Faculty of Civil and Environmental Engineering					
Study programme:	**Environmental Engineering**	Degree level: full-time	**Master's degree**		
Specialization	**Advanced Technologies in Environmental Engineering**	Diploma path:	**-**		
Module name:	**Heat Centres**				
Module type:	**obligatory**	Semester: **II**	ECTS **6**	Module ID:	
No. of hrs in semester:	L - 1 C - 0 LC- 0 P- 1 SW- 0 S- 0				
Prerequisites:	*Complete with prerequisites or "-"*	Fluid Mechanics, Thermal Technique, Heat Transfer Theory			
Teaching methods:	*lecture, project*	*Assessment:*	*Evaluation must be relevant to the intended learning outcomes*		
		lecture - written exam; project - completion, presentation and discussion of the project			
Aims and objectives:	*Description of assumed knowledge, skills and social competence the student should have acquired after the completion of the module: Familiarize students with the methods of calculation and design of the Heat Centres and heating systems.*				
Module content:	*Complete with module content: Balancing the energy demand for heating or cooling. Computational schemes of the Heat Centres.* *The used equipment; the choice of appropriate equipment and pipe diameters. Pressure drop calculations and pumps selection. Presentation of the Heat Centers and heating systems i n the drawings: diagrams, plans and sections.*				

Learning outcomes	*Write min. 4, max. 8 learning outcomes in the following order: knowledge - skills - competences. Each learning outcome must be verifiable.*	*Relevance to the programme learning outcomes*
LO1	**Student has detailed knowledge of the fields of study**	K_W03
LO2	**Student knows and uses computer tools to support the calculation and design of equipment and systems in environmental engineering**	K_W13
LO3	**The student knows the standards, guidelines, principles of environmental engineering design objects and their components, and their consideration in engineering practice**	K_W14

LO4	**Student is able to work individually and in a team, is able to estimate the necessary time of the task, can lead a small team to ensure execution of tasks in a given period**	K_U02	
LO5	**Students can prepare and give a presentation on the implementation of the project or research task, and lead a discussion about the showed presentation**	K_U04	
LO6	**Student is able to use the guidelines, standards and principles of design in order to select the appropriate processes and components to designed technological device or system as well as the unusual processes with the conceptually new methods**	K_U22	
LO7	**Students can interact and work in a group, taking into the group different roles**	K_K03	
LO8	**Student is able to think and act in a creative and enterprising way**	K_K06	
student workload	lecture attendance	15 x 1h	15
	participation in classes, laboratory classes, etc.	15 x 1h	15
	preparation for classes, laboratoratory classes, projects, seminars, etc.	15 x 2h	30
	work on projects, reports, etc.	15 x 2h	30
	participation in student-teacher sessions related to the class / seminar /		10
	implementation of project tasks		20
	preparation for and participation in exams/tests		30
		TOTAL:	150
quantitative indicators	Student workload - activities that require direct teacher participation 15+15+10 = 40 h	40	ECTS
			1,6
	Student workload - practical skills activities 5+10+10+10+5+20+10=70 h	70	2,8
basic references:	*1. Natka M. - Ogrzewnictwo i ciepłownictwo. Gliwice : Wydawnictwo Politechniki Śląskiej 2006.* *2. Foit H.- Indywidualne węzły cieplne. Gliwice : Wydaw. Politechniki Śląskiej, 2012.* *3. Zaborowska E. - Zasady projektowania wodnych węzłów ciepłowniczych: Gdańsk : Wydaw. Politechniki Gdańskiej, 2010.* *4.Pieńkowski K., Krawczyk D., Tumel W.: Ogrzewnictwo. Politechnika Białostocka 1999r.* *Rosiński M., Odzyskiwanie ciepła w wybranych technologiach inżynierii środowiska. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2008*		

supplementary references:	*1. Recknagel H., Sprenger S., Schramek E.: Kompendium wiedzy. Ogrzewnictwo,klimatyzacja, ciepła woda, chłodnictwo. Omni Scala2008* *2.Chiras, Daniel D. The solar house:passive heating and cooling. White River Junction: Chelsea Green Publishing Company, 2002.*

learning outcomes	*methods of assessing learning outcomes*	type of class (if more than one) where the outcomes are assessed
LO1	evaluating the student's reports and preparation for the classes	L, P
LO2	evaluating the student's reports and preparation for the classes , tests on lecture content	L
LO3	evaluating the student's reports, tests on lecture content	L
LO4	evaluating the student's reports, tests on lecture content	L
LO5	evaluating the student's reports and performance in classes	L
LO6	discussion of the student's reports, evaluation of the student's performance	L, P
LO7		
LO8		

Department:	Department of Heat Engineering / District Heating	Group instructors:	PhD Mariusz Adamski, PhD Dorota Krawczyk
Date:	20.10.2013	Coordinator:	PhD Mariusz Adamski

L - lecture C - class LC - laboratory class P-project
SW - specialization workshop S - seminar