

Course title: DESIGN OF ENERGY-EFFICIENT BUILDINGS

ECTS credit allocation (and other scores): 2

Semester: spring

Level of study: ISCED-7 - second-cycle programmes (EQF-7)

Branch of science: Engineering and technology

Language: English

Number of hours per semester: 30 classes, 15 lectures

Course coordinator/ Department and e-mail: dr inż. Piotr Kosiński / Institute of Building Engineering
piotr.kosinski@uwm.edu.pl

Type of classes: classes

Substantive content

CLASSES: Students in three-person teams perform a low-energy single-family house design in frame or brick technology. The design includes: structural calculations, solution of building nodes in order to minimize the influence of thermal bridges and secure the building against air filtration, as well as the designed energy performance of the building. Then students prepare a team presentation of their projects, which they present in class. The presentation is accompanied by a discussion in which all students from the exercise group participate

LECTURES: 1. Problems of energy consumption in the market. Energy intensity of construction and its impact on the environment. 2. Basic legal acts regarding the European Union's climate policy, including legal acts on energy efficiency in construction. 3. Definitions of energy-efficient buildings: low-energy, passive, zero-energy, plusenergy. Examples of global and national implementation. 4. Energy standard of the building. Technical requirements in the field of thermal insulation for buildings. 5. Basic features of an energy-efficient building. 6. The role of the right type of foundation for an energy-efficient building. 7. Constructional solutions in an energy-efficient building: external walls, roofs, flat roofs. 8. Insulations and airtightness in an energy-efficient building. 9. Rules for the selection of an appropriate ventilation, heating and cooling system in an energy-efficient building. The role of RES in the building's heating system. 10. Rules for the selection of window and door joinery for an energy-efficient house. The rules for installing window and door joinery. 11. Rules for the elimination of thermal bridges. 12. Sustainable construction, green and ecological construction

Learning purpose: The basic aim of education is to transfer knowledge and develop the ability to design energy-efficient buildings: low-energy and passive while meeting the conditions that buildings and their location should meet, as well as standards for designing energy-efficient buildings at application of modern construction and material solutions. An additional goal of education is to develop teamwork skills, good organization of work in a project team, creativity and the ability to search for unconventional solutions in designing.

On completion of the study programme the graduate will gain:

Knowledge: The student knows construction and material solutions suitable for energy-saving construction. The student knows how the appropriate design solutions affect the energy efficiency of the building and on environment. The student knows and applies the provisions of the construction law in the design of energy-efficient buildings.

Skills: The student is able to design the structural elements of an energy-efficient building. The student can choose the right tools to solve engineering problems.

Social Competencies: - Student completes and broadens knowledge in the field of modern solutions in energy-saving construction. The student is aware of the importance of the reliability of the work. The student is aware of the



sustainable development in construction, the impact of construction on the environment. The student can describe conclusions, formulate and present views.

Basic literature:

Carl-Eric Hagentoft. Introduction to Building Physics. ISBN 9144018967. Lund, Sweden : Studentlitteratur, 2001.

Supplementary literature:

Journal of Building Physics. ISSN: 1744-2591. <https://journals.sagepub.com/home/jen>

Energy and Buildings. ISSN: 0378-7788. <https://www.journals.elsevier.com/energy-and-buildings>

[Carl-Eric Hagentoft](#) Youtube channel

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 47

Student's independent work: 3