COURSE DESCRIPTION CARD - SYLLABUS

Course name
Heating

Course

Field of study
Environmental Engineering Extramural First

Year/Semester
3/5

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
16

Laboratory classes

Other (e.g. online)

Tutorials
10

Projects/seminars
10

Number of credit points

4

Lecturers

Responsible for the course/lecturer:
prof. dr hab. inż. Halina Koczyk

email: halina.koczyk@put.poznan.pl

tel. (61) 6652532

Faculty of Environmental Engineering and Energy

ul. Berdychowo 4, 61-131 Poznań

Responsible for the course/lecturer:
dr hab. inż. Małgorzata Basińska

email: malgorzata.basinska@put.poznan.pl

tel. (61) 6475224

Faculty of Environmental Engineering and Energy

ul. Berdychowo 4, 61-131 Poznań

Prerequisites

1.Knowledge: The student has knowledge in the following areas: mathematics, building physics, basics of thermal engineering and fluid mechanics, needed to formulate and solve simple tasks. The student is familiar with applicable building envelopes solutions.

2.Skills:

The student is able to solve the problems of fluid mechanics and thermal engineering, and can draw and read construction drawings.

3.Social competencies:

The student is aware of the need to constantly update and supplement knowledge and skills.

Course objective

Acquiring by students basic knowledge and skills in the scope of the basics of water heating design

Course-related learning outcomes

Knowledge

1. The student has knowledge of thermal parameters of the internal environment associated with heating systems. - [KIS_W07]

2. The student knows the basic solutions of heating installations of buildings and their components. - [KIS_W07]

3. The student knows the basic requirements for building thermal protection. - [KIS_W05]

4. The student has the knowlegde of the calculation of heat transfer coefficients for building envelopes, designed heat load for individual rooms and the building, selection of radiators and protection of the system. - [KIS_W05, KIS_W06]

5. The student has knowledge of hydraulic calculations of water heating installations, including the determination of circulation pressure, pressure losses in circuits and installation characteristics. - [KIS_W02, KIS_W04]

Skills

1. The student can propose a concept solution for the heating system in a small building with a single utility function as well as a developed view of central heating system - [KIS_U01, KIS_U06, KIS_U07, KIS_U08]

2. The student can calculate the designed heat load for individual rooms and the building as well as design the basic elements of central heating installation. - [KIS_U09

Social competences

1. The student understands the need for teamwork in solving theoretical and practical problems. - [KIS_K03, KIS_K04]

2. The student is aware of the importance and understand the non-technical consequences of engineering activities, including the impact on the environment. - [KIS_K02]

3. The student sees the need for extending their competence systematically. - [KIS_K01]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: final test (positive grade from 45%) effects W2, W4, W5, W6, W7

Recitation classes

are credited on the basis of successful completion of the final test tasks.

Class Projects

are credited on the basis of the thermal part of project design of the heating system for a small building made in traditional technique and an oral defence of the project.

Programme content

Factors of external climate and their effect on the heat balance of the building. Thermal comfort. The external climate factors and their impact on the building energy balance. Calculation of heat and moisture transfer for building envelopes. Thermal protection requirements according to building regulations. Calculations of heat transfer coefficients for the envelopes consisting of homogeneous and heterogenous layers. Thermal bridges, their effects and how they can be included in the design calculations. The heat balance of buildings under design conditions and during the heating season. Calculations of the design heat load. Tasks and classification of heating systems. Schemes of modern heating solutions for housing levels. Expansion facilities in heating systems. Diagrams of solutions of the levels of housing in modern hesting systems. Protection of heating systems (diagrams and calculation formulas).Principles of pipe dimensioning in water heating. Circulation pressure. Pressure losses of circuits. The definition of pipe section and circuit. Pipes used in heating installations. Materials and their characteristics. Compensation for thermal line extension. Thermal insulation of heating installations. . Thermostatic valves. Hydraulic stabilization of heating system. Types of regulators, installation diagrams. Heaters classification. Requirements and rules for the selection of convection heaters

Teaching methods

Informative lecture with seminar elements, lecture with multimedia presentation

Exercises - exercise method

Individual project, case study

Bibliography

Basic

1. Koczyk H., Antoniewicz B., Basińska M., Górka A., Makowska-Hess R.: Ogrzewnictwo Praktyczne projektowanie, montaż, certyfikacja energetyczna, eksploatacja Systherm Serwis, Poznań 2009

2. Recknagel, Schramek, Sprenger, Honmann: Kompendium wiedzy OGRZEWNICTWO, KLIMATYZACJA, CIEPŁA WODA, CHŁODNICTWO 08/09 OMNI SCALA, Wrocław, 2008

3. Koczyk H., Antoniewicz B., Basińska M., Górka A., Makowska-Hess R.: Ogrzewnictwo Praktyczne projektowanie, montaż, certyfikacja energetyczna, eksploatacja Systherm Serwis, Poznań 2009

4. Recknagel, Schramek, Sprenger, Honmann: Kompendium wiedzy OGRZEWNICTWO, KLIMATYZACJA, CIEPŁA WODA, CHŁODNICTWO 08/09 OMNI SCALA, Wrocław, 2008

Additional

1. Klemm P. (red.): Budownictwo ogólne tom II. Wydawnictwo Arkady 2005

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	36	1,5
Student's own work (literature studies, preparation for tutorials, preparation for tests, project preparation) [1]	64	2,5

[1] delete or add other activities as appropriate