



Subject card

Subject name and code	Conventional and unconventional sources of heat, PG_00048032						
Field of study	Environmental Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2022/2023		
Education level	second-cycle studies	Subject group			Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	Part-time studies	Mode of delivery			at the university		
Year of study	2	Language of instruction			Polish		
Semester of study	4	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Sanitary Engineering -> Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Ewa Zaborowska					
	Teachers	dr hab. inż. Ewa Zaborowska mgr inż. Natalia Janowicz					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	25.0	0.0	0.0	15.0	0.0	40
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	40		5.0		75.0	120
Subject objectives	The aim of the course is to familiarize students with theoretical and practical knowledge in the field of various heat sources and conditions of application, legal regulations and standards, installation materials and criteria for their selection, design basics, methods and technologies for the implementation of the installations.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U12] can design: developed water and sewage system, complex heat source, pool water treatment technology, mechanical ventilation installation or underground water intake, drainage of urban water catchment, reservoir control system during flood seizure or water treatment technology, domestic waste water treatment plant	Student can design a complex heat source	
	[K7_W06] has deepened, structured and theoretical knowledge related to hydraulics used in the construction, operation, operation of networks and plumbing, sewage, heating, ventilation or water treatment plants and wastewater treatment facilities	Student has theoretically founded knowledge of heating installations in the field of heat sources	
	[K7_U03] can elaborate detailed documentation presenting results of an experiment, design or research task; can prepare a paper to discuss the results	Student can prepare a documentation on the implementation of a project.	
	[K7_W11] has knowledge to analyze, evaluate and optimize processes, objects and systems of environmental engineering and knows the principles of rational energy management and resources	Student knows the principles of rational energy and resources management, activities for improving energy efficiency	
	[K7_U14] can technically and economically analyze and evaluate the solutions and functioning of facilities and systems in the sanitary engineering or flood protection, water intakes and water infrastructure or water and wastewater treatment plants; can assess the suitability and potential of using new achievements in materials, fixtures, devices and methodologies for designing and modeling the analyzed technical infrastructure and industrial objects, including innovative solutions	Student can assess directions of development and the possibilities of using new solutions in the field of heat sources	
Subject contents	Characteristics of fuels supplying boilers. Burners. Boilers - classification and characteristics. Technology of boiler room operation using conventional and renewable fuels - solid, liquid, gaseous. Hydraulic and automatic control systems. Devices and fittings. Requirements for boiler rooms. Distribution and storage of fuels, installations for supplying fuels to boilers. Accompanying installations in boiler rooms - ventilation, exhaust gas, water and wastewater. Combined heat and power generation. Heat pumps.		
Prerequisites and co-requisites	Fundamental knowledge of hydraulics and thermodynamics. Knowledge of heating and domestic hot water installations. Drawing skills in AutoCAD.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Project	50.0%	50.0%
	Exam	50.0%	50.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> Nowak W. i in.: Zastosowanie odnawialnych źródeł energii. Wydawnictwo Uczelniane PSz., Szczecin 2008. Pisarev V.: Projektowanie instalacji grzewczych z pompami ciepła. Politechnika Rzeszowska 2013. Rubik M.: Pompy ciepła. Poradnik. Ośrodek Informacji Technika instalacyjna w budownictwie, W-wa 2006. Skorek J., Kalina J.: Gazowe układy kogeneracyjne. WNT, Warszawa 2005 lub późn. Zaborowska E.: Projektowanie kotłowni wodnych na paliwa ciekłe i gazowe. Wyd. PG, Gdańsk 2012 lub późn. Przepisy prawne, Polskie Normy związane z tematem i warunki techniczne COBRTI Instal. 	

	Supplementary literature	<ol style="list-style-type: none"> 1. Albers J. i in.: Systemy centralnego ogrzewania i wentylacji. Poradnik dla projektantów i instalatorów. WNT, Warszawa 2007. 2. Lewandowski W.M.: Proekologiczne źródła energii odnawialnej, WNT, Warszawa 2007. 3. Rubik M.: Pompy ciepła w systemach geotermii niskotemperaturowej. MULTICO Oficyna Wydawnicza, W-wa 2011. 4. Recknagel, Sprenger, Schramek: Kompendium wiedzy. Ogrzewnictwo, klimatyzacja, ciepła woda, chłodnictwo. Wyd. 08/09. Wrocław: Omni Scala 2008. 5. Czasopisma techniczne (GWTS, COW, Instal, Rynek Instalacyjny i inne).
	eResources addresses	
Example issues/ example questions/ tasks being completed	Project of a complex heat source/boiler system	
Work placement	Not applicable	