



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Renewable energy sources [S1Eltech1P>OZE]

Course

Field of study

Electrical Engineering

Year/Semester

3/5

Area of study (specialization)

–

Profile of study

practical

Level of study

first-cycle

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

15

Other

0

Tutorials

0

Projects/seminars

0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of physics, electrical engineering and mathematics (on a general level). The ability to effectively self-education in a field related to the chosen field of study. The awareness of the need to expand their competence, their willingness to cooperate within the team.

Course objective

To acquaint students with the structure, principles of operation and application possibilities of renewable energy: photovoltaic, wind energy and water. Reason the need to replace conventional sources for renewable, due to the depletion of the former and growing environmental pollution. Presentation of new opportunities in the field of sourcing electricity.

Course-related learning outcomes

Knowledge:

1. Has ordered and theoretically founded knowledge in the field of renewable energy sources,
2. Knows and understands the phenomena and processes that allow for the conversion of energy from RES in electricity,
3. Orients itself in the current state of development of renewable energy sources and prospective trends

in Poland and in the world.

Skills:

1. Can obtain information from the literature, databases and other sources, analyze it and interpret, draw conclusions, justify opinions,
2. Can work independently and in a team, use a properly chosen methods and devices in terms of performance and electrical characteristics,
3. Can interpret the results, draw conclusions.

Social competences:

1. Can work individually and together in a group,
2. Is aware of the the importance and understanding of the non-technical aspects and impact of engineering activities, including its impact on environment and associated with this responsibility for decisions.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired as part of the lecture is verified by passing the lecture lasting about 45-60 minutes, consisting of 10-15 questions (test and open), variously scored. Passing threshold: 50% of points. The issues on the basis of which questions are prepared will be sent to students by e-mail using the university's e-mail system.

Skills acquired as part of the laboratory are verified on the basis of: grades from reports on exercises performed. In addition, the following are taken into account for the final evaluation of the laboratories: rewarding the knowledge necessary to implement the problems posed in a given area of laboratory tasks, activity during each class, rewarding the increase in the ability to use known principles and methods, assessment of knowledge and skills related to the implementation of the exercise task. The final grade is proposed by the company in accordance with the criteria adopted by the employer. In addition, students can get extra points for activity during classes, especially for: proposing to discuss additional aspects of the subject, the effectiveness of applying the acquired knowledge when solving a given problem, the ability to work within a team that practically performs a specific task in the laboratory, comments related to improving teaching materials, diligence aesthetic of the developed tasks within self-study.

Programme content

The module program covers issues related to the construction, principles of operation, cooperation and use of devices generating energy using renewable energy sources.

Course topics

The lecture program includes the following topics:

Justification of the need to use renewable energy sources. Legal conditions. Characteristics of renewable energy sources. Characteristics of devices enabling the conversion and storage of energy from RES: photovoltaics, wind and water energy. Costs of generation, transmission and distribution of electricity. The impact of RES on the natural environment. Estimation of energy yield. Application possibilities in various fields. Advantages, disadvantages, limitations of this type of solutions. Presenting innovative solutions in the field of the subject, used in the latest practical solutions.

The laboratory program includes the following issues:

Classes at an industrial plant on the selection, operation and use of selected elements of various types of renewable energy sources and energy storage in various configurations and working conditions. Planning measurement methodology, measurements and calculations of characteristic parameters of the above-mentioned devices. Laboratory classes are carried out on the company's premises.

Teaching methods

Lecture: multimedia presentations with figures, diagrams, photos, supplemented with practical examples on the board, slides and computer programs, facilitating the linking of theory to practice. Lecture supplemented with additional materials provided to students for self study. Use students' knowledge of other subjects, initiate discussions, ask questions to increase student activity and autonomy.

Laboratory: Teamwork (measurements) on the premises of the workplace at physical positions and devices related to renewable energy and energy storage.

Bibliography

Basic:

1. Jastrzębska G., Odnawialne źródła energii i pojazdy proekologiczne, WNT, Warszawa 2009.
2. Jastrzębska G., Ogniwa słoneczne. Budowa, technologia i zastosowanie, Wydawnictwa Komunikacji i Łączności, Warszawa, 2013.
3. Wolańczyk F., Elektrownie wiatrowe, Wydawnictwo KaBe, Krosno, 2009.
4. Lewandowski W.: Proekologiczne źródła energii odnawialnej, WNT, Warszawa 2012.
5. Corkish R., Sproul A., and others, Applied Photovoltaics, 3rd Edition , Taylor&Francis eBooks, 2013.
6. Habberlin H, Photovoltaics system design and practice, Wiley, 2013.
7. Jenkins D., Renewable Energy Systems, Earthscan Expert, 2013.
8. White S., Solar Photovoltaic Basics, Taylor&Francis Ltd, 2015.

Additional:

1. Ciok Z., Ochrona środowiska w elektroenergetyce, PWN, Warszawa 2001.
2. Zimny J., Odnawialne źródła energii w budownictwie niskoenergetycznym, Wydawnictwa Naukowo-Techniczne, Kraków-Warszawa, 2010.
3. Paska J., Wytwarzanie energii elektrycznej, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2005.
4. Lubośny Z, Farmy wiatrowe w systemie elektroenergetycznym, Wydawnictwo WNT, Warszawa, 2013.
5. Trzmiel G., Analiza metod regulacji mocy w elektrowniach wiatrowych, Computer applications in electrical engineering vol. 89/2017, Poznan University of Technology Academic Journals Electrical Engineering, Poznań, 2017, str. 395-404.
6. Trzmiel G., Układy śledzące punkt maksymalnej mocy w inwerterach stosowanych w instalacjach fotowoltaicznych, Computer applications in electrical engineering vol. 87/2016, Poznan University of Technology Academic Journals - Electrical Engineering, Poznań, 2016, str. 23 - 36.
7. Trzmiel G., Determination of a mathematical model of the thin-film photovoltaic panel (CIS) based on measurement data. Eksploatacja i Niezawodność - Maintenance and Reliability 2017; 19 (4): 516-521, <http://dx.doi.org/10.17531/ein.2017.4.4>.
8. Kurz D. Morawska L., Piechota R., Trzmiel G., Analysis of the impact of a flexible photovoltaic tile shape on its performance, E3S Web of Conferences, vol. 44, 2018 (00085), <https://doi.org/10.1051/e3sconf/20184400085>.
9. Internet: specialist subject literature, datasheets, standards.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	40	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	10	0,00