POLYTECHNIC OF MEĐIMURJE IN ČAKOVEC

COURSE SYLLABUS

ACADEMIC YEAR: 2020/2021

1. GENERAL COURSE INFORMATION

1.1 Course name	**Physics**			
1.2 Study program/s	Undergraduate professional study Sustainable Development			
1.3 Course status (O,E)	0	**1.6 Mode of instruction (number of hours)**	**Lectures**	30
1.4 Course code			**Exercises**	30
1.5 Course abbreviation	FIZ		**Seminars**	
1.6 Semester	II		**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	Valentina Novak, lecturer	**contact**	vnovak1@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 course will enable students to understand physical phenomena, laws and models, and after completing the course, students will be able to apply the basic laws of physics. Students will develop a scientific approach to solving physical problems.
3.2 Prerequisites	There are no conditions.
3.3 Course outcomes	After successfully completing the course, students will be able to: O1 - analyze the types of motion by integrating appropriate mathematical expressions into solving numerical problems O2 - distinguish and apply physical quantities in the field of heat and thermodynamics O3 - analyze circuits and the influence of electric field on magnetic field and vice versa O4 - explain wave motion O5 - understand and apply the laws of radiation and the law of radioactive decay
3.4 Course content	The course presents contents related to matter, motion, energy and interaction.

	The content is based on physical laws from the fields of mechanics, thermodynamics, statistical physics, electromagnetism, harmonic oscillation and waves, optics, atomic and quantum physics and nuclear physics.

3.5 Types of coursework

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

3.6 Language of instruction

Croatian

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		Seminars		Essay
	Class activity		Project		Report/paper
2,0	Exams (Midterm exam, written and oral exam)		Practical task		Continuous knowledge check
			Experimental work	1,0	Homework
			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
Midterm exam 1	35%	35
Midterm exam 2	35%	35
Oral exam	10%	10
Exam assessment for the students who failed to fullfil all the obligatory requirements during the semester		
Written exam	*60%*	*60*
Oral exam	*20%*	*20*
Total:	**100%**	**100**

3.9 Assessment criteria – analysis per learning outcomes

Ways of evaluating learning outcomes						
	Attendance	**Activity**	**Mid-term exam 1**	**Mid-term exam 2**	**Oral exam**	**Total**
Outcome 1			20		2	22
Outcome 2			20		2	22
Outcome 3				20	2	22
Outcome 4				10	2	12
Outcome 5				10	2	12
Outcome not-related	5	5				10
Total	5	5	40	40		100

Grading of outcomes (in order to pass the mid-term exam/exam the student must achieve at least 50% points for each learning outcome)

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	In order for a student to pass the course, he must achieve a minimum of 50% of the points available for that learning outcome for each learning outcome. If a student does not achieve a sufficient number of points in the 1st midterm exam (minimum 50% of the total number of points), he / she cannot take the next midterm exam. Once achieved points in intermediate exams for each learning outcome are no longer deleted unless the student decides to correct the result for individual learning outcomes, whereby the points won are deleted and newly achieved 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 take the written and oral part of the exam, where all learning outcomes are checked, and are required to submit all homework 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		
3.13 Required reading	1.	P. Kulišić: Mehanika i toplina, Školska knjiga, 2011.
	2.	V. Henč-Bartolić, P. Kulišić: Valovi i optika, Školska knjiga, 1991
	3.	Eyvind H. Wichmann: Quantum Physics - Physics Textbook, University of Berkeley, Tehnička knjiga, 2003.
3.14 Additional reading	1.	Petar Kulišić i suradnici: Riješeni zadaci iz mehanike i topline, Školska knjiga,2011.
	2.	Young&Freedman: University Physics with Modern Physics, 2016.
	3.	J. D. Cutnell, K.W. Johnson, Physics, John Wiley and Sons; 9th edition, 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, which will be answered in 48 hours at the latest. It is desirable for students to come as often as possible for any possible questions during the teacher's office hours.	

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	Apply the acquired learning skills, basic knowledge of the profession and problem solving necessary for continuing studies at a higher level. Apply communication and professional ethics.

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.	Introduction. Physical quantities and units of measuremen	Lecture, pp presentation	Distinguish scalar and vector quantities	O1
2. **3.**	Kinematics	Lecture, pp presentation	Explain uniform motion, uniformly accelerated motion, and uniformly decelerated motion	O1
4. **5.**	Dynamics	Lecture, pp presentation	Explain and express Newton's laws	O1
6.	Work and strength, complex movements	Lecture, pp presentation	Explain the connection between work and energy	O1
7.	Gravitational force, inertial and non-inertial systems	Lecture, pp presentation	Express the general law of gravity	O1
8.	Fluid statics and dynamics	Lecture, pp presentation	Explain the concept of pressure and buoyancy, explain the floating, floating and sinking of a body in a fluid, distinguish the continuity equation	O1

			and the Bernoulli equation	
9. **10.** **11.** **12.**	Rigid body mechanics	Lecture, pp presentation	Define the equilibrium conditions of a rigid body and the center of mass	O1
13.	Gaseous state, Heat and temperature	Lecture, pp presentation	Distinguish isochoric, isobaric and isothermal change of gas state. Distinguish between heat, temperature and internal energy	O2
14.	Thermodynamics	Lecture, pp presentation	Explain the laws of thermodynamics	O2
15. **16.**	Midterm exam	Individual	Outcome check O1, 02	
17.	Electrostatics	Lecture, pp presentation	Explain Coulomb's law, the notion of electric field and the notion of voltage	O3
18.	Electrodynamics	Lecture, pp presentation	Recognize the effect of electricity	O3
19.	Magnetism	Lecture, pp presentation	Explain the action of Lorentz and Ampere forces	O3
20.	Electromagnetic induction	Lecture, pp presentation	Recognize the influence of a magnetic field on an electric field	O3
21.	Harmonic vibration	Lecture, pp presentation	Explain the concept of harmonic oscillation, distinguish the oscillation of a harmonic oscillator and a simple pendulum	O4
22.	Mechanical waves	Lecture, pp presentation	Describe the origin of wave motion, the formation of a standing wave and explain wave interference	O4

23.	Geometric optics	Lecture, pp presentation	List four basic laws of geometric optics	O4
24.	Wave optics	Lecture, pp presentation	Explain interference and light deflection	O4
25.	Atomic physics	Lecture, pp presentation	Explain the laws of black body radiation	O5
26.				
27.	Nuclear physics	Lecture, pp presentation	Explain the law of radioactive decay	O5
28.				
29.	Midterm exam	Individual	Outcome check O3, 04, O5	
30.				
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.	Physical quantities and units of measuremen	Lecture, individual	Convert units of measure	O1
2.	Kinematics	Lecture, individual, discussion	Graphically represent uniformly, uniformly accelerated and uniformly decelerated motion, draw a diagram of forces	O1
3.				
4.	Dynamics	Lecture, individual, discussion	Apply Newton's laws to solving problems	O1
5.				
6.	Work and strength, complex movements	Lecture, individual, discussion	Apply the link between work and energy change	O1
7.	Gravitational force, inertial and non-inertial systems	Lecture, individual, discussion	Apply the general law of gravity	O1
8.	Fluid statics and dynamics	Lecture, individual, discussion	Apply Archimedes' law. Apply the continuity equation	O1

9. **10.** **11.** **12.**	Rigid body mechanics	Lecture, individual, discussion	Apply the rotation equation	O1
13.	Gaseous state. Heat and temperature	Lecture, individual, discussion	Identify isoprocesses. Apply the term for heat and gas operation at constant pressure	O2
14.	Thermodynamics	Lecture, individual, discussion	Recognize the laws of thermodynamics	O2
15. **16.**	Midterm exam	Individual	Outcome check O1, 02	
17.	Electrostatics	Lecture, individual, discussion	Apply the law of charge conservation	O3
18.	Electrodynamics	Lecture, individual, discussion	Apply Ohm's law and Kirchhoff's rules	O3
19.	Magnetism	Lecture, individual, discussion	Recognize the influence of the magnetic field, apply the term for Lorentz and Ampere force	O3
20.	Electromagnetic induction	Lecture, individual, discussion	Apply Faraday's law of electromagnetic induction	O3
21.	Harmonic vibration	Lecture, individual, discussion	Apply the expression for the period of oscillation of a harmonic oscillator	O4
22.	Mechanical waves	Lecture, individual, discussion	Apply the harmonic wave equation and the Huygens principle of wave propagation	O4
23.	Geometric optics	Lecture, individual, discussion	Apply the laws of geometric optics and Snell's law of refraction	O4

24.	Wave optics	Lecture, individual, discussion	Apply light interference and deflection to numerical tasks	O4
25.	Atomic physics	Lecture, individual, discussion	Apply the laws of black body radiation	O5
26.				
27.	Nuclear physics	Lecture, individual, discussion	Apply the law of radioactive decay	O5
28.				
29.	Midterm exam	Individual	Outcome check O3, 04, O5	
30.				