



MODULE SPECIFICATION

Module code	
Module title in Polish	Układy chłodnicze i klimatyzacyjne
Module title in English	Refrigeration and Air-conditioning (RAC) Modules
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
Organisational unit responsible for module delivery	Department of Piped Utility Systems
Module co-ordinator	Tadeusz Orzechowski, PhD hab., Eng., Professor of the University
Approved by:	Prof. Andrzej Kulickowski, PhD hab., Eng.

B. MODULE OVERVIEW

Module type	programme-specific module (core/programme-specific/elective HES*)
Module status	optional module (compulsory/optional)
Language of module delivery	Polish/ English
Semester in the programme of study in which the module is taught	semester 7
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	No (Yes/No)
ECTS credits	1

* 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				



C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The aim of the module is to learn basic devices of cooling and air conditioning systems (together with the principles of operation), the criteria of selecting devices and apparatuses being part of a simple refrigeration and air conditioning system with the use of a heat balance of the refrigerated object.
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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 basic processes of the refrigeration and air conditioning technology (as well as cooling systems).	l	IS_W10	T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_02	A student knows the methods of accumulating cold, cooling factors and coolants.	l	IS_W10	T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_03	A student knows basic operations of steam compressor coolers and the principles of heat balance as regards the refrigerated objects.	l	IS_W08 IS_W10	T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07
U_01	A student can select cooling and air conditioning devices (a student can also thermally balance refrigerated objects).	l	IS_U03 IS_U19	T1A_U02 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 prepare a project concept of a cooling and air conditioning installation.	l	IS_U03 IS_U19	T1A_U02 T1A_U03 T1A_U05 T1A_U07 T1A_U08 T1A_U09 T1A_U10 T1A_U11 T1A_U13 T1A_U14 T1A_U15 T1A_U16
K_01	A student can formulate conclusions and describe the results of the obtained work.	l	IS_K07	T1A_K07

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1.	Basic processes of the cooling and air conditioning technology.	W_01 U_02
2.	The accumulation of cold, cooling factors, and coolants.	W_02 U_02
3.	The devices of steam compressor coolers.	W_03



4.	Thermal balancing of the refrigerated objects.	U_01 W_03 U_01 K_01
5.	Cooling systems.	W_01 U_02

Assessment methods

Module outcome code	Assessment methods <i>(Method of assessment; for module skills – reference to specific project, laboratory and similar tasks)</i>
W_01	A test
W_02	A test
W_03	A test
U_01	A test
U_02	A test
K_01	A test

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	
3	Contact hours: participation in laboratories	
4	Contact hours: attendance at office hours (2-3 appointments per semester)	5
5	Contact hours: participation in project-based classes	
6	Contact hours: meetings with a project module leader	
7	Contact hours: attendance at an examination	
8		
9	Number of contact hours	20 <i>(total)</i>
10	Number of ECTS credits for contact hours <i>(1 ECTS credit = 25-30 hours of study time)</i>	0.8
11	Private study hours: background reading for lectures	3
12	Private study hours: preparation for classes	
13	Private study hours: preparation for tests	2
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	
18	Private study hours: preparation for an examination	
19		
20	Number of private study hours	5



		<i>(total)</i>
21	Number of ECTS credits for private study hours <i>(1 ECTS credit =25-30 hours of study time)</i>	0.2
22	Total study time	25
23	Total ECTS credits for the module <i>(1 ECTS credit =25-30 hours of study time)</i>	1
24	Number of practice-based hours <i>Total practice-based hours</i>	
25	Number of ECTS credits for practice-based hours <i>(1 ECTS credit =25-30 hours of study time)</i>	

E. READING LIST

References	<ol style="list-style-type: none">1. Langley B.C., Fine tuning air conditioning and refrigeration systems, Lilburn: Fairmont Press, cop. 2002.2. Jeffus L.F., Refrigeration and air conditioning: an introduction to HVAC/R. Upper Saddle River: Pearson Prentice Hall, cop. 2004.3. Ibrahim Dinçer, Refrigeration systems and applications, Chichester: John Wiley & Sons, 2003.4. Hundy G.F., Trott A.R., Welch T.C. , Refrigeration and air-conditioning, Amsterdam: Elsevier/Butterworth-Heinemann, 2008.5. Miller R., Miller M.R., Air conditioning and refrigeration, New York: McGraw-Hill Companies, cop. 2012.6. Fischer R.A., Chernoff K., Air conditioning and refrigeration repair, New York: TAB Books Division of Mc Graw-Hill, cop. 1988.7. Althouse A.D., Turnquist C.H., Bracciano A.F., Modern refrigeration and air conditioning, Tinley Park: Goodheart-Willcox Company, cop. 2004.8. Pita E.G., Air conditioning principles and systems , Upper Sadle River: Prentice Hall, cop. 2002.9. Oughton D. R., Hodkinson S. L., Faber & Kell's heating and air-conditioning of buildings, Oxford; Burlington: Butterworth-Heinemann, 2008.10. Pisarev V., Rabczak R., Some issues of ventilation and air conditioning systems, Rzeszów: Oficyna Wydawnicza Politechniki Rzeszowskiej, 2015.
Module website	