COURSE DESCRIPTION CARD - SYLLABUS

Course name
Selected issues of RES [N2Elenerg1>WZOZE]

Course

Field of study
Electrical Power Engineering

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
10

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

1,00

Coordinators

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Lecturers

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Prerequisites

Basic knowledge of electrical engineering, mathematics and physics in the field of renewable energy sources. The ability to effectively self-educate in a field related to the chosen field of study. Awareness of the need to expand their competences, readiness to cooperate as part of the team.

Course objective

To acquaint students with selected issues in the field of renewable energy sources, i.e. the structure, principle of operation and the possibilities of renewable energy systems in the field of solar energy and wind and hybrid systems. Justification for the need to replace traditional sources with renewable sources, due to the depletion of conventional resources and increasing environmental pollution. Presentation of new possibilities in the field of obtaining electricity. Presentation of standardization, legal, economic and recycling issues.

Course-related learning outcomes

Knowledge:
1. has an orderly and in-depth knowledge of the work of: solar, wind and hybrid electric energy sources in the power system.

2. he knows the issues of mathematical and numerical modeling of photovoltaic modules and wind turbines in the field of renewable energy.
3. has a structured and in-depth knowledge of the use of various optimization methods in the issues of energy generation in res.
4. has a basic knowledge of the purpose of optimizing the structure of hybrid res systems.

Skills:
1. can independently model a hybrid power system using properly selected parameters and characteristics of selected renewable sources.
2. is able to make a comprehensive analysis of profitability and technical and economic evaluation of solar-wind installations.

Social competences:
1. can think in a creative and developmental way and understands the need to act for the natural environment and make the society aware of the need to replace traditional energy sources with renewable sources.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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The knowledge acquired during the lecture is verified by passing a test lasting from 45 to 60 minutes, consisting of 10-15 questions (test and open), with different scores. Passing threshold: 50% of points. The issues on the basis of which the questions are developed will be sent to Students by e-mail using the university"s e-mail system.

Programme content

Lecture:
Justification for the need to use renewable energy sources. Legal regulations concerning the production of electricity in installations with renewable energy sources in Poland. Characteristics of solar and wind energy resources in Poland. Characteristics of: photovoltaic modules, wind turbines, hybrid systems (solar power plant with a wind generator, solar power plant with a battery bank, solar power plant with a wind generator and an alternating current generator with a diesel engine, a solar power plant with a fuel cell, a wind farm with an energy storage) and a combined heat and power plant for biomass. Estimating the energy yield of solar-wind systems based on the energy efficiency of generating units. Calculation of the unit cost of electricity generation in a solar-wind system. Determining the amount of electricity purchased from the power grid to supply the facility with a known load profile in the analysis of solar-wind systems. Advantages and disadvantages of hybrid systems.

Teaching methods

Lecture:
Multimedia presentations containing drawings, diagrams, photos, supplemented with practical examples on the blackboard, slides and computer programs, which makes it easier to link theories with practice. The lecture is supplemented with additional materials provided to students for independent study. Using Students" knowledge of other subjects, initiating discussions, asking questions to increase Student activity and independence.

Bibliography

Basic
1. Jastrzębska G., Odnawialne źródła energii i pojazdy proekologiczne, WNT, Warszawa 2009.
2. Jastrzębska G., Ogniwa słoneczne. Budowa, technologia i zastosowanie, WKŁ, Warszawa 2013.
3. Jastrzębska G., Energia ze źródeł odnawialnych i jej wykorzystanie, WKŁ, Warszawa 2017.
4. Lubośny Z., Elektrownie wiatrowe w systemie elektroenergetycznym, WNT, Warszawa 2006.
5. Lubośny Z., Farmy wiatrowe w systemie elektroenergetycznym, WNT, Warszawa 2009.
6. Praca zbiorowa pod redakcją: Gałusza M., Paruch J., Odnawialne i niekonwencjonalne źródła energii, Wydawnictwo Tarbonus, Kraków 2008.
7. Tomczewski A., Techniczno-ekonomiczne aspekty optymalizacji wybranych układów elektrycznych, Rozprawy nr 520, Wydawnictwo Politechniki Poznańskiej, Poznań 2014.

8. Góralczyk I., Tytko R., Fotowoltaika. Urządzenia, instalacje fotowoltaiczne i elektryczne, Wydanie II, Kraków 2015.
Additional
1. Jarmuda T., Mikulski S., Nawrowski R., Tomczewski A., The use of the Matlab & Simulink environment to simulate the operation of a PV panel with an actual input function, Computer Applications in Electrical Engineering vol. 12/2014, Poznan University of Technology Academic Journals – Electrical Engineering, grudzień 2014, Poznań, Polska, str. 497 – 510.
2. Jarmuda T., Methods of Modeling the Power Characteristics of Wind Turbines, Computer Applications in Electrical Engineering vol. 14, Publishing House of Poznan University of Technology, December 2016, Poznan, Poland, pp. 393 – 406.
3. Jarmuda T., Tomczewski A., Modelowanie hybrydowego systemu zasilania typu solarno–wiatrowego, Poznan University of Technology Academic Journals. Electrical Engineering vol. 89, 10 – 11 kwiecień 2017, Poznań, Polska, str. 373 – 384.
4. Głuchy D., Jarmuda T., Tomczewski A., Comparison of different configurations of the solar and wind power supply system with energy storage using Matlab, Open Access Proceedings in Information Technology, Computer Science and Mathematics, ITM Web of Conferences (ZKwE'2018), 2018, Vol. 19, No. 01023, p. 01023-1-01023-2, doi: https://doi.org/10.1051/itmconf/20181901023.
5. Singh S. S., Fernandez E., Modeling, size optimization and sensitivity analysis of a remote hybrid renewable energy system, Energy, 15 January 2018, Vol. 143, s. 719 – 731.

Breakdown of average student's workload

	Hours	ECTS
Total workload	27	1,00
Classes requiring direct contact with the teacher	17	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	10	0,50