COURSE DESCRIPTION CARD - SYLLABUS

Course name
Municipal Energy Systems [S2IŚrod2-ZwCKiOP>SEK]

Course

Field of study
Environmental Engineering

Year/Semester
1/2

Area of study (specialization)
Heating, Air Conditioning and Air Protection

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
0

Other
0

Tutorials
15

Projects/seminars
15

Number of credit points

4,00

Coordinators

prof. dr hab. inż. Tomasz Mróz
tomasz.mroz@put.poznan.pl

dr hab. inż. Łukasz Amanowicz prof. PP
lukasz.amanowicz@put.poznan.pl

Lecturers

Prerequisites

1.Knowledge: Classification of renewable and non-renewable primary energy sources, evaluation of energy capacity of demand and supply side of energy market; , Principles of energy balancing, economic and ecological evaluation of energy systems in built environment. 2.Skills: Application of energy balance equation in evaluation of energy systems in built environment; Calculation of coefficients of energy, economic and ecologic efficiency of energy systems in built environment; 3.Social competencies: Awareness of the need to constantly update and supplement knowledge and skills.

Course objective

Purchase by the students the knowledge and skills in analysis of energy systems in communities and planning of their modernization and development

Course-related learning outcomes

Knowledge:

1. The student has a theoretical and practical knowledge on energy systems in communities
2. The student has a theoretical and practical knowledge on the structure and principles of exploitation of electro-energy systems in communities
3. The student has a theoretical and practical knowledge on the structure and principles of exploitation of gas systems in communities and has a theoretical and practical knowledge on the structure and principles of exploitation of district eating and district cooling systems in communities
4. The student knows the principles of demand and supply side analysis of energy markets in communities and market interdependences between energy sides
5. The student knows the methods of multicriteria aided planning of modernization and development of energy market in communities

Skills:
1. The student can evaluate the energy capacity of demand and supply side of energy market in communities
2. The student can identify and calculate the evaluation criteria of demand and supply side of energy markets in communities
3. The student can identify the basic trends of energy market development in communities
4. The student is able to use one of multicriteria analysis in planning of modernization and development of energy markets in communities

Social competences:
1. The student understands the need for teamwork in solving theoretical and practical problems
2. The student is aware of the need to sustainable development of energy markets in communities
3. The student sees the need for systematic increasing his skills and competences

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures:
Written examination multiple choice test consisting of 30 questions
Continuous assessment during lectures (rewarding activity of the students).
Classes:
- Final colloquium
Project:
- preparation and defending the project on energy planning,
- continuous assessment during lectures (rewarding activity of the students).

Programme content

The module program covers the following topics:
1. Introduction to the topic of municipal energy systems.
2. Review of selected solutions used in energy management.
3. Technical, economic, environmental and legal aspects related to energy management.

Course topics

Lectures:
Basic knowledge on energy systems in communities: energy market, demand and supply side of energy market, market interdependency;
Description of demand and supply side of electro-energy system in communities; Principles of evaluation of demand and supply side of electro-energy system in communities;
Description of demand and supply side of gas system in communities; Principles of evaluation of demand and supply side of gas system in communities;
Description of demand and supply side of distrct heating and district cooling energy system in communities; Principles of evaluation of demand and supply side of district heating and cooling energy;
Evaluation criteria of energy systems in communities based on energy, economy and ecological issues;
The structure of the existing and planned municipal energy systems - development prospects.
Examples of energy supply systems - case studies.
Possibilities of using renewable energy sources, increasing energy efficiency and reducing the environmental burden in the context of energy supply systems.

Associated energy management.
Project:
1.Energy planning for chosen Energy system in community

Teaching methods

none

Bibliography

Basic:
1. Szargut J., Ziębik A.: Termodynamika techniczna. Warszawa, WNT 2001.
2. Marecki J.: Podstawy przemian energetycznych. Warszawa, WNT 2000.
3. Chmielniak T: Technologie energetyczne. Warszawa, WNT 2008.
4. Szargut J., Guzik J.: Programowany zbiór zadań z termodynamiki technicznej. Warszawa, WNT 1980.
5. Rocznik statystyczny Rzeczpospolitej Polskiej 2010. Warszawa, ZWS 2011.
6. Mróz, T.M.: Planowanie modernizacji i rozwoju komunalnych systemów zaopatrzenia w ciepło. Wydawnictwo Politechniki Poznańskiej, seria rozprawy Nr 400, 2006,
7. Mróz T.M.: Energy Management in Built Environment. Tools and Evaluation Procedures, Wyd. Politechniki Poznańskiej 2013
8. Bagieński Z., Amanowicz Ł., Ciepłownictwo. Projektowanie kotłowni i ciepłowni, Wydawnictwo Politechniki Poznańskiej, Poznań 2018

Additional:
1. Kreith, F., West, R.E.: CRC Handbook of Energy Efficiency. CRC Press Inc. 1997.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50