COURSE DESCRIPTION CARD - SYLLABUS

Course name
Modern RES technologies [N2Elenerg1-ŹOiME>WT2]

Course

Field of study
Electrical Power Engineering

Year/Semester
2/4

Area of study (specialization)
Renewable Sources and Storage of Energy

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
0

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
20

Number of credit points

2,00

Coordinators

dr inż. Artur Bugała
artur.bugala@put.poznan.pl

Lecturers

Prerequisites

Basic knowledge of electrical engineering, mathematics and renewable energy (general level). 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 within the team.

Course objective

- Familiarizing students with modern technologies in the field of renewable energy, enabling the effective conversion of primary energy into mechanical, electrical or thermal energy. - Use of advanced computer design software used by architects, electrical engineers and specialists in the field of construction, energy and electrical engineering to support complex functional analysis of renewable energy sources. - Presentation of the current directions of development of renewable energy. - Developing spatial thinking skills, implementing own technical solutions and verifying the results obtained.

Course-related learning outcomes

Knowledge:
1. has an ordered and theoretically founded knowledge of modern and currently used in practice renewable energy sources (including, inter alia, hydro and wind power plants) and their cooperation

with the power system.
2. knows and understands the phenomena and processes that allow the conversion of energy from renewable energy sources into electrical, mechanical and thermal energy.
3. is familiar with the issues of energy security, the current state of res development and prospective trends in poland and in the world.

Skills:
1. can obtain information from literature, databases and other sources, analyze and interpret it, draw conclusions, justify opinions.
2. can evaluate the applied solutions, technical and organizational measures in the field of energy based on alternative energy sources.
3. can perform an energy analysis of the devices used to convert wind and water energy into electricity.
4. is able to use specialized engineering software for the modeling of res systems.

Social competences:
1. is aware of the importance of broadly understood energy security and the promotion of activities in the society related to the development of res in the power system.
2. is aware of and responsible for their own work and is ready to submit to the principles of teamwork, can think and act in a creative and entrepreneurial manner.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
The knowledge acquired under the project is verified by presenting a computer project made in a team of two, supplemented by analytical calculations and by presenting an oral description with justification.

Programme content

Project:
- familiarizing students with the software for three-dimensional design of RES systems,
- the use of tools for analyzing and predicting the behavior of a real object through virtual testing of CAD models in an environment for the assessment of phenomena related to fluid flows,
- development of a 3D model of a wind or hydroelectric power plant and analysis of the influence of selected geometric parameters on its operation.

Teaching methods

Project: multimedia presentations containing drawings, detailed documentation, diagrams, photos, supplemented with practical examples on the blackboard, slides and computer programs, which makes it easier to link theory with practice. The project is supplemented with additional materials provided to students for independent study.

Bibliography

Basic
1. Boczar T. Wykorzystanie energii wiatru, Wydawnictwo PAK, 2010.
2. Wolańczyk F. Elektrownie wiatrowe, Wydawnictwo Kabe, 2021.
3. Kaldellis J., Zafirakis D. The wind energy (r)evolution: A short review of a long history, Renewable Energy, 36 (2011), 1887-1901.
4. Bugała A. Roszyk O. Investigation of an Innovative Rotor Modification for a Small-Scale Horizontal Axis Wind Turbine. Energies 2020, 13, 2649. https://doi.org/10.3390/en13102649.
5. Bazilevsa Y., Hsua M., Akkermana I., Wrightb S., Takizawab K., Henickeb B., Spielmanb T., Tezduyarb T.
3D simulation of wind turbine rotors at full scale. Part I: Geometry modeling and aerodynamics, International Journal for Numerical Methods in Fluids, 65 (2011) 207–235.
6. Chmielniak T. Technologie Energetyczne, Wydawnictwo Naukowe PWN, 2021.
7. Gundlach Władysław R. Podstawy maszyn przepływowych i ich systemów energetycznych, Wydawnictwo Naukowe PWN, 2021.
Additional
1. Manwell F.Wind Energy Explained , Wiley John + Sons, 2010.

2. Lubośny Z.Farmy wiatrowe w systemie elektroenergetycznym, Wydawnictwo Naukowe PWN, 2016.
3. Gomez-Lazaro E. Special Issue Modeling of Wind Turbines and Wind Farms, Energies, 2020, https://doi.org/10.3390/books978-3-03928-757-4
4. Singh M., Santoso S. Dynamic Models for Wind Turbines and Wind Power Plants, National Laboratory of the U.S. Department of Energy NREL, https://www.nrel.gov/docs/fy12osti/52780.pdf
5. Jastrzębska G. Energia ze źródeł odnawialnych i jej wykorzystanie, WKiŁ, 2017.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	20	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00