POLYTECHNIC OF MEĐIMURJE IN ČAKOVEC

COURSE SYLLABUS

ACADEMIC YEAR: 2020/2021

1. GENERAL COURSE INFORMATION				
1.1 Course name	**Heating and Air Conditioning**			
1.2 Study program/s	Undergraduate professional study Sustainable Development			
1.3 Course status (O,E)	Obligation	**1.6 Mode of instruction (number of hours)**	**Lectures**	30
1.4 Course code			**Exercises**	30
1.5 Course abbreviation	GiK		**Seminars**	
1.6 Semester	V		**E-learning**	
1.7 ECTS	5	**1.7 Place and time of instruction**	Premises of the Polytechnic of Međimurje in Čakovec, according to the schedule published on the website	
2. TEACHING STAFF				
2.1 Course leader/s-title	prof. Sarajko Baksa, Ph.D.	**contact**	sbaksa@mev.hr	
	- - -	**contact**	- - -	
2.2 Assistant/s- title	- - -	**contact**	- - -	
	- - -	**contact**	- - -	
2.3 Instruction held by- title	- - -	**contact**	- - -	
3. COURSE DESCRIPTION				
3.1 Course goals	The aim of the course is the acquisition of basic knowledge and education of students of thermotechnical engineering in the professional field of heating and air conditioning.			
3.2 Prerequisites	Passed the course Maintenance and Fundamentals of Automation.			
3.3 Course outcomes	After successfully passing the course, the student will be able to: 1. Interpret and valorize the mode of operation of heating and air conditioning systems. 2. Evaluate, justify and select the required thermal comfort of the system. 3. Identify and valorize the air conditioning system by ventilation. 4. Explain and investigate the principle of selection of equipment needed for heating and air conditioning. 5. Identify, isolate and estimate heat losses in heating and air conditioning. 6. Select and apply the mode of operation of the heating and air conditioning system in the project tasks. 7. Plan and apply the method of selection of heating and air conditioning equipment. 8. Analyze, evaluate and develop the thermal balance of a thermotechnical system. 9. Predict and calculate the elements of air conditioning systems. 10. Expose and manage activities related to the implementation and maintenance of the system.			
3.4 Course content	The course presents the contents related to the selection of the required thermal comfort of the heating and air conditioning system with the assessment and implementation of the thermal balance of the thermotechnical system.			

3.5 Types of coursework

x	Lectures	x	Exercises	x	Blended e-learning	x	Individual activities		Laboratory
x	Seminars and workshops	x	Distant learning	x	Field classes	x	Multimedia and network	x	Mentorship
	Other								

3.6 Language of instruction

Croatian / English

3.7 Monitoring students' work (enter the number of ECTS credits for each activity so that the total number of ECTS credits is equal to the total ECTS value of the course, 1 ECTS = 30 hours)

2,0	Class attendance	0,3	Seminars		Essay
0,3	Class activity	0,3	Project		Report/paper
	Midterm exams	0,3	Practical task	0,3	Continuous knowledge check
1,0	Written exam		Experimental work		
0,5	Oral exam		Research		

3.8 Assessment and evaluation of students' work during classes and at the final exam

Activity specification	Percent %	Points
Assessment during instruction		
Attendance	5%	5
Class activity	5%	5
Project / Practical work	20%	20
Seminar / Colloquium I	20%	20
Seminar / Colloquium II	20%	20
Oral exam	30%	30
Exam assessment for the students who failed to fullfil all the obligatory requirements during the semester		
Written exam	*60%*	*60*
Total:	**100%**	**100**

3.9 Assessment criteria – analysis per learning outcomes

	Ways of evaluating learning outcomes						
	Atten-dance	**Activity**	**Project**	**Mid-term exam 1**	**Mid-term exam 2**	**Practic work**	**Total**
Outcome 1			2	4		3	9
Outcome 2			2	4		3	9
Outcome 3			2	4		3	9
Outcome 4			2	4		3	9
Outcome 5			2	4		3	9
Outcome 6			2		4	3	9
Outcome 7			2		4	3	9
Outcome 8			2		4	3	9
Outcome 9			2		4	3	9
Outcome 10			2		4	3	9
Outcome not-related	5	5					10
Total	**5**	**5**	**20**	**20**	**20**	**30**	**100**

The course has defined 10 learning outcomes, a system of scoring outcomes, in order to pass the exam the student must achieve at least 50% points for each learning outcome.

