POLYTECHNIC OF MEĐIMURJE IN ČAKOVEC

COURSE SYLLABUS

ACADEMIC YEAR: 2020/2021

1. GENERAL COURSE INFORMATION

1.1 Course name	**Energy Conversions**			
1.2 Study program/s	Undergraduate professional study Sustainable Development			
1.3 Course status (O, E)	O	**1.6 Mode of instruction (number of hours)**	**Lectures**	30
1.4 Course code	4083		**Exercises**	30
1.5 Course abbreviation	EP		**Seminars**	
1.6 Semester	IV		**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	Marijan Horvat, dipl.ing.str.,pred.	**contact**	mhorvat2@mev.hr
		contact	
2.2 Assistant/s- title	-	**contact**	
		contact	
2.3 Instruction held by-title	Marijan Horvat, dipl.ing.str.,pred.	**contact**	mhorvat2@mev.hr

3. COURSE DESCRIPTION

3.1 Course goals	The student will be able to evaluate energy conversions of different forms of energy.
3.2 Prerequisites	Basics of Energetics
3.3 Course outcomes	After successfully completing the course, students will be able to: I1 – Present energetic physical quantities. I2 – Identify the possibilities of using and converting thermal energy. I3 – Evaluate the energy conversions of other forms of energy considering technical-technological-ecological context. I4 – Compare the energy conversions of other forms of energy considering technical-technological-ecological context. I5 – Evaluate energy conversions of renewable forms of energy. I6 – Identify energy saving opportunities in buildings.
3.4 Course content	The course presents contents related to energy conversions. Based on presentations, determinations, evaluations and comparisons, the student will be able to objectively articulate energy conversions of various forms of energy.

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

3.6 Language of instruction	Croatian					
	2	Class attendance	-	Seminars	-	Essay

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)

1	Class activity	1	Project	-	Report/paper
-	Midterm exams	-	Practical task	-	Continuous knowledge check
-	Written exam	-	Experimental work	-	
1	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	10%	10
Class activity	10%	10
Project 1	30%	30
Project 2	30%	30
Oral exam	20%	20
Total:	**100%**	**100**

3.9 Assessment criteria – analysis per learning outcomes*

Ways of evaluating learning outcomes						
	Attendance	**Activity**	**Project 1**	**Project 2**	**Oral exam**	**Total**
Outcome 1			10		3	13
Outcome 2			10		3	13
Outcome 3			10		3	13
Outcome 4				1	1	2
Outcome 5				19	6	25
Outcome 6				10	4	14
Outcome not-related	10	10				20
Total	10	10	30	30	20	100

Points Grade
89 – 100 excellent (5)
76 – 88 very good (4)
63 – 75 good (3)
50 – 62 pass (2)
0 – 49 fail (1)

3.10 Specific features related with taking the course

The student is required to create and present projects 1 and 2 in order to take the mandatory oral 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		
3.13 Required reading	1.	Bošnjaković: Nauka o toplini, sv. 1, 2 i 3,
	2.	Mađerić, Čikić: Zbirka zadataka iz termodinamike, Sveučilište Sjever 2015.
3.14 Additional reading	1.	Recknagel, Sprenger, Schramek, Čeperković: Grejanje i klimatizacija, Energetika marketing 2012.
	2.	Skupina autora: Osnove primjene biomase, Energetika marketing 2012.
	3.	Skupina autora: Osnove primjene dizalica topline, Energetika marketing 2012.
	4.	Skupina autora: Osnove primjene fotonaponskih sustava, Energetika marketing 2012.
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 also possible to ask questions by e-mail.	
4.3 Information about the course	It is the obligation of each student to be regularly informed about the course. All notifications about the classes or possible postponement of classes will be posted on the bulletin board and on the website of the Polytechnic at least 24 hours in advance.	
4.4 Course contribution to the study program	Interpret information, ideas, problems, and solutions to professional and general audiences. Use new technologies and techniques as part of the lifelong learning process. Use foreign languages in professional communication and use of professional literature. Advocate an ethical approach to work and to associates in project teams. Critically evaluate arguments, assumptions, and data to form opinions and contribute to solving the problems. Apply the basics of thermoenergetics, thermodynamics and hydromechanics in the spatial planning of thermodynamic systems. Justify the use of non-renewable and renewable energy sources and characteristic energy sources, applicable to thermotechnical systems in practice. Maintain thermotechnical systems and thermal distribution networks. Propose technical changes and upgrades of conventional 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)	Learning outcomes	Course outcome

