COURSE DESCRIPTION CARD - SYLLABUS

Course name
The use of biomass, biogas, water and geothermal energy and the exploitation of renewable energy systems [N1Energ1>WBBEW]

Course

Field of study
Power Engineering

Year/Semester
5/9

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
part-time

Requirements
elective

Number of hours

Lecture
20

Laboratory classes
10

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of electrical engineering, electronics and computer science as well as the construction and operation of typical ecological sources of electricity.

Course objective

Acquainted with the properties and electrical characteristics of typical ecological sources of electricity and the principles of their operation. Understanding the theoretical and practical issues related to the design, construction, operation and operation as well as cooperation of various renewable energy systems. Impact of renewable energy sources on the environment and living organisms.

Course-related learning outcomes

Knowledge:
1. has basic and systematic knowledge in the field of building and connecting typical ecological sources of electricity to the power system,
2. knows the principles of operating installations and networks with typical ecological sources of electricity,

3. has knowledge of applied reliability models.
4. has knowledge of the basic technologies of converting primary energy into work, heat and electricity.

Skills:
1. is able to compare different variants of the concept of building power installations and networks powered from typical ecological sources of electricity and assess their reliability,
2. is able to compare design solutions and test hypotheses from the analysis of the operating status of electrical systems of renewable energy sources.

Social competences:
1. is aware of the need to behave in a professional manner, and in particular the impact of the power engineering engineer on the safety of use of typical ecological sources of electricity and the power grid,
2. is aware of the effects of renewable energy sources on the environment.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture: assessment of knowledge and skills demonstrated on the written exam of a descriptive / problem nature (checking the ability to use the acquired knowledge), individual elements assessed according to the points system, 50% of the maximum number of points required to pass.
Laboratory: the evaluation covers the content and the ability to present and answer questions in the field of computer-aided design of renewable energy installations; obtaining additional points for activity during laboratory classes.

Programme content

Lecture: fundamentals of exploitation theory, reliability models, general principles for the operation of electrical power equipment, qualification requirements for persons involved in the operation of electrical power equipment, technical and operational documentation and operating instructions, commissioning of electrical power equipment its operation and control, organization and performance of works on electrical equipment, installations and networks with ecological sources of electric energy, command to perform work, preparation of the workplace, admission to work, end of work, rules for the safe performance of works, protective equipment and work tools; energizing agriculture with regard to renewable energy sources, the use of agricultural biomass for conversion into electricity and heat, biofuels, agricultural biogas as a renewable energy source, hydro power plants in the Polish power system, construction and operation of small hydropower plants., the use of geothermal energy, horizontal and vertical collectors.
Laboratory:computer aided design of geothermal systems, performing calculations using computer environments in the field of biofuels, as well as hydropower and solar collectors.

Teaching methods

Lecture: lecture with multimedia presentation (including drawings, photos, animations, sound, films) supplemented by examples given on the board, lecture conducted in an interactive way with the formulation of questions for a group of students or specific students indicated, initiating discussions during the lecture, taking into account various aspects of the issues presented, including: economic, ecological, legal, social, etc., presenting a new topic preceded by a reminder of related content known to students in other subjects;
Laboratory: solving sample design tasks with the use of computer software, initiating a discussion on solutions, working in groups while performing a final project task.

Bibliography

Basic
1. Laskowski J. Nowy poradnik elektroenergetyka przemysłowego, Centralny Ośrodek Szkolenia i Wydawnictw SEP, Warszawa 2011.
2. Markiewicz H. Instalacje elektryczne WNT, Warszawa, 2012
3. Niestępski S., Parol M.,Pasternakiewicz J., Wiśniewski T.,Instalacje elektryczne budowa, projektowanie, eksploatacja", Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2011.
4. Orlik W. Egzamin kwalifikacyjny elektryka w pytaniach i odpowiedziach, KaBe S. C., Krosno, 1999

5. Steller J., Henke A., Kaniewski M. Jak zbudować małą elektrownię wodną? Przewodnik inwestora, Europejskie Stowarzyszenie Małej Energetyki Wodnej (ESHA), 2010
6. Jędrczak A.: Biologiczne przetwarzanie odpadów. PWN, Warszawa 2008.
7. Chmielniak T.: Technologie energetyczne. WNT, Warszawa 2008.
8. Banach M., Kowalski Z., Kwaśny J.: Przegląd technologii produkcji biogazu różnego pochodzenia. Wyd. Politechniki Kra-kowskiej, Kraków 2013.
9. Praca zbiorowa pod red. Myczko A.: Budowa i eksploatacja biogazowni rolniczych. Wyd. Inst. Technologiczno-Przyrodniczy,Warszawa - Poznań 2011.
Additional
1. Tytko R.: Odnawialne źródła energii, Wydawnictwo OWG, Warszawa, 2009.
2. Lewandowski W.: Proekologiczne odnawialne źródła enrgii. WNT, Warszawa 2012.
3. Popczyk J.: Energetyka alternatywna. Polkowice 2013.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	36	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	39	2,00