	The grade is calculated as follows: • 87.51-100.00 points: rating Excellent (5) • 75.01- 87.5 points: rating Very good (4) • 62.51 -75.00 points: rating Good (3) • 50.01- 62.5 points: rating Pass (2) • 00.00- 50.00 points: rating Fail (1)	
3.10 Specific features related with taking the course	If the student collects 50% of the points of each outcome, he / she directly takes the exam, provided that he / she has done practical work (seminars / project). During the exam, it is possible to orally check the knowledge from practical work (seminars / project). Once earned points for each learning outcome are no longer deleted unless the student, with the express approval of the course leader, decides to correct the result for each learning outcome, whereby the points won are deleted and newly earned points for that learning outcome are entered. The final grade is obtained on the exam period and is the sum of points earned during classes. Students who did not take the colloquium access the written part of the exam where all learning outcomes are checked, and are required to have completed practical work (seminars / project) before taking the exam.	
3.11 Students obligations	Full-time students are required to attend at least 70% of the total number of hours of lectures and exercises in order to exercise the right to take the exam. Part-time students are required to attend at least 30% of the total number of hours of lectures and exercises in order to exercise the right to take the exam. If the student has not fulfilled all the obligations set by the course, he is obliged to attend the lectures again and meet the conditions for taking the exam. Attendance can be offset by online tuition, organised webinars and added assignments given by teachers. One lesson lasts 45 minutes, and several hours form a teaching unit. Absence from one teaching unit is counted as one absence. Delays and apologies are recorded separately. In that case, if the student missed more than 50% of classes, and has a justifiable reason/apology, the request should be submitted to the Department Council, which then decides on the justification of student absences with the obligatory opinion of the course leader.	
3.12 Written assignments	Seminars / Projects	
3.13 Required reading	1.	I. Galaso: Podloge za predavanja iz grijanja, Interno FSB
	2.	I. Galaso: Određivanje toplinskog opterećenja prostorije, Zagreb, 1992
	3.	P. Donjerković: Osnove regulacije sustava grijanja, ventilacije i klimatizacije, Alfa Zagreb, 1996
	4.	Recknagel-Sprenger: Priručnik za grijanje i klimatizaciju, Oldenbourg 2004
3.14 Additional reading	1.	Propisi Hrvatske norme, pravilnici i smjernice za izvođenje, nadzor i puštanje u rad instalacija

4 ADDITIONAL COURSE INFORMATION	
4.1 Quality control	The quality of the program, teaching process, teaching skills and level of mastery of the material will be established by conducting a written evaluation based on questionnaires, and in other standardised ways and in accordance with the by-laws of the Polytechnic of Međimurje in Čakovec.
4.2 Contact the teacher	Students can contact the teacher during the office hours and during classes, while for short questions and explanations they can contact him/her any day during working hours by coming in person or by landline. It is possible to ask questions and e-mail which will be answered as soon as possible.
4.3 Information about the course	It is the obligation of each student to be regularly informed about the course. All relevant information and notices related to classes and exams, maintenance or any year, will be reported in a timely manner on the bulletin board and on the website of the Polytechnic of Međimurje in Čakovec.
4.4 Course contribution to the study program	Course contribution to the study program in generic learning outcomes; I1 - Interpret information, ideas, problems and solutions to professional and General public, I2 - Use new technologies and techniques as part of a lifelong process Learning, I5 - Critically evaluate arguments, assumptions and data in order to create opinions and contributing to the solution of the problem. The contribution of the course to the study program in specific learning outcomes; I6 - Solve engineering problems of sustainable development by applying mathematics, physics, chemistry and biology, I7 - Analyze collected data in the field of sustainable development, I8 - Interdisciplinary to solve engineering problems of sustainable development, I11 - Apply basics of thermoenergetics, thermodynamics and hydromechanics in spatial design of thermodynamic systems, I12 - Develop a technical plan in the field of design of Mechanical Thermotechnical System, I13 - Analyze the basic elements and networks in electrical engineering and justify use of non-renewable and renewable energy sources, applicable code thermotechnical systems, I14 - Apply and monitor conventional heating, cooling, and ventilation systems and devices, I15 - Maintain thermotechnical systems and thermal distribution networks I16 - Propose technical changes and upgrades to conventional ones thermotechnical systems in the direction of sustainable development.