		• Discovery learning (individual, lead, discussion) • Group learning • Case study • Field classes…		
1.2.	Energy physical quantities.	Lecture, pp presentation	Analyse basic energy physical quantities.	I1
3.4.	Calculations with energetic physical quantities.	Lecture, pp presentation	Analyse expressions describing the relationship of energetic physical quantities.	I1
5.6.	Conversion of chemical and nuclear energy into thermal energy.	Lecture, pp presentation	Valorise the laws of conversion of chemical and nuclear energy into thermal energy.	I2
7.8.	Laws of thermal energy conversion.	Lecture, pp presentation	Valorise the laws of conversion of thermal energy into other forms of energy.	I2
9.10.	Conversion of thermal energy into mechanical work and electricity.	Lecture, pp presentation	Valorise the conversion of thermal energy into mechanical work.	I3
11.12.	Technical-technological-ecological context elements of thermal energy conversion into mechanical work and electricity.	Lecture, pp presentation	Valorise the conversion of thermal energy into mechanical work.	I3
13.14.	Technical-technological-ecological context elements of thermal energy conversion into mechanical work and electricity.	Lecture, pp presentation	Valorise the conversion of thermal energy into mechanical work.	I3
15.16.	Energy conversions of other forms of energy.	Lecture, pp presentation	Evaluate the conversion of other forms of energy.	I4
17.18.	Energy conversions of renewable forms of energy – hydropower.	Lecture, pp presentation	Evaluate hydropower conversion.	I5
19.20.	Energy conversions of renewable forms of energy – hydropower.	Lecture, pp presentation	Evaluate hydropower conversion.	I5
21.22.	Energy conversions of renewable forms of energy - geothermal energy.	Lecture, pp presentation	Evaluate geothermal energy conversion.	I5
23.24.	Energy conversions of renewable forms of energy - solar energy.	Lecture, pp presentation	Evaluate the conversion of solar energy.	I5

25.26.	Energy conversions of renewable forms of energy - wind energy.	Lecture, pp presentation	Vrjednovati pretvorbu energije vjetra.	I5
27.28.	Heat losses in buildings.	Lecture, pp presentation	Analyse housing losses.	I6
29.30.	Possibilities of energy saving in buildings.	Lecture, pp presentation	Analyse energy saving opportunities in buildings.	I6
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**
1.2.	Calculation of energy physical quantities.	Combination of methods	Calculate energy physical quantities.	I1
3.4.	Calculation of energy physical quantities.	Combination of methods	Calculate energy physical quantities.	I1
5.6.	Combustion budget.	Combination of methods	Calculate combustion tasks.	I2
7.8.	Calculation of the degree of utilization of the right-handed process.	Combination of methods	Analysis of the usability of right-handed processes.	I2
9.10.	Calculation of steam turbine utilization rate and gas turbine selection.	Combination of methods	Analyse the use of steam and gas turbines for electricity production.	I3
11.12.	Calculation of flue gases of a thermal power plant on coal and natural gas.	Combination of methods	Calculate and analyse the amount of harmful flue gases.	I3
13.14.	Calculation of flue gases of a natural gas turbine.	Combination of methods	Calculate and analyse the amount of harmful flue gases.	I3
15.16.	Presentation and analysis of project task no.1	Combination of methods	Evaluate project tasks.	I1+I2+I3
17.18.	Basics of hydropower plant budget.	Combination of methods	Perform a simple hydropower plant calculation.	I5
19.20.	Basics of hydropower plant budget.	Combination of methods	Perform a simple hydropower plant calculation.	I5
21.22.	Basics of ground-water heat pump calculation.	Combination of methods	Calculate the basic parameters of the	I5

			ground-to-water heat pump.	
23.24.	Calculation of solar collectors for DHW.	Combination of methods	Calculate the basic parameters of the solar collector for DHW.	I5
25.26.	Calculation of heat losses of a family house.	Combination of methods	Calculate the heat loss of a family home using a simple calculation.	I6
27.28.	Calculation of heat losses of a family house energy saving possibilities.	Combination of methods	Analyse energy saving opportunities.	I6
29.30.	Presentation and analysis of project task no.2	Combination of methods	Evaluate project tasks.	I4+I5+I6