



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Sustainable building with universal design [S2Bud1E>BZzPU]

### Course

Field of study

Civil Engineering

Year/Semester

1/1

Area of study (specialization)

Sustainable construction and management

Profile of study

general academic

Level of study

second-cycle

Course offered in

English

Form of study

full-time

Requirements

compulsory

### Number of hours

Lecture

15

Laboratory classes

15

Other

0

Tutorials

10

Projects/seminars

0

### Number of credit points

2,00

### Coordinators

dr inż. Joanna Sinacka

joanna.sinacka@put.poznan.pl

dr inż. Marlena Kucz prof. PP

marlena.kucz@put.poznan.pl

### Lecturers

### Prerequisites

Knowledge in the field of building materials, general construction, building physics, and basics of energy - efficient construction. Proficiency in a foreign language enabling the use of specialized literature

### Course objective

Developing skills in analyzing buildings in terms of energy efficiency, energy demand, carbon footprint, and the impact of design solutions on users' comfort, health, and well-being. The course incorporates principles of sustainable development and the circular economy (GOZ - Circular Economy). It enhances competencies in universal and inclusive design, promoting health, safety, and well-being of users throughout the entire life cycle of the building.

### Course-related learning outcomes

Knowledge:

Student:

- Knows the basic concepts and principles of sustainable development and understands the need to implement them in construction processes.
- Understands the environmental impact of construction projects and is familiar with current regulations, national standards (PN), and European standards (EN) concerning sustainable and energy-efficient construction.
- Is familiar with currently used building materials and technologies in traditional, ecological, energy-efficient, and sustainable construction.
- Identifies architectural, communication, and digital barriers in the context of universal design and understands their significance for user comfort and accessibility.

Skills:

Student:

- Can incorporate proper technical solutions in building analyses and designs in accordance with the principles of sustainable development, calculate energy demand, and analyze the energy performance of buildings.
- Selects appropriate materials and construction technologies under complex conditions in traditional, ecological, sustainable, and energy-efficient construction.
- Can prepare a geodetic study of a construction project and carry out geodetic measurements at the stage of implementation and operation of selected construction facilities.
- Can prepare technical documentation using selected computer tools (e.g., SketchUp).
- Gains practical experience in identifying users' functional limitations as well as architectural, communication, and digital barriers, supporting universal and inclusive design.
- Can acquire information from literature, databases, and other sources, integrate it, interpret it creatively, draw conclusions, and present opinions.

Social competences:

Student:

- Consciously applies the principles of sustainable development in construction practice and understands the impact of structural, material, and technological solutions on the environment and building users.
- Understands the importance of communicating knowledge about sustainable construction to the public in an accessible and understandable manner.
- Is ready to independently expand knowledge in modern construction technologies and processes.
- Identifies architectural, communication, and digital limitations and barriers, and understands their impact on building accessibility and user comfort.
- Aware of the need to enhance professional and personal competencies, can critically assess their own knowledge and the information received.

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Grading Scale (according to the Regulations): Very Good (A, 5.0): 90-100% / Good Plus (B, 4.5): 80-89% / Good (C, 4.0): 70-79% / Satisfactory Plus (D, 3.5): 60-69% / Satisfactory (E, 3.0): 50-59% / Fail (F, 2.0): 0-49%

Lecture: written assessment.

Exercises: active participation using aging simulators and preparation of a housing design project following universal design principles (teamwork / presentation).

Laboratory: conducting an analysis of usable, final, and primary energy for heating, ventilation, and cooling of a base building, as well as sensitivity analysis for different input data. Reinforcement of energy-efficient building design principles. Preparation of a report for each task and presentation of results.

## Programme content

- Sustainable, energy-efficient, and eco-friendly construction.
- Regulations and standards, both national (PN) and European (EN), concerning buildings.
- Methodology for energy and multi-criteria building certification.
- Modern materials, technologies, and bioclimatic façades.
- Analysis of energy demand, carbon footprint, and energy performance.

- Principles of the Circular Economy (GOZ) in construction.
- Universal and inclusive design, and the impact of construction solutions on users' comfort, health, and well-being.

### Course topics

- Regulations, standards, and rules concerning energy-efficient construction.
- Energy and multi-criteria certification - methods and criteria.
- Modern building materials and technologies, including bioclimatic façades.
- Energy demand analyses and computer simulations.
- Circular Economy (GOZ) and sustainable building operation processes.
- Impact of construction solutions on users' comfort, health, and well-being.

### Teaching methods

Lecture: informational (multimedia) session and, for example, the De Bono's Six Thinking Hats method.

Exercises: workshop sessions using aging simulators, conducted in groups.

Laboratories: information sessions - presentation of topics necessary for task completion, discussion, work with building energy assessment software (e.g., designPH, PHPP), and consultations.

### Bibliography

Basic:

Feist W., et al., "Durability of building fabric components and ventilation systems in passive houses Energy Efficiency", (2020) 13:1543-1559

Sinacka J., Ratajczak K., Analysis of selected input data impact on energy demand in office building - case study, MATEC Web of Conferences - 2018, vol. 222, s. 01015-1-01015-8

Ana-Maria Dabija, Energy Efficient Building Design, Springer International Publishing, 2020

Sofia-Natalia Boemi, Olatz Irulegi, Mattheos Santamouris, Energy Performance of Buildings.

EnergyEfficiency and Built Environment in Temperate Climates, Springer International Publishing, 2016

Feist W.: Podstawy budownictwa pasywnego. PIBP Gdańsk 2007.

Wnuk R.: Instalacje w domu pasywnym i energooszczędnym. Przewodnik Budowlany 2007.

Recknagel H., Sprenger E., Schramek E.R.: Kompendium wiedzy: ogrzewnictwo, klimatyzacja, ciepła woda, chłodnictwo, Wydawnictwo Omni Scala, Wrocław 2008.

2008, 2014: METHODOLOGY ROZPORZADZENIE MINISTRA INFRASTRUKTURY w sprawie metodologii obliczania charakterystyki energetycznej budynku

Kronenberg J., Bergier T. (red.), Wyzwania zrównoważonego rozwoju w Polsce, Fundacja Sendzimira, Kraków 2010.

Kowalski K.: Włącznik 2.0 link [https://integracja.org/wp-content/uploads/2024/03/wlacznik\\_2\\_0\\_dostepny-.pdf](https://integracja.org/wp-content/uploads/2024/03/wlacznik_2_0_dostepny-.pdf)

Obowiązujące regulacje prawne - dyrektywy UE, normy. Agenda 2030.

Relevant legal regulations - EU directives, standards, etc. Agenda 2030.

Additional:

Teaching materials provided by lecturers

### Breakdown of average student's workload

|                                                                                                                                         | Hours | ECTS |
|-----------------------------------------------------------------------------------------------------------------------------------------|-------|------|
| Total workload                                                                                                                          | 80    | 2,00 |
| Classes requiring direct contact with the teacher                                                                                       | 40    | 1,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 45    | 1,00 |