# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Renewable energy [S2EPiO1>EO]

## Course

Field of study
Industrial and Renewable Energy Systems

Year/Semester
1/2

Area of study (specialization)
Thermal and Renewable Energy

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

## Number of hours

Lecture
30

Laboratory classes
15

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

## Number of credit points

3,00

## Coordinators

dr inż. Przemysław Grzymisławski
przemyslaw.grzymislawski@put.poznan.pl

## Lecturers

## Prerequisites

KNOWLEDGE: In the field of mathematics, physics, thermodynamics and basic knowledge about energy production SKILLS: Can use the scientific method to solve problems, experiment and draw conclusions. SOCIAL COMPETENCIES: The student knows the limits of their own knowledge and skills; understands the need for lifelong learning.

## Course objective

To familiarize students with the basic issues in the field of renewable energy, including renewable energy sources (sun, wind, tides, geothermal energy, water), restrictions and dependencies between sources. In addition, the presentation of equipment for the production of energy from renewable sources along with the principle of operation and construction.

## Course-related learning outcomes

Knowledge:
knows the main directions of development of the energy industry, taking into account economic and environmental requirements in the field of renewable energy
has expanded knowledge about the development directions of technologies based on renewable energy

sources
knows the basic principles of creating and developing various forms of entrepreneurship

Skills:
is able to use analytical, simulation and experimental methods to formulate and solve engineering tasks in the field of renewable energy
is able to use the experience gained in the environment of professionally engaged in engineering activities related to the maintenance of equipment, facilities and systems of renewable energy
can interact with other people as part of team work and take a leading role in teams

Social competences:
is ready to recognize the importance of knowledge in solving cognitive and practical problems in the field of renewable energy sources
is ready to fulfill social obligations, inspire and organize activities for the social environment
is ready to think and act in an 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:
Lecture - written exam, the exact form will be given in the first lecture, minimum to pass – 51% of all available points
Laboratory classes - reports based on laboratories

## Programme content

Basic knowledge about aerodynamics, aerodynamic forces, characteristics of the boundary layer in the atmosphere, wind energy, principles of operation of vertical and horizontal wind turbines, construction of a wind turbine, innovative concepts of wind turbines, solar energy, solar radiation, black body, solar energy conversion, photovoltaic processes, characteristics of photovoltaic materials, basics of geology, energy storage efficiency, heat flow in geological structures and groundwater, soil temperature profiles, COP efficiency, natural gas diversification policy, sharing natural gas and geothermal energy in heating processes, reliability and profitability of using geothermal energy

## Course topics

none

## Teaching methods

Lecture - multimedia presentation
Laboratory - experiments done by students

## Bibliography

Basic
1. David JC MacKay, Sustainable Energy ? without hot air, UIT Cambridge, 2009 (https://www.withouthotair.com/)
2. Aldo Vieira da Rosa, Fundamentals of Renewable Energy Processes, Elsevier, 2013
3. Burkhard Sanner, Frank Kabus , Peter Seibt and Jörn Bartels: Underground Thermal Energy Storage for the German Parliament in Berlin, System Concept and Operational Experiences, Proceedings World Geothermal Congress 2005, Antalya, Turkey, 24-29 April 2005
Additional
1. Manfred Reuss: Shallow Geothermal ? a Technique with Several Aspects, Geothermal Energy in Bavaria, 2011
2. Mizerski, W., 2006. Geologia dynamiczna. Wydawnictwa Naukowe PWN
3. Plewa M. Geologia inżynierska w inżynierii środowiska. Podręcznik dla studentów wyższych szkół technicznych 1999
4. Martin O.L. Hansen: Aerodynamics of Wind Turbines, 2008

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 90 | 3,00 |
| Classes requiring direct contact with the teacher | 52 | 2,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 38 | 1,00 |