

MEDIMURJE POLYTECHNIC IN ČAKOVAC

POLYTECHNIC OF MEDIMURJE AND ČAKOVEC

SYLLABUS COURSE

ACADEMIC YEAR: 2020/2021

1. GENERAL INFORMATION ABOUT THE COURSE

Course title	Chemistry in sustainable development			
Study program (s)	Undergraduate professional study Sustainable Development			
Course status (O, I)	O	Teaching methods (number of hours)	Lectures	15
Course code	4099		Exercises	30
Course abbreviation	CSD		Seminar	
Semester	II		E-learning	
Credit value (ECTS)	4	Place and time of classes	The premises of the Polytechnic of Međimurje in Čakovec, according to the schedule published on the website	

2. TEACHING STAFF

Holder / s-title	Silvija