STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Heating**		Code **1010134261010130187**
Field of study **Environmental Engineering Extramural First-**	Profile of study (general academic, practical) **(brak)**	Year /Semester **3 / 6**
Elective path/specialty **-**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **part-time**	
No. of hours Lecture: **16** Classes: **6** Laboratory: **-** Project/seminars: **10**		No. of credits **4**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art **technical sciences**		ECTS distribution (number and %) **4 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

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.

Assumptions and objectives of the course:

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

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

Knowledge:

1. The student has theoretically underpinned, organized general knowledge of issues related to the installation of central heating. - [-]
2. The student has structured knowledge on the developments in the field of heating systems. - [-]
3. The student knows the requirements for thermal protection and energy ratings of heating systems as well as the building regulations related to heating systems. - [-]
4. The student knows the calculation methods, design techniques, tools and materials used in solving engineering tasks related to heating systems design. - [-]

Skills:

1. The student can assess the heating, ventilation and hot water systems in terms of energy use - [-]
2. The student can design a central heating installation, configure a small heat source for the purposes of heating and hot water systems and justify the choice of individual components in terms of computation. - [-]

Social competencies:

1. The student understands the need for teamwork in solving theoretical and practical problems. - [-]
2. The student is aware of the importance and understand the non-technical consequences of engineering activities, including the impact on the environment. - [-]
3. The student sees the need for extending their competence systematically. - [-]

Assessment methods of study outcomes

Lectures

Written examination followed, in case of doubt, by an oral examination.

Final evaluation of the exam takes into account the result of the test and grades earned for the recitation and design exercises

Recitation classes

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

Class Projects

? are credited on the basis of the project design of the heating system for a small building with a small heat source for the purposes of heating and hot water systems made in traditional technique and an oral defence of the project.

Course description

Calculations of the energy needs, delivered energy and primary energy for heating, ventilation and domestic hot water purposes - basic computational methodology based on energy certificates. Heat sources. Principles of design, selection of boilers and requirements for small boiler rooms for heating and hot water purposes. Waste gas disposal systems. Chimney classification. Examples of solutions for modern boilers. Gas supply installations for boiler rooms for the gas lighter and heavier than air. Oil fuel storage. Oil supply installations. Requirements for oil fuel storage rooms in the building. Control of boiler for the needs of heating. Hot water systems arrangements. Selection of hot water system depending on hot water demand and its variability. Methods for implementing the priority of hot water. The annual fuel demand for heating and hot water. . Panel heating systems. Advantages and limitations of use. Example solutions of floor and wall heaters. Differences in selection of conventional and panel heater. Thermal and technological requirements for floor heating. Radiator - floor systems. The tasks and types of operational control. Theoretical basis of qualitative and quantitative regulation. Chart control for weather control. Pumps in heating and hot water systems - principles of selection. The use of solar energy for heating systems. Systems diagrams. Types of solar collectors. Rules for the selection and placement of collectors. Heat pumps in heating systems ? the conditions of use.

Basic bibliography:

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. Mizielińska K., Olszak J.: Gazowe i olejowe źródła ciepła małej mocy. Oficyna Wydawnicza Politechniki Warszawskiej. Warszawa 2005

Additional bibliography:

1. Chwieduk D.: Energetyka słoneczna budynku Arkady Warszawa 2011

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

Result of average student's workload

Activity	Time (working hours)

Student's workload

Source of workload	hours	ECTS
Total workload	120	4
Contact hours	39	2
Practical activities	16	1