# COURSE DESCRIPTION CARD - SYLLABUS

Course name

Unconventional Energy Sources

## Course

Field of study

Power Engineering

Year/Semester

2/3

Area of study (specialization)

Ecological Energy Sources

Profile of study

general academic

Level of study

Second-cycle studies

Course offered in

polish

Form of study

full-time

Requirements

compulsory

## Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

Tutorials

Projects/seminars

15

## Number of credit points

6

## Lecturers

Responsible for the course/lecturer:

Dr hab.inż. Grażyna Jastrzębska prof.nadzw.

Faculty of Control, Robotics and Electrical Engineering

Poznan University of Technology

ul. Piotrowo 3A/615, 60-965 Poznań

Tel.: +48 61 665 23 82

E-mail: grazyna.jastrzebska@put.poznan.pl

Responsible for the course/lecturer:

## Prerequisites

Basic knowledge of renewables and unconventional energy sources.

Ability to effective self education related to the chosen field of study.

Is aware of the need to expand own competences. Willingness to work in a team.

## Course objective

Extend knowledge related to the design, technology and principles of operation and possibilities of application of unconventional energy sources.

Demonstrate new opportunities to acquire and storage energy. Promote clean energy technologies with environmental, ecological and efficiency considerations.

Familiarize students with selected applications of unconventional energy sources (mainly construction and transportation), on a global scale.

Practical introduction of students with selected applications of unconventional energy sources available in the city of Poznan and surroundings during outside activities.

Raising the importance of energy self-sufficiency on a micro and macro scale.

Developing of theoretical and practical skills in solving problems in the field of unconventional energy sources, including design.

Briefing on normalization, legal issues, economic issues and recycling.

## Course-related learning outcomes

### Knowledge

Have a advanced knowledge of renewables (wind, solar, water, biomass and geothermal sources) and unconventional energy sources, both in the description and analysis of elements and systems, phenomena, mathematical and chemical description.

Is familiar with current state of unconventional energy sources and trends in Poland and in the world .

### Skills

Is able to use use known mathematical methods and models, modify them, if necessary to analyze or design of circuits.

Can select the calculation method, use or realize the appropriate software to solve a specific problem, taking into account new technological achievements.

### Social competences

Can think and act in a creative and entrepreneurial way, understands the need for information and public consultation about unconventional energy sources

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The basis for assessing the knowledge and skills is a written exam.

Additional points (during lecture project and laboratory) are given for:

- continuous assessment (rewarding activity and quality of perception during classes),

- control of the increase of skills in the use of learned principles and methods),

- the effectiveness of the use of acquired knowledge when solving a given problem;

- assessment of the degree of project task completion and evaluation of the report of the laboratory exercise,

- proposing to discuss additional aspects of the issue;

- discussion of results, proposals for different solutions. choice of the most favorable,

- ability to cooperate within the team practically fulfilling the task (project and laboratory exercise);

- comments related to the improvement of didactic materials;

- the aesthetic diligence of the reports and design tasks elaborated (graphic illustration),

- independence in the selection of complementary bibliography.

## Programme content

1. Develop and complete of RES messages from sem. 6 and 7, concerning also the description and analysis of elements and systems, phenomena occurring in them in mathematical and chemical terms.

2. Familiarize with the practical aspects of the discussed issues on the example of unconventional energy sources; in the construction and transportation sectors. Architecture (energy saving, low energy, passive, zero energy, plus energy). Possibilities to use RES in new and modernized buildings. Optimization possibilities. Electric and hybrid vehicles. Unconventional methods of power supply and storage, Recuperation, Monitoring, Vehicle charging stations. Environmental effect.

3. Raising the importance of energy self-sufficiency as an important aspect of energy security. Analysis of the issue on the national scale - characterization of selected self-sufficient energetic objects, powered exclusively by RES. Characteristics of the selected places worldwide (islands, cities) powered by unconventional energy sources.

4.Multi-dimensional design issues on the example of hybrid power supply in architecture and transport.

## Teaching methods

Learning methods include lecture, project and laboratory.

Lecture

Lecture with multimedia presentation (drawings, photos, animations and illustrations of own research). A reference to content known to students in other subjects.

Project

Multimedia demonstration.

Project the power supply for selected object.

Analysis and discussion of various aspects (economic, environment al, legal and social), methods of problem solving. Detailed review of the project documentation. Discussion on the effects of work. Teamwork.

Laboratory

Detailed review of the report by the instruktor, including the evaluation of results and coclusions.Discussion of the effects of work. Teamwork.

## Bibliography

Basic

1. Jastrzębska G.: Energia ze źródeł odnawialnych i jej wykorzystanie, WKŁ, Warszawa, 2017.

2. Jastrzębska G. Odnawialne źródła energii i pojazdy proekologiczne, WNT, 2009.

3. Zimny J.: Odnawialne źródła energii w budownictwie niskoenergetycznym, Polska Geotermalna Asocjacja WNT/AGH Warszawa Kraków 2010.

Additional

1.Chwieduk D. : Energetyka w budynku, Wydawnictwo Arkady, 2011.

2. Wnuk R. Instalacje w domu pasywnym i energooszczędnym, Wydawnictwo Przewodnik Budowlany 2007, względnie Wnuk, R. : Budowa domu pasywnego w praktyce. Warszawa: Wydawnictwo Przewodnik Budowlany.2012

3. Praca zbiorowa Odnawialne i niekonwencjonalne źródła energii, Poradnik, Tarbonus 2008.

4. Jastrzębska G.: Akumulator jako źródło energii w Poradniku Montera Elektryka, PWN, Warszawa 2016.

5. Frydrychowicz-Jastrzębska G., Perez E.: Computer simulation of Power balance of a solar vehicle depending on its parameters and outsider factors, The International Conference on Renewable Energy and Power Quality, ICREPQ' 11, Las Palmas de Gran Canaria, 2011, April 13-15.

6. Frydrychowicz-Jastrzębska G., Perez E.: Symulacja osiągów pojazdu zasilanego energią Słońca w Barcelonie i w Warszawie,, II Konferencja Fotowoltaiki, Krynica Zdrój, 2011, 12- 15 maja.

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 155 | 6,0 |
| Classes requiring direct contact with the teacher | 95 | 4,0 |
| ,0Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation)[1] | 60 | 2,0 |

[1] delete or add other activities as appropriate