COURSE DESCRIPTION CARD - SYLLABUS

Course name
Energy and buildings [S2ZE1E>EiB]

Course

Field of study
Green Energy

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
english

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

dr hab. inż. Katarzyna Ratajczak
katarzyna.m.ratajczak@put.poznan.pl

Lecturers

Prerequisites

Knowledge: basics of architectural design, building physics, general construction. Skills acquired in the subjects: architectural design, building physics, knowledge of the use of computer programs including: Excel and Word, ability to evaluate the effects on the movement of heat in buildings.

Course objective

Learning about methods of building energy assessment and energy balance in buildings (monthly method) for architectural and construction parameters used in Europe. Consideration of renewable and non-renewable energy sources in building energy balance. Design of a passive building located in Europe.

Course-related learning outcomes

Knowledge:
1. Student knows different methods of building energy assessment, including energy classifications of buildings used in different countries.
2. Student knows the basics of energy balance in buildings (monthly method) and tools for the analysis and design of energy-efficient and passive buildings.
3. Student knows construction and installation parameters affecting energy consumption in

buildings and the values of indicators concerning heat gain and loss in buildings.

Skills:
1. Student is able to use theoretical knowledge to assess the energy standard of the building.
2. Student is able to conduct a computer simulation of buildings, including the implementation of changes to improve the energy standard.
3. Student is able to assess the impact of various parameters of construction and installation on the value of usable, final and primary energy in the building.
4. Student is able to use software for energy simulation of buildings (designPH) and design of passive and energy efficient building (PHPP), which are commercially used for energy assessment of these buildings.
5. Student is able to prepare a report based on calculations and present the results with reference to the scientific and technical literature.

Social competences:
1. Student is able to present the results of his calculations and simulations to a group in a communicative way.
2. Student is aware of the different conditions of energy-saving construction and different energy standards used in different countries.
3. Student is aware of changes in energy indicators, the need to ensure low energy consumption in buildings and constantly update knowledge in this field due to changing requirements, including those of the European Union.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
Written exam covering the scope of issues presented during the lecture - open and closed (test).
Passig from 50%.
Laboratory-simulations - a pass in the form of a presentation of results for the whole group for selected variants. In addition, a complete report including a description of the results for all variants should be given.
Selection of the building variant for further detailed analysis takes place during the classes. The presentation should include a comparison of the obtained results to the results of scientific and technical literature.
The number of points to obtain is 100 and will be evaluated on:
− completeness of the report (Points will be awarded for each task performed and clear detailed conclusions, taking into account the calculations and simulations performed)
− presentation of results (form of presentation - clarity of slides, presentation of all important information, communicativeness of the presentation)
− comparison of own results to the scientific and technical literature
50 points are required to get a credit.
Laboratory-Project
Realization of a project in PHPP in two variants.
Evaluation includes:
− timeliness of the project,
− obtaining results for the variant with a traditional heat source and the variant with a renewable source,
The project should be submitted in electronic form –
− two calculation files
− a summary of the project, which will present a comparison of energy indicators for the building in two variants
50 points are required to get a credit.

Programme content

Lecture: Structure of energy consumption in building - energy crisis, introduction of methods of energy assessment of buildings. Changing regulations in the field of thermal protection of buildings. Energy balancing in buildings in terms of providing thermal comfort in buildings in winter and summer, mainly for architectural and construction parameters used in Europe. Energy balance in buildings (monthly

method), based on standard 13790. Basic information about the structures of HVAC systems in buildings.
Laboratories - simulations: analysis of the influence of variable data, mainly architectural and construction, on the energy balance in the building. The use of building modeling program designed for certification of designPH buildings. The course contents: building modeling, analysis of selected parameters, selection of recommended variant. Variants for usable, final and primary energy will be analyzed. Preparing a report and presenting the results to the group.
Laboratories - project: Building project implementation in Passive House Planning Package (PHPP) - a program dedicated to passive building certification. Introduction of the building, introduction of all data, introduction and description of installations in the building, including renewable energy sources. Comparative description of energy ratios for two variants.

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples, discussion.
2. Laboratory: multimedia presentation, performing energy simulations on computers - practical training.

Bibliography

Basic:
1. www.passivehouse.com
2. Tymkow P. et al. Building Services Design for Energy Efficient Buildings. Eartscan London and New York 2013
3. Sinacka, J. Ratajczak, K. Analysis of selected input data on Energy demand in Office buildings – case study, DOI: 10.1051/matecconf/201822201015

Additional:
Current Scientific and technical articles on the subcejt of Energy-efficient buildings searched at scholar.google.com.

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,00
Classes requiring direct contact with the teacher	45	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	45	1,50