

# 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	<a href="#">Faculty of Computer Science, Electrical Engineering and Automatics</a>
Field of study	Electrical Engineering
Education profile	academic
Level of studies	First-cycle Erasmus programme
Beginning semester	winter term 2022/2023

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 such as: PV sources, wind turbines as well as basic issues related to power grid.

## Scope

Photovoltaic installations: types of PV panels; connection topologies of PV systems; prosumer PV installation

Wind generators: types of wind generators.

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.		<ul style="list-style-type: none"><li>an ongoing monitoring during classes</li><li>carrying out laboratory reports</li></ul>	<ul style="list-style-type: none"><li>Laboratory</li></ul>

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.		<ul style="list-style-type: none"> <li>• activity during the classes</li> <li>• an evaluation test</li> <li>• an ongoing monitoring during classes</li> </ul>	<ul style="list-style-type: none"> <li>• Class</li> </ul>
Is able to design distributed energy sources systems, storage systems.		<ul style="list-style-type: none"> <li>• a project</li> </ul>	<ul style="list-style-type: none"> <li>• Project</li> </ul>
Characterizes distributed energy sources and energy storage technologies. Characterizes types of electric vehicles.		<ul style="list-style-type: none"> <li>• an exam - oral, descriptive, test and other</li> </ul>	<ul style="list-style-type: none"> <li>• Lecture</li> </ul>

## 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. A. Reinders, P. Verlinden, W. van Sark, A. Freundlich: Photovoltaic Solar Energy: From Fundamentals to Applications, John Wiley & Sons, 2016.
2. O'Hayre R.: Fuel Cell Fundamentals, John Wiley & Sons, 2016.
3. S. Sachan, S. Padmanaban, S. Deb: Smart Charging Solutions for Hybrid and Electric Vehicles, John Wiley & Sons, 2022.

## Further reading

1. Bogdan Szymański, Instalacje Fotowoltaiczne 2021.

## Notes

Modified by dr inż. Szymon Wermiński (last modification: 12-04-2022 15:42)

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