# STUDY MODULE DESCRIPTION FORM

| Name of the module/subject | | Code |
|---|---|---|
| **Energy technology in construction** | | **1010112111010115652** |

| Field of study | Profile of study (general academic, practical) | Year /Semester |
|---|---|---|
| **Civil Engineering** | **(brak)** | **1 / 1** |
| Elective path/specialty | Subject offered in: | Course (compulsory, elective) |
| **-** | **Polish** | **obligatory** |

| Cycle of study: | Form of study (full-time,part-time) |
|---|---|
| **Second-cycle studies** | **full-time** |

| No. of hours | | | | No. of credits |
|---|---|---|---|---|
| Lecture: **15** | Classes: **-** | Laboratory: **15** | Project/seminars: **15** | **3** |

| Status of the course in the study program (Basic, major, other) | (university-wide, from another field) |
|---|---|
| **(brak)** | **(brak)** |

| Education areas and fields of science and art | ECTS distribution (number and %) |
|---|---|
| **technical sciences** | **3 100%** |

**Responsible for subject / lecturer:**

dr inż. MARLENA KUCZ
email: marlena.kucz@put.poznan.pl
tel. +48 61 6652864
Faculty of Civil and Environmental Engineering
ul. Piotrowo 5 60-965 Poznań

**Responsible for subject / lecturer:**

dr inż. KATARZYNA RATAJCZAK
email: KATARZYNA.M.RATAJCZAK@PUT.POZNAN.PL
tel. +48 61 6652864
Faculty of Civil and Environmental Engineering
ul. Piotrowo 5 60-965 Poznań

## Prerequisites in terms of knowledge, skills and social competencies:

| | | |
|---|---|---|
| 1 | **Knowledge** | Methods to minimise energy use in buildings. Basic ways to estimate life cycle of building elements and energy calculations, knowledge of generation methods, accumulation and sustainable use of energy. |
| 2 | **Skills** | Ways to acquire and analyse information from various sources. Ability to assess heat flows, ability to differentiate heat sources used in buildings and calculate effects of their operation. Ability to use computer software based on BIM principles. |
| 3 | **Social competencies** | Professional responsibility of engineers as the ?environment stewards? and representatives of the society in regard to environmental changes. The need for life-long learning, ability to work in teams and accepting various societal roles and responsibilities. |

## Assumptions and objectives of the course:

Recognition of the issues related to minimisation of energy use in buildings and by the building industry, differentiation of various energy sources, with the focus on the renewable ones; implementation of the acquired knowledge in buildings.

## Study outcomes and reference to the educational results for a field of study

### Knowledge:

1. Student knows the basic European norms of energy demand in apartment buildings/dwellings - [W06]
2. Student knows principles of building basic structural elements in buildings - [W05, W07]
3. Student knows standards and regulations regarding design of buildings and their elements - [W06, W07]
4. Student knows software and calculation procedures used in design - [W08]
5. Student knows basic relationships between decisions regarding choice of materials , technologies and construction methods and their energy outcomes - [W13, W19]

### Skills:

1. Utilising computer software to model building engineering objects - [U05]
2. Ability to perform basic energy calculations for a building - [U08, U17]
3. Ability to design building structures utilising passive methods of providing energy - [U05, U17]

### Social competencies:

1. Student can identify and solve problems related to variety of engineering solutions - [K04]
2. Student can cooperate in a team and provide leadership to the group - [K01]
3. Student is conscious of the need for sustained development of his personal abilities - [K03, K06]
4. Student can think and act creatively - [K03]
5. Student understands the need for sustainable building - [K04, K07]

## Assessment methods of study outcomes

The final test checking command of knowledge taken from lectures.

Scale of marks (given as a percentage points)

| | |
|---|---|
| 91-100 | very good (A) |
| 81 - 90 | good + (B) |
| 71 - 80 | good (C) |
| 61 - 70 | pass + (D) |
| 51 - 60 | pass (E) |
| below 50 | fail (F) |

## Course description

1. Sustainable building
2. How to design an energy efficient building
3. Energy Calculation - methodology,
4. LCC, life cycle of the building,
5. BEMS - Building Management System (control and monitoring of energy consumption), Energy management in the building Intelligent systems,
6. Energy efficiency in buildings - practical examples, Case study: Improving energy efficiency

Project and laboratory:

- Energy-efficient building design based on BIM and analysis of ecological aspect and cost - LCC, Optimum solution for set boundary conditions in term of cost end energy- heating, insulation, heat recovery

Lecturer: dr inż. M.KUCZ, d inż. K.Ratajczak, mgr inż. R.Milwicz

## Basic bibliography:

1. Brown GZ and DeKay M Sun, wind & light, architectural design strategies 2nd ed. John Wiley & Sons 2001
2. Givoni B Man, climate & architecture 2nd ed. Van Nostrand Reinhold 1981
3. Givoni B Climate considerations in building and urban design Van Nostrand Reinhold 1998
4. Goulding JR, Lewis O and Steemers TC Energy in architecture Comm. of the European Communities 1993
5. Olgyay V Design with climate Van Nostrand Reinhold 1992 (repr.)
6. 2008, 2014: METHODOLOGY ROZPORZADZENIE MINISTRA INFRASTRUKTURY w sprawie metodologii obliczania charakterystyki energetycznej budynku
7. Włodarczyk J., Podosek Z, Systemy teletechniczne budynków inteligentych : okablowanie strukturalne, instalacje elektryczne, systemy alarmowe, systemy kontroli dostępu, sieci domowe, systemy HVAC, systemy przeciwpożarowe, Przedsiębiorstwo Badawczo-Projektowo-Wdrożeniowe Cyber : Bel Studio, 2002
8. Baird, G. ; Aun, C.S. ; Brauder, W.D.S. ; Donn, M.R. ; Pool, F. Energy performance of buildings ,
9. Zunde J and Bougdah H Integrated strategies in architecture Taylor & Francis 2006
10. ISO 13790:2008, Energy performance of buildings - Calculation of energy use for space heating and cooling

## Additional bibliography:

1. Ad van Wijk, Welcome in the green village. IOS Press, Delft 2013
2. Lennart J. Lundqvist, Sweden and ecological governance. Manchester University Press, Manchester 2004
3. Costanza R., Building a Sustainable and Desirable Economy-in-Society-in-Nature,ANU E Press, Canberra 2012
4. Berardi U., Moving to Sustainable Buildings: Paths to Adopt Green Innovations in Developed Countries.Versita,London 2013
5. EN ISO 13790:2006, Heating systems in buildings - Method for calculation of system energy requirements and system efficiencies

## Result of average student's workload

| Activity | Time (working hours) |
|---|---|
| 1. Classes participation | 45 |
| 2. Works preparation | 30 |
| 3. Computer work | 15 |
| 4. Works finishing | 15 |

| Student's workload | | |
|---|---|---|
| **Source of workload** | **hours** | **ECTS** |
| Total workload | 100 | 3 |
| Contact hours | 50 | 2 |
| Practical activities | 45 | 1 |