5. ANALYSIS OF COURSE TOPICS (the number of hours is equal to the number of lectures and exercises of the course)				
LECTURES				
Hours	**Topic and description**	**Method** • Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion) • Group learning • Case study • Field classes…	**Learning outcomes**	**Course outcome**
1.	Introduce students to the lecture program, teaching conditions, literature and criteria for evaluating knowledge. Development and perspective, a historical overview of the development of heating with an impact on the development of society	Lecture, Discovery learning, Presentation	Use knowledge of historical development and future perspective projections of technical systems of ventilation, heating, cooling and air conditioning	I1
2.	Types of systems and system features, Example of technical system, Relationship between system and environment, climatic parameters.	Lecture, Discovery learning, Presentation	Distinguish system models and system characteristics of climatic parameters.	I1
3.	Thermal comfort.	Lecture, Discovery learning, Presentation	Distinguish the principles and operating parameters of thermal comfort	I2
4.	The principle of heat required for heating.	Lecture, Discovery learning, Presentation	Use the principles of heat required for heating	I3
5.	The principle of heat loss.	Lecture, Discovery learning, Presentation	Use the principles of heat loss	I4
6.	Basic concepts of monitoring and measuring the heating system process.	Lecture, Discovery learning, Presentation	Distinguish the basic concepts of monitoring and measuring the process of technical heating system	I5
7.	Thermotechnical characteristics of heating sources.	Lecture, Discovery learning, Presentation	Apply and distinguish the input and output features of the heating source	I5
8.	Thermotechnical characteristics of heating heat.	Lecture, Discovery learning, Presentation	Apply and distinguish the input and output characteristics of heating heat	I5
9.	Thermotechnical characteristics of radiators.	Lecture, Discovery learning, Presentation	Apply and distinguish input and output features of radiators	I5
10.	Features and examples of expansion systems.	Lecture, Discovery learning, Presentation	Apply and distinguish the features of expansion systems	I6

11.	Air conditioning, Examples.	Lecture, Discovery learning, Presentation	Exemplary differentiation of air conditioning systems	I7
12.	Thermal balance of thermotechnical system.	Lecture, Discovery learning, Presentation	Explain the heat balance of the system	I7
13.	Thermotechnical preparation and air distribution.	Lecture, Discovery learning, Presentation	Explain the preparation and distribution of air	I8
14.	Construction elements of air conditioning plants.	Lecture, Discovery learning, Presentation	Explain the construction elements of air conditioning systems	I9
15.	Thermotechnical air conditioning systems.	Lecture, Discovery learning, Presentation	Apply engineering of thermotechnical air conditioning systems	I10
EXERCISES/ SEMINARS				
Hours	**Topic and description**	**Method** • Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion) • Group learning • Case study • Field classes…	**Learning outcomes**	**Course outcome**
1.	Introduce students to the lecture program, teaching conditions, literature and criteria for evaluating knowledge. Development and perspective, a historical overview of the development of heating with an impact on the development of society	Lecture, Discovery learning, Presentation	Use knowledge of historical development and future perspective projections of technical systems of ventilation, heating, cooling and air conditioning	I1
2.	Types of systems and system features, Example of technical system, Relationship between system and environment, climatic parameters.	Lecture, Discovery learning, Presentation	Distinguish system models and system characteristics of climatic parameters.	I1
3.	Thermal comfort.	Lecture, Discovery learning, Presentation	Distinguish the principles and operating parameters of thermal comfort	I2
4.	The principle of heat required for heating.	Lecture, Discovery learning, Presentation	Use the principles of heat required for heating	I3
5.	The principle of heat loss.	Lecture, Discovery learning, Presentation	Use the principles of heat loss	I4
6.	Basic concepts of monitoring and measuring the heating system process.	Lecture, Discovery learning, Presentation	Distinguish the basic concepts of monitoring and measuring the process of technical heating system	I5

7.	Thermotechnical characteristics of heating sources.	Lecture, Discovery learning, Presentation	Apply and distinguish the input and output features of the heating source	I5
8.	Thermotechnical characteristics of heating heat.	Lecture, Discovery learning, Presentation	Apply and distinguish the input and output characteristics of heating heat	I5
9.	Thermotechnical characteristics of radiators.	Lecture, Discovery learning, Presentation	Apply and distinguish input and output features of radiators	I5
10.	Features and examples of expansion systems.	Lecture, Discovery learning, Presentation	Apply and distinguish the features of expansion systems	I6
11.	Air conditioning, Examples.	Lecture, Discovery learning, Presentation	Exemplary differentiation of air conditioning systems	I7
12.	Thermal balance of thermotechnical system.	Lecture, Discovery learning, Presentation	Explain the heat balance of the system	I7
13.	Thermotechnical preparation and air distribution.	Lecture, Discovery learning, Presentation	Explain the preparation and distribution of air	I8
14.	Construction elements of air conditioning plants.	Lecture, Discovery learning, Presentation	Explain the construction elements of air conditioning systems	I9
15.	Thermotechnical air conditioning systems.	Lecture, Discovery learning, Presentation	Apply engineering of thermotechnical air conditioning systems	I10