Energy conversions and alternative power sources - course description

General information

Course name	Energy conversions and alternative power sources
Course ID	06.2-WE-ELEKTD-ECandAES-Er
Faculty	Faculty of Computer Science, Electrical Engineering and Automatics
Field of study	Electrical Engineering
Education profile	academic
Level of studies	Second-cycle Erasmus programme
Beginning semester	winter term 2017/2018

Course information

Semester	3
ECTS credits to win	4
Course type	optional
Teaching language	english
Author of syllabus	• prof. dr hab. inż. Grzegorz Benysek

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	30	2	-	-	Credit with grade
Laboratory	30	2	-	-	Credit with grade

Aim of the course

To provide fundamental knowledge in subject of energy conversions and renewable energy sources.

Prerequisites

Circuit theory, Fundamentals of electrical power engineering.

Scope

Energy resources and energy demands. Conversion of the thermal energy into mechanical and electrical. Conversion of the wind and water energy. Conversion of the nuclear energy into thermal and electrical energy. Energy conversions and influence onto environment.
Nuclear energy. Nuclear reactor – principle of operation. Advantages and disadvantages of the nuclear power stations.
Wind energy. Wind conditions In Poland and Europe. Wind conversion system. Ecological, scenery and environmental results of the wind installations utilization.
Solar energy. Insolation in Poland. Types and construction of the solar systems. Principle of operation.
Examples of the industrial installations with photovoltaic.

Water energy. Turbine construction. Influence of the large water power stations onto environmental changes. Principles of constructions as well as cooperation of the small water power stations with the energy network.
Geothermal energy. Methods and examples of utilization of the geothermal energy. Geothermal energy resources in Poland. Principle of operation of the heat pumps, heat sources utilized In heat pumps.
Biogas, biomass and waste heat. Fermentation as source of the biogas. Straw and brushwood utilization.
Electrical arrangements In alternative energy sources. Methods of solar energy conversion into electrical energy. Arrangements to cooperation with AC networks.
Novel sources of the alternative energies. Electrolysis and hydrogen utilization.
Thermonuclear fusion. Financial aspects of the alternative energy installations.

Teaching methods

Lecture, laboratory exercises.

Learning outcomes and methods of theirs verification

Outcome description	Outcome symbols	Methods of verification	The class form
Characterizes the sources of renewable energy and energy storage.		• an evaluation test	• Lecture
Knows properties of renewable energy sources and electric energy deposits.		• an evaluation test	• Lecture
Knows about energy conversion.		• an evaluation test	• Lecture
Can select installation elements, estimate design cost and investment payback time for alternative energy sources.		• carrying out laboratory reports	• Laboratory

Assignment conditions

Lecture – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester.

Laboratory – the main condition to get a pass is acquiring sufficient marks for all laboratory exercises as scheduled.

Recommended reading

1. Klugmann E., Klugmann-Radziemska E.: Alternative energy sources. Photovoltaics power systems, Wydawnictwo Ekonomia i Środowisko, Białystok, 1999. (in Polish)
2. Heier S., Waddington R.: Grid integration of wind energy conversion systems, John Wiley & Sons, 2006.
3. Luque A.: Handbook of photovoltaic science and engineering, John Wiley & Sons, 2003.
4. Lewandowski W.: Ecological friendly renewable energy sources, WNT, Warszawa, 2001. (in Polish)
5. Marecki J.: Basic of energy transformations, WNT, Warszawa, 1995. (in Polish).

Further reading

1. O'Hayre R.: Fuel cell fundamentals, John Wiley & Sons, 2006.
2. Mielczarski W., Electrical energy market – selected technical and economical aspects, ARE & EP-C, Warszawa, 2000 (in Polish)

Notes

Modified by dr hab. inż. Radosław Kłosiński, prof. UZ (last modification: 30-04-2017 12:22)