Cracow University of Technology

Course syllabus

binding for the doctoral students of the CUT Doctoral School commencing their studies in the academic year 2022/2023

Information on the course

Name of the course in Polish	Systemy grzewcze
Name of the course in English	Heating systems
Number of the ECTS points	1
Language of instruction	Polish
Category of the course	Elective
Field of education	Engineering and Technology
Discipline of education	Environmental engineering, ,mining and power engineering
Person responsible for the course Contact	Prof. Wiesław Zima, *doctor hab.*, MSc in Eng. wieslaw.zima@pk.edu.pl

Type of course, number of hours in the study programme curriculum

Semester	Credit type (G / NG)*	Lecture	Practical class	Laboratory	Computer Laboratory	Project class	Seminar
2, 3, 4, 5, 6	G	15	0	0	0	0	0

*G – graded credit, NG – non-graded credit

Course objectives

Code	Objective description
Objective 1	Introduction to the basic heating systems and their characteristic
Objective 2	Introduction to calculation methods for the choice of components of selected heating systems
Objective 3	Acquiring the abilities to choose the appropriate heating system for different buildings

Learning Outcomes

Code	Description of the learning outcome adjusted to the specific characteristics of the discipline	Learning outcome symbol in the CUT SD	Methods of verification
OUTCOMES RELATED TO KNOWLEDGE			
EUW1	The doctoral student knows the methodology of hydraulic calculations for various heating systems	E_W01 E_W02	Involvement in class activities, presentation
EUW2	The doctoral student knows the methods of regulating the parameters of heating systems (pressure, temperature)	E_W01	Involvement in class activities, presentation
OUTCOMES RELATED TO SKILLS			
EUU1	The doctoral student is able to present the effects of hydraulic imbalance of the heating system; is		

	able to describe the static and dynamic behaviour of control objects in relation to elements of heating systems.	E_U01	Graded presentation and paper , written test
EUU2	The doctoral student is able to make correct calculations related to the selection of safety devices for heating installations	E_U01	Graded presentation, discussion, written test
OUTCOMES RELATED TO SOCIAL COMPETENCES			
EUK1	The doctoral student is able to refer to the literature in the field of calculation methods and the use of various heating systems; The student appreciates the importance of knowledge in solving problems occurring in heating systems.	E_K01 E_K03	Discussion

Course outline

No.	Contents	Learning outcomes for the course	No. of hours
LECTURE			
W1	Characteristics of heating systems with particular emphasis on radiator heating (convection) and surface heating (by radiation)	EUW1, EUK1	2
W2	Methodology of hydraulic calculations of various heating systems.	EUW1, EUW2	3
W3	Hydraulic balancing of heating circuits	EUW2, EUU1	2
W4	Control and regulation in heating systems. Static and dynamic behaviour of control objects.	EUW1, EUU1, EUK1	2
W5	Regulation methods of convection radiator heating and surface heating.	EUW2, EUU1	2
W6	Protection of heating systems against temperature and pressure increase.	EUW2, EUU2	1
W7	Calculations and selection of safety valves for different heat sources. Calculation of diaphragm expansion vessels.	EUU2	3

The ECTS points statement

WORKING HOURS SETTLEMENT	
Type of activity	Average number of hours (45 min.) dedicated to the completion of an activity type
SCHEDULED CONTACT HOURS WITH THE ACADEMIC TEACHER	
Hours allotted in the syllabus	15
Consultations	1
Examination / course credit assignment	2
HOURS WITHOUT THE PARTICIPATION OF THE ACADEMIC TEACHER	
Independent study of the course contents	8
Preparation of a paper, report, project, presentation, discussion	4
ECTS POINTS STATEMENT	
Total number of hours	30
The ECTS points number	1

Preliminary requirements

No.	Requirements
1	Basic knowledge of heat transfer
2	Knowledge of the English language

Course credit assignment conditions / method of the final grade calculation

No.	Description
	COURSE CREDIT ASSIGNMENT CONDITIONS
1	80% attendance in class.
2	Delivery of a paper presentation.
3	Written test
	METHOD OF THE FINAL GRADE CALCULATION
	Credit assigned on the grounds of weighted average of a written test and a paper presentation

Additional information

None

The course reading list

1	Albers J. and others - Central heating and ventilation systems, Warsaw, 2007, WNT
2	Winter W. and others - Thermal, hydraulic and water quality problems in heating systems, Krakow, 2015, CUT
3	Muniak D. - Regulating fittings in water heating systems, Warsaw, 2017, PWN