

(faculty stamp)

**COURSES DESCRIPTION**

<b>1. Course title: SELECTED PROBLEMS OF DISTRICT HEATING SYSTEMS</b>		<b>2. Course code:</b>		
<b>3. Validity of course description: from 2012/2013</b>				
<b>4. Level of studies: 2<sup>nd</sup> cycle of higher education</b>				
<b>5. Mode of studies: <u>intramural studies</u> / extramural studies<sup>1</sup></b>				
<b>6. Field of studies: POWER ENGINEERING</b>				
<b>7. Profile of studies: <u>academic</u> / practical<sup>1</sup></b>				
<b>8. Speciality: Gas and distributed power engineering</b>				
<b>9. Semester: 1</b>				
<b>10. Faculty teaching the course: Institute of Power Engineering and Turbomachinery</b>				
<b>11. Course teacher: dr inż. Anna Skorek-Osikowska</b>				
<b>12. Course classification: Professional</b>				
<b>13. Course status: compulsory</b>				
<b>14. Course language: English</b>				
<b>15. Pre-requisite qualifications: heat flow, thermodynamics, energy management</b>				
<b>16. Objective of the course: provide knowledge on selected problems of designing, optimization and exploitation of district heating systems. Transfer of knowledge on selected issues of design and operation of heating systems.</b>				
<b>17. Learning outcomes: <sup>1</sup></b>				
Nr	Learning outcomes description	Method of evaluation	Teaching methods	Learning outcomes reference code
1	Student can describe heat sources used in district heating systems	Test	Lecture	K_W10 K_W16
2	Student knows types of district heating systems and is able to determine losses connected to the flow of a medium in pipelines	Test	Lecture	K_W09 K_W14 K_U15
3	Student can perform thermal and hydraulic calculations of district heating pipelines	Test	Class	K_W09 K_W17 K_U15

<sup>1</sup> należy wskazać ok. 5 – 8 efektów kształcenia

4	Student knows the principles of the design of heating systems, can calculate the heat demand and construct ordered diagram of heat load	Test	Class	K_W09 K_U15
5	Student can conduct analysis of the influence of the selected parameters on the energy and economic efficiency of the whole heating system	Test	Class	K_W14 K_U22 K_U16
<b>18. Teaching modes and hours (hours)</b>				
15 Lecture 15 Classes				
<b>19. Syllabus description:</b>				
<b>Lectures:</b>				
Reasons for development of centralized heat sources. Fuels used for supplying heat sources in district heating systems including waste derived fuels and biomass. Ordered diagram of heat load and determination of heat demand. Principles of designing of heat sources. Safety devices in the plants. Types of media used in district heating systems. Types and configuration of district heating networks. Principles of calculating pipe diameters and selection of the parameters of the circulating media. Principles of hydraulic calculations of district heating networks. Principles of calculating heat loss in district heating networks. Mathematical modeling. Heat exchangers. Principles of regulation of heating networks.				
<b>Class:</b>				
Computational examples illustrating the lectures – determination of the heat demand, thermal and hydraulic calculations of district heating systems: designing of district heating systems.				
<b>20. Examination: <u>yes</u> no<sup>1</sup></b>				

<b>21. Primary sources:</b>
Kamler W. Ciepłownictwo. Państwowe Wydawnictwo Naukowe. Warszawa 1976.
Górecki J. Sieci ciepłownicze. Oficyna wydawnicza Politechniki Wrocławskiej. Wrocław 1997.
<b>22. Secondary sources:</b>
Nantka M. Ogrzewnictwo i ciepłownictwo. Wydawnictwo Politechniki Śląskiej. Gliwice 2006
Grabarczyk C. Przepływy cieczy w przewodach. Metody obliczeniowe. ENVIROTECH. Poznań 1997.
Krygier K., Klinke T., Sewerynik J. Ogrzewnictwo, Wentylacja, Klimatyzacja. Wydawnictwa Szkolne i Pedagogiczne. Warszawa 1995.
Randlov P. Podręcznik ciepłownictwa – system rur preizolowanych. European District Heating Pipe Manufacturers Association, Brussels, 1998.
Recknagel, Springer, Hönnmann, Schramek. Poradnik ogrzewanie i klimatyzacja. EWFE. Gdańsk 1994.
Szczechowiak E. Energooszczędne układy zaopatrzenia budynków w ciepło - budowa i eksploatacja. Envirotech, 1994.
Szłęk A. Zarys ciepłownictwa. PRATERM S.A. Gliwice 2005

<b>23. Total workload required to achieve learning outcomes</b>		
Lp.	Teaching mode	Contact hours / Student workload hours
1	Lecture	15/30
2	Classes	15/30
3	Laboratory	/
4	Project	/
5	BA/MA Seminary	/
6	Other	/
	Total number of hours	30/60
<b>24. Total hours: 90</b>		
<b>25. Number of ECTS credits:<sup>2</sup> 3</b>		
<b>26. Numbers of ECTS credit allocated for contact hours: 1</b>		
<b>27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 2</b>		
<b>26. Comments:</b>		

Approved:

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 (date and instructor's signature)

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 (date, the Director of the Faculty Unit signature)

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<sup>2</sup> 1 ECTS point – 30 hours