Faculty of Civil and Environmental Engineering					
Study programme:	**Environmental Engineering**	Degree level: full-time programme:	**Bachelor's degree**		
Specialization	**sanitary devices and installations**	Diploma path:	**-**		
Module name:	Heating Engineering Basic Course				
Module type:	**obligatory**	Semester: **V**	ECTS **5**	Module ID:	**Ś15023**
No. of hrs in semester:	L - 15 C - LC- 15 P- 30 SW- S-				
Prerequisites:	*Complete with prerequisites or "-"*	*Fluid mechanics, heat transfer*			
Teaching methods:	*lecture, laboratory class, project*	*Assessment:*	*Evaluation must be relevant to the intended learning outcomes*		
		e.g.: lecture - written exam, laboratory class - evaluation of reports, tests; project - completion, presentation and discussion of the project			
Aims and objectives:	*Information about the basic elements of the heating system. Knowleage how to make heat loss calculation and choose radiators type and size. Ability to make heating system design. Skills how characterize radiators and heating system elements.*				
Module content:	*The classification of heating systems. The calculation of heat losses. The classification of heat sources. The radiators - classification, the selection rules and testing methods, the requirements for units. The gravity and pump heating - system schemes, implementation rules, regulation and the amount of energy measuring.*				
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 an elementary knowledge about the materials used in central heating (pipes, radiators, insulation)			K_W04	
LO2	Student knows the rules of technical drawing for reading and writing data architectural data needed for the heating system design, as well as one knows the rules for making sanitary drawing using CAD.			K_W06	
LO3	Student knows the rules and law for determining the design heat losses, making heating system dedign and guidelines for the elements selection (radiators, pipes, valves, boilers).			K_W016	

LO4	Student is able to obtain information form the literature about different types of heaters, radiators, gravity and pump installation or knows how to measure the amount of thermal energy. Student can compare knowleage from lectures and literature, make their interpretation, go to the conclusions and formulate and justify own opinions.	K_U02	
LO5	Student is able to work individually and in a team during the laboratory course and can estimate the time needed for the study.	K_U03	
LO6	Student can make the heating installation design, prepare the technical description and explain the scope of the project.	K_U04	
LO7	Student can use the guidelines or standards for the the heating system design, discussing how to calculate the heat losses in the room and choose radiators and other system components.	K_U20	
LO8	Student is responsible for own work and can work in a team during radiators study, and takes responsibility for collaborative research.	K_K04	
student workload	lecture attendance	15 x 1h =	15
	participation in classes, laboratory classes, etc.	15 x 3 =	45
	preparation for classes, laboratoratory classes, projects, seminars, etc.	15 x 1h =	15
	work on projects, reports, etc.	15 x 1h =	15
	participation in student-teacher sessions related to the class / seminar /	15 x 1h =	5
	implementation of project tasks	15 x 1h =	20
	preparation for and participation in exams/tests		15
		TOTAL:	130
quantitative indicators	Student workload - activities that require direct teacher participation	69	ECTS
			2,6
	Student workload - practical skills activities	110	4,2
basic references:	*1. Pieńkowski K., Krawczyk D., Tumel W.: Ogrzewnictwo. Politechnika Białostocka 1999r. 2.Żukowski M. , Ogrzewanie podłogowe. Oficyna Wydawnicza Politechniki Białostockiej. Białystok 2009 3.Recknagel H., Sprenger S., Schramek E.: Kompendium wiedzy. Ogrzewnictwo,klimatyzacja, ciepła woda, chłodnictwo. Omni Scala2008 4.Natka M. - Ogrzewnictwo i ciepłownictwo. Gliwice : Wydawawnictwo Politechniki Śląskiej 2006.*		
supplementary references:	*1.Kołodziejczyk W., Płuciennik M.:Wytyczne projektowania instalacji c.o.,Instal 2001 2.Mizielińska K., Gazowe i olejowe źródła ciepła małej mocy.Warszawa: Oficyna Wydaw.Politechniki Warszawskiej, 2011. 3. 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, egzam, design presentation	L,LC,P
LO2	design form	P
LO3	design form and presentation, exam	P,L
LO4	exam, design form and presentation	L,P
LO5	evaluating the student's work during laboratory class	LC
LO6	discussion of the student's design	P
LO7	discussion of the student's design	P
LO8	evaluating the student's work during laboratory class	LC

Department:	Department of Heat Engineering	Group instructors:	PhD. Eng. Dorota Krawczyk PhD. Eng. Beata Biernacka.
Date:	30.10.2012	Coordinator:	PhD. Eng. Dorota Krawczyk

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