MODULE SPECIFICATION

Module code	
Module title in Polish	Ogrzewnictwo
Module title in English	Heating Systems
Module running from the academic year	2016/2017

A. MODULE IN THE CONTEXT OF THE PROGRAMME OF STUDY

Field of study	Environmental Engineering
Level of qualification	first cycle (first cycle, second cycle)
Programme type	academic (academic/practical)
Mode of study	full-time (full-time/part-time)
Specialism	Sanitary Pipelines and Systems; Water Supply, Treatment of Wastewater and Solid Waste
Organisational unit responsible for module delivery	Department of Piped Utility Systems
Module co-ordinator	Łukasz Orman, PhD hab., Eng.
Approved by:	Prof. Andrzej Kuliczkowski, PhD hab., Eng.

B. MODULE OVERVIEW

Module type	core module (core/programme-specific/elective HES*)
Module status	compulsory module (compulsory/optional)
Language of module delivery	English
Semester in the programme of study in which the module is taught	semester 5
Semester in the academic year in which the module is taught	winter semester (winter semester/summer semester)
Pre-requisites	None (module code/module title, where appropriate)
Examination required	Yes (Yes/No)
ECTS credits	4

* elective HES – elective modules in the Humanities and Economic and Social Sciences

Mode of instruction	lectures	classes	laboratories	project	others
Total hours per semester	15	15		15	

C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The aim of the module is to learn and master the issues of thermal balance of a building; other aims include: learning basic types of heating installations as well as their components; together with the principles of designing and exploiting them.

Module outcome code	Module learning outcomes	Mode of instruction *(l/c/lab/p/ others)*	Corresponding programme outcome code	Corresponding discipline-specific outcome code
W_01	A student knows physiological fundamentals (together with thermal comfort); a student is also familiar with meteorological and climatic conditions.	l/p	IŚ_W10	T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_02	A student knows the principles of heat transfer in a room.	l/c/p	IŚ_W10	T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_03	A student knows basic sources of obtaining heat as well as the methods of warehousing fuel.	l/p	IŚ_W10	T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_04	A student knows the principles of designing a boiler room, boiler and radiator types.	l/c/p	IŚ_W10	T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_05	A student knows the characteristics and components of heating systems.	l/p	IŚ_W10	T1A_W04 T1A_W05 T1A_W06 T1A_W07
U_01	A student can determine the demand for heat in a building.	l/c/p	IŚ_U19	T1A_U03 T1A_U05 T1A_U07 T1A_U08 T1A_U09 T1A_U10 T1A_U11 T1A_U13 T1A_U14 T1A_U15 T1A_U16
U_02	A student can select the components of heating systems.	l/p	IŚ_U21	T1A_U03 T1A_U05 T1A_U07 T1A_U08 T1A_U09 T1A_U10 T1A_U11 T1A_U13 T1A_U14 T1A_U15 T1A_U16
U_03	A student can make hydraulic calculations of central heating ducts networks.	l/p	IŚ_U22	T1A_U07 T1A_U09 T1A_U15
K_01	A student is responsible for the reliability of the obtained results.	c/p	IŚ_K02	T1A_K02 T1A_K05
K_02	A student can formulate conclusions and describe the results of the obtained work.	c/p	IŚ_K07	T1A_K07

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1.	Introductory classes. Meteorological and climatic conditions. Physiological fundamentals and thermal comfort.	W_01
2.	Heat transfer in a room. Thermal balance of a building, determining demand for heat in a building.	W_02 U_01
3.	Basic sources of obtaining heat. The methods of warehousing fuel. Gas installations.	W_03
4.	Heating boilers (their division, types, and structure). The principles of designing boiler rooms. Heat centres.	W_05 U_02
5.	Heating systems (their division, characteristics, and components – devices and fittings, protection systems, the advantages and disadvantages of various solutions).	W_05 U_02
6.	The division, types, and selection of radiators.	W_04 U_02
7.	The principles of conducting hydraulic calculations as regards central heating ducts networks	U_03

2. Topics to be covered in the classes

No.	Topics	Module outcome code
1.	Heat transfer through building dividing structures.	W_02 U_01 K_01 K_02
2.	Calculating seasonal demand for heat in a building.	W_02 U_01 K_01 K_02
3.	Calculations connected with fuel combustion in central heating boilers.	W_04 K_01 K_02

3. Topics to be covered in the project

No.	Topics	Module outcome code
1.	Introductory classes, project assumptions.	W_01 W_02 K_01 K_02
2.	Calculating heat losses for a detached residential building, selecting radiators.	W_04 W_05 U_01 U_02 K_01 K_02
3.	Hydraulic calculation and distributing the network of ducts, selecting a boiler.	W_04 W_05 U_02 U_03 K_01 K_02
4.	Making drawings.	U_03 K_01 K_02

Assessment methods

Module outcome code	Assessment methods *(Method of assessment; for module skills – reference to specific project, laboratory and similar tasks)*
W_01	An exam and a project
W_02	An exam, a test and a project
W_03	A test and a project
W_04	An exam, a test and a project
W_05	An exam and a project
U_01	An exam, a test and a project
U_02	A test and a project
U_03	A test and a project
K_01	A discussion and a project
K_02	A test and a project

D. STUDENT LEARNING ACTIVITIES

ECTS summary		
	Type of learning activity	**Study time/ credits**
1	Contact hours: participation in lectures	**15**
2	Contact hours: participation in classes	**15**
3	Contact hours: participation in laboratories	
4	Contact hours: attendance at office hours (2-3 appointments per semester)	**3**
5	Contact hours: participation in project-based classes	**15**
6	Contact hours: meetings with a project module leader	**2**
7	Contact hours: attendance at an examination	**10**
8		
9	**Number of contact hours**	**60** *(total)*
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**2.4**
11	Private study hours: background reading for lectures	**10**
12	Private study hours: preparation for classes	
13	Private study hours: preparation for tests	**10**
14	Private study hours: preparation for laboratories	
15	Private study hours: writing reports	
16	Private study hours: preparation for a final test in laboratories	
17	Private study hours: preparation of a project/a design specification	**10**
18	Private study hours: preparation for an examination	**10**
19		
20	**Number of private study hours**	**40** *(total)*
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**1.6**

22	**Total study time**	**100**
23	**Total ECTS credits for the module** *(1 ECTS credit =25-30 hours of study time)*	**4**
24	**Number of practice-based hours** *Total practice-based hours*	**27**
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	**1.08**

E. READING LIST

References	1. Brumbaugh, James E., Audel HVAC fundamentals. Vol. 1, Heating systems, furnaces, and boilers, Indianapolis: Wiley Publishing, cop. 2004, all new 4th ed. 2. Brumbaugh, James E., Audel HVAC fundamentals. Vol. 2, Heating system components, gas and oil burners, and automatic controls, Indianapolis: Wiley Publishing, cop. 2004, all new 4th ed. 3. Babiarz, Bożena, Heating system designing, Rzeszów: Oficyna Wydawnicza Politechniki Rzeszowskiej, 2015 4. Ward, Ray, Domestic central heating wiring systems and controls, Oxford ; Burlington: Newnes, 2007 5. Michael J. Moran, Introduction to thermal systems engineering: thermodynamics, fluid mechanics, and heat transfer, New York : John Wiley & Sons, Inc., 2003
Module website	