Nazwa w jęz. angielskim: Alternative energy sources

Dane dotyczące zajęć:
Information on course:

Jednostka oferująca: Wydział Inżynierii Środowiska i Energetyki // dr inż. Tomasz Bury
Course offered by: Faculty of Energy and Environmental Engineering // dr inż. Tomasz Bury

Język wykładowy:
angielski
Language:
English
Strona WWW: **Course homepage:**
Skrócony opis:
Short description:
The objective of the course is to provide students with an up to date knowledge on alternative energy sources and technologies utilizing these sources. The course is focused on different sources of primary energy, which are different than fossil fuels. Technologies for utilizing those sources are also presented. The lectures cover topics of renewable sources of energy (solar, wind, hydro, geothermal, biomass), as well as other non-conventional sources (fuel cells, hydrogen, waste, nuclear). Time of lectures is divided almost equally between detailed characteristics of a source of primary energy, and technologies utilizing it to produce final, useful form of energy. There is increasing interest in applying renewable energy sources nowadays, part of which is characterized by a very stochastic production. Therefore the topic of energy storage systems is also presented. Environmental aspects of all the presented technologies are addressed during the lectures.
Opis:
Description:
Lectures: 1) Introduction (forms of energy, sources of energy, options for energy conversion, definition of alternative energy sources) 2) Fuel cells (principle of operation, type of fuel cells and fuels, applications and current status) 3) Hydrogen (characteristic of hydrogen as a fuel, sources and production methods, applications) 4) Geothermal energy (characteristic of the source, availability, technologies for heat and power production, environmental impact) 5) Biomass (types and sources of biomass, methods of conversion, technologies review, environmental impact) 6) Solar energy (characteristic of the source, availability of solar radiation on Earth, photothermal and photovoltaic conversion, technologies, environmental impact) 7) Hydro energy (water as the source of energy, water turbines, hydro power plants, hydro power status in the world, environmental impact) 8) Wind energy (source and wind patterns in the world, wind turbines types and construction, wind power plants status, environmental impact) 9) Waste to energy (sources and types of waste, methods of conversion, environmental impact) 10) Energy storage (characteristics of methods for storing electricity and heat, technological solutions of storage systems) 11) Nuclear energy (physical basis of nuclear fission and fusion, nuclear fuels cycles, current status of nuclear energy in the world, characteristics of pressurized and boiling water reactors technologies, safety issues, generation III, III+ and IV reactors, investigations on thermonuclear reactors) **Lab classes:** 1) Heat pump 2) Measurement of a photovoltaic cell parameters

3) Estimating electricity production by a wind turbine
4) Working out a simplified computational model of a PV module
5) Analysis of a PV installation operation using PVGIS tool
6) Analysis of a heat pump energy efficiency
7) Energy efficiency of an Organic Rankine Cycle utilizing geothermal source of energy

Number of hours of classes with direct participation of academic teachers or other persons conducting
classes and students
Lecture: 30h
Laboratory: 15h
Number of ECTS credits:2

Literatura:

Bibliography:

1. BOYLE G.: Renewable Energy: Power for a Sustainable Future, Oxford
University Press, Oxford 2012
2. KALTSCHMITT M. (ed): Renewable Energy: Technology, Economics and
Environment, Springer 2007
3. BECKMAN WA, DUFFIE JA: Solar Engineering of Thermal Processes.
John Wiley and Sons; 1980
4. KALOGIROU S: Solar Energy Engineering Processes and Systems.
Academic Press; 2009.

Efekty uczenia się:

Learning outcomes:

Knowledge
Student knows and understands:
K1A_W18 basic renewable energy technologies, including technologies for the use of solar energy, water, wind, geothermal energy, biomass, basics of waste and nuclear energy use for heat and electricitygeneration, understands the principles of their design and operation
K1A_W16 environmental protection issues related to the use of alternative energy sources
K1A_W19 methodology for energy assessment of processes using alternative energy sources

Skills
Student is able to:
K1A_U24 use renewable energy technologies

Metody i kryteria oceniania:

Assessment methods and assessment criteria:

Lectures: written test containing single-choice, multiple-choice and open questions.
Labs: each exercise is evaluated based on a submitted report
Basis for the final grade is 2/3*Lecture grade + 1/3*Lab grade

Przynależność do grup przedmiotów w cyklach:
Element of course groups in various terms:

Opis grupy przedmiotów Course group description	Cykl pocz. First term	Cykl kon. Last term
przedmioty obieralne studia stacjonarne i niestacjonarne stopień studiów – dowolny kierunek studiów – dowolny, semestr dowolny elective courses	2023/2024	

full-time and part-time studies degree - any field of study - any semester - any		