

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject District Heating and Gas Engineering		Code 1010101251010130285
Field of study Environmental Engineering First-cycle Studies	Profile of study (general academic, practical) general academic	Year /Semester 3 / 5
Elective path/specialty -	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: First-cycle studies	Form of study (full-time,part-time) full-time	
No. of hours Lecture: 30 Classes: 15 Laboratory: - Project/seminars: 15		No. of credits 4
Status of the course in the study program (Basic, major, other) other		(university-wide, from another field) university-wide
Education areas and fields of science and art technical sciences		ECTS distribution (number and %) 100 4%
Responsible for subject / lecturer: dr hab. inż. Zbigniew Bagiński email: zbigniew.bagienski@put.poznan.pl tel. 61-6652524, 61-6652413 Budownictwa i Inżynierii Środowiska ul. Piotrowo 5, 60-965 Poznań		Responsible for subject / lecturer: dr inż. Marek Juszczyk email: marek.juszczyk@put.poznan.pl tel. 61-6652524, 61-6652413 Budownictwa i Inżynierii Środowiska ul. Piotrowo 5, 60-965 Poznań
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Fundamentals of combustion processes. Incompressible fluid flows in pipes, pressure loss, pump selection. Pressure, pressure units. Fundamentals of heat exchange. Material resistance. Automatisation.
2	Skills	Calculation of simple and complex hydraulic networks. Calculation of heat flow through flat and round walls. Calculation and selection of automatic devices utilized in hydraulic networks .
3	Social competencies	Awareness to constantly update and supplement knowledge and skills
Assumptions and objectives of the course: Transfer of basic information in the area of heat demand systems in towns and industry, also in the area of design of district heating consist of: heat source, pipe line system, heat transfer unit. Transfer of basic information in the area of construction, operation and design of gas pipe line networks low and medium pressure.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Student knows rules in the area of heat demand systems in towns and industry, based on conventional heat sources - [K_W04, K_W05]		
2. Student knows rules of construction and design and operation: medium power heat station (water and steam) , pipe lines and heat transfer units - [K_W05,K_W06,K_W07]		
3. Student knows rules of design and operation for district heating consist of: heat station pipe lines and heat transfer units - [K_W05,K_W06,K_W07]		
4. Student has a basic knowledge about cogeneration systems - [K_W04, K_W06]		
5. Student has knowledge in the area of construction, design, operation and control of low and medium pressure gas pipe line networks - [K_W05,K_W06,K_W07]		
Skills:		
1. Student is able to calculate heat power of heat sources demanding with heat residential and industrial receivers - [K_U13, K_U14]		
2. Student is able to make projects of medium power heat station (water and steam), pipe lines and heat transfer units - [K_U01, K_U04, K_U07, K_U13, K_U14]		
3. Student is able to make projects of district heating consist of : heat station, pipe lines and heat transfer units - [K_U01,K_U03, K_U07,K_U13, K_U14]		
4. Student is able to make project of gas connection and low and medium pressure gas network - [K_U04, K_U07, K_U13, K_U14]		

Social competencies:
1. Student is aware of playing a role of energy carriers in operation of towns and industry - [K_K02, K_K]
2. Student understands a need of team work in resolving of practical and theoretical issues - [K_K03]

Assessment methods of study outcomes
Lecture: Written exam after sem. No. 6, Project: Currently evaluation of work during contact hours, presentation of project, discussion and conclusions

Course description
District heating systems - comparative analysis. Heat demands balance of receivers: Q_{ch}, Q_w, Q_{wh}, Q_t . Diagram of heat balance for heat source. Fundamentals of boiler construction, operation and control: coal, oil and gas boilers. Localization of heat source in town. District heating - water heat stations: technological schemes of low and high temperature heat stations, working for central heating, hot water and technology: water flows in heat station and district heating, control schemes, boiler water preparation: vacuum and heat, scheme of pressure line for heat station and district heating, security devices. Medium pressure steam heat stations, realm of employment, scheme of technology, security devices, scheme of pressure lines. Pipe lines, configuration, rules of localization, kind of heat carrier, temperature, rules of hydraulic calculation, selection of pipe diameters, pressure line; insulation, compensators, water and air removing devices. Project themes: Project are made in two-persons groups, -Project of district heating for housing estate with social buildings. Project consist of heat station and pipe lines (sem.5)

Basic bibliography:
1. Szargut J., Ziębik A., Podstawy energetyki cieplnej, PWN, Warszawa, 2000. 2. Szkarłowski A., Łatowski L.: Ciepłownictwo, WNT 2006 3. Górzyński J., Urbaniec K., Wytwarzanie i użytkowanie energii w przemyśle, Wyd. Politechniki Warszawskiej, 2000 4. Krygier K., Sieci ciepłownicze, Oficyna Wydawnicza PW, Warszawa 2006 5. Nantka M., Ogrzewnictwo i ciepłownictwo; t.1 i 2; Wydawnictwo Politechniki Śląskiej, Gliwice 2010 6. Ciepłownictwo, eksploatacja, projektowanie, inwestycje; praca zbiorowa; (zeszyty tematyczne); Unia Ciepłownicza 1995.

Additional bibliography:
1. Turschmidt R.: Kotlewnie i elektrociepłownie przemysłowe, Arkady, 1988 2. Krygier K., Sieci ciepłownicze, materiały do ćwiczeń projektowych, Oficyna Wyd. PW, Warszawa 1993 3. Żarski K. Obiegi wodne i parowe w kotłowniach; Wyd. Ośrodek Informacji Technika Instalacyjna w Budownictwie; Warszawa 2000 4. Mizielińska K., Olszak J., Gazowe i olejowe źródła ciepła małej mocy, Oficyna Wyd. PW, Warszawa 2006

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	30
2. Participation in project work	15
3. Consultation for projects	10
4. Project preparation (work at home)	35
5. Preparation to project presentation	10

Student's workload		
Source of workload	hours	ECTS
Total workload	100	4
Contact hours	55	2
Practical activities	35	1