STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Special Purpose Heating Systems**		Code **1010134281010135185**
Field of study **Environmental Engineering Extramural First-**	Profile of study (general academic, practical) **general academic**	Year /Semester **4 / 8**
Elective path/specialty **-**	Subject offered in: **Polish**	Course (compulsory, elective) **elective**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **part-time**	
No. of hours Lecture: **14** Classes: **12** Laboratory: **-** Project/seminars: **-**		No. of credits **4**
Status of the course in the study program (Basic, major, other) **major**	(university-wide, from another field) **from field**	
Education areas and fields of science and art		ECTS distribution (number and %**)**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Knowledge of heat transfer, fluid mechanics and thermal systems operation.
2	**Skills**	Engineering calculations and equipment sizing in basic thermal systems.
3	**Social competencies**	Awareness of the need to constantly update and supplement one's knowledge and skills.

Assumptions and objectives of the course:

Students will acquire basic knowledge in the design of special thermal systems, particularly industrial installations.

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

Knowledge:

1. Student has basic knowledge of thermal systems used in industrial plants - [[K_W05]]
2. Student knows common thermal fluids and their properties - [[K_W05]]
3. Student knows calculation methods, design techniques and tools used during design process - [[K_W04]]
4. Student has the knowledge associated with balancing energy, heat transfer, flow of heating media - [[K_W04]]

Skills:

1. Student can choose the type of heating system appropriate for specific application - [[K_U11, K_U14]]
2. Student can perform the calculation and sizing for piping and ather equipment for a particular system - [[K_U13, K_U15, K_U16]]
3. Student is able to devise control algorithm for simple thermal system - [[K_U13]]

Social competencies:

1. The student sees the need for extending their competence systematically - [[K_K01]]
2. The student is aware of the importance and understand the non-technical consequences of engineering activities, including the impact on the environment - [[K_K02]]

Assessment methods of study outcomes

Lecture: written test.

Seminars: written test.

Course description

Industrial thermal systems: the specifics of various industrial processes, most common solutions, different thermal fluids, different heat exchangers. Balancing of the installation: instantaneous demand, energy consumption, operating cost. Regulation and control of industrial thermal systems. Calculating and sizing of pipelines and other equipment. Different materials. Installation layout. Examples of specific thermal systems.

Basic bibliography:

1. Poradnik GESTRA (Flowserve), wydanie 7 (2010)
2. Parowe źródła ciepła, Krystyna Mizielińska, Jarosław Olszak, WNT 2012
3. Steam and Condensate Loop, Spirax Sarco (first or second edition, 2008-2011)
4. Odzysk i zagospodarowanie niskotemperaturowego ciepła odpadowego ze spalin wylotowych, Kizimierz Wójs, PWN 2015

Additional bibliography:

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	14
2. Participation in seminars	12
3. Preparation for final tests	20

Student's workload

Source of workload	hours	ECTS
Total workload	46	4
Contact hours	26	3
Practical activities	12	1