



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Energy technology in construction [S2Bud1E-ZBZ>TEwB]

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

0

Other

0

Tutorials

0

Projects/seminars

15

Number of credit points

2,00

Coordinators

dr inż. Marlena Kucz prof. PP
marlena.kucz@put.poznan.pl

Lecturers

Prerequisites

Knowledge of building materials, basic physico-mechanical properties, topics in building physics, general construction issues, knowledge of English at B2 level

Course objective

The aim of the course Energy Technologies in Construction is to provide advanced knowledge on the design and evaluation of energy systems in buildings, with particular emphasis on energy efficiency, renewable energy sources, and modern energy management technologies.

Course-related learning outcomes

Knowledge:

Students:

have detailed and theoretically based knowledge in the field of building physics, related to heat and moisture migration in selected building units,

have detailed knowledge of the impact of building investments on the environment and understand the need to implement the rules of sustainable development,

know in detail the Act of Building Law, standards and recommendations for building unit design: Polish

standards (PN) and European standards (EN) as well as the technical conditions of constructing selected building units,

know in detail the rules of design, construction and operation of selected building unit.

Skills:

Students:

are able to prepare and analyse the energy balance of a selected building unit, match the materials and technologies to perform traditional, ecological, sustainable and energy-saving constructions in complex conditions,

can communicate in a foreign language at B2 level according to the Common European Framework of Reference for Languages; know technical vocabulary in the field of building engineering,

are able to obtain information from literature, databases and other properly selected information sources; can integrate the obtained information, interpret and evaluate it as well as draw conclusions, formulate, justify, discuss and present opinions,

are able to prepare a building unit design and technical documentation in the environment of selected CAD software, including the usage of BIM technology,

can make plans autonomously, carry out lifelong learning processes and direct others in this respect; can apply the obtained knowledge into building engineering in order to communicate with different target groups using specialized terminology and discuss important problems of building industry.

Social competences:

Students:

are ready to autonomously complete and broaden (extend) knowledge in the field of modern processes and technologies of building engineering,

are aware how important is sustainable development in building engineering,

can realise that it is necessary to improve professional and personal competence; are ready to critically evaluate the knowledge and received content,

understand the need to transfer to the society the knowledge about comprehensible manner.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture - A written final test assessing the student's knowledge of the material presented in the lectures. Passing grade in accordance with the university guidelines is 50%. Grading scale and assignment of grades to percentage ranges of results in accordance with the Study Regulations.

Project requirement: Completion of a building design project that incorporates energy efficiency considerations. The project must meet the following requirements: Compliance with applicable building law regulations and Technical Conditions; Use of appropriate material solutions affecting the building's energy efficiency; Consideration of solar energy utilization in both passive and active ways; Implementation of solutions to reduce energy consumption in the building.

The project scope includes both graphic and descriptive parts, in particular: Architectural and construction drawings (plans, sections, elevations); Description of the adopted design solutions; A brief cost analysis.

Programme content

The course covers topics related to building energy efficiency, energy balance, and legal requirements. Modern heating, ventilation, and air-conditioning systems are discussed, along with their integration with renewable energy sources. The course also addresses technologies for utilizing solar, geothermal, and biomass energy in construction, as well as BEMS (Building Energy Management Systems) for controlling and monitoring energy consumption, and intelligent energy management systems in buildings.

Course topics

Lectures: Introduction and energy requirements in construction; Building energy efficiency; Heating, cooling, and HVAC systems; Renewable energy sources in construction; Intelligent systems and energy management in buildings; Building energy audits and assessment; Economics and sustainable development in construction; Sustainable development goals

Building project with consideration of energy efficiency: The project includes both graphic and

descriptive components, in particular: Architectural and construction drawings (plans, sections, elevations); Description of the adopted design solutions; A brief cost analysis

Teaching methods

Lecture: Informative lecture with multimedia presentation, educational discussion (e.g., using the “Six Thinking Hats” method), case study analysis, lecture delivered remotely using online learning methods and techniques.

Project:

Project (development of individual or team projects); project consultations (individual and group); project corrections during class; case study analysis; problem-based discussion on design solutions.

Bibliography

Basic:

Brown GZ and DeKay M, Sun, wind & light, Architectural Design Strategies, 2nd ed., John Wiley & Sons 2001

Givoni B, Climate Considerations in Building and Urban Design, Van Nostrand Reinhold, 1998

Douglas Harris: Guide to Energy Management in Buildings, Routledge; 1 edition (November 30, 2011)

Haines, Roger W., Myers, Michael E., HVAC systems design handbook, McGraw-Hill, cop. 2010.

Rozporządzenie Ministra Infrastruktury w sprawie metodologii obliczania charakterystyki energetycznej budynku

Baird, G.; Aun, C.S.; Brauder, W.D.S.; Donn, M.R.; Pool, F., Energy performance of buildings, 2019

ISO 13790:2008, Energy performance of buildings - Calculation of energy use for space heating and cooling

Additional:

Buildings' Thermal Performance and Energy Efficiency for a Sustainable Construction, ebook - link

[https://mdpi-](https://mdpi-res.com/bookfiles/book/11647/Buildings_Thermal_Performance_and_Energy_Efficiency_for_a_Sustainable_Construction.pdf?v=1774318307)

[res.com/bookfiles/book/11647/Buildings_Thermal_Performance_and_Energy_Efficiency_for_a_Sustainable_Construction.pdf?v=1774318307](https://mdpi-res.com/bookfiles/book/11647/Buildings_Thermal_Performance_and_Energy_Efficiency_for_a_Sustainable_Construction.pdf?v=1774318307)

Energy Efficiency Applications in Buildings, ebook

Indoor Environment Quality and Health in Energy-Efficient Buildings, ebook, link - [https://mdpi-](https://mdpi-res.com/bookfiles/book/5282/Indoor_Environment_Quality_and_Health_in_EnergyEfficient_Buildings.pdf?v=1774317966)

[res.com/bookfiles/book/5282/Indoor_Environment_Quality_and_Health_in_EnergyEfficient_Buildings.p](https://mdpi-res.com/bookfiles/book/5282/Indoor_Environment_Quality_and_Health_in_EnergyEfficient_Buildings.pdf?v=1774317966)

[df?v=1774317966](https://mdpi-res.com/bookfiles/book/5282/Indoor_Environment_Quality_and_Health_in_EnergyEfficient_Buildings.pdf?v=1774317966)

Energy Efficiency in Buildings Both New and Rehabilitated, ebook - link [https://mdpi-](https://mdpi-res.com/bookfiles/book/2218/Energy_Efficiency_in_Buildings.pdf?v=1774317801)

[res.com/bookfiles/book/2218/Energy_Efficiency_in_Buildings.pdf?v=1774317801](https://mdpi-res.com/bookfiles/book/2218/Energy_Efficiency_in_Buildings.pdf?v=1774317801)

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00