positive grades from all laboratory exercises carried out under the program.

Project - the condition for getting credit is obtaining positive grades from all project tasks implemented under the program.

Components of the final grade = lecture: 45% + exercises: 20 + laboratory: 20% + project 15%

Recommended reading

1. Heier S., Waddington R.: Grid Integration of Wind Energy Conversion Systems, John Wiley & Sons, 2006.
2. Luque A.: Handbook of Photovoltaic Science and Engineering, John Wiley & Sons, 2003.
3. O'Hayre R.: Fuel Cell Fundamentals, John Wiley & Sons, 2006.

Further reading

1. Klugmann E., Klugmann-Radziemska E.: Alternatywne źródła energii. Energetyka fotowoltaiczna, Wydawnictwo Ekonomia i Środowisko, Białystok, 1999.
2. Lewandowski W.: Proekologiczne źródła energii odnawialnej, WNT, Warszawa, 2001.
3. Marecki J.: Podstawy przemian energii, WNT, Warszawa, 1995.

Notes

Modified by dr hab. inż. Paweł Szcześniak, prof. UZ (last modification: 08-07-2021 21:49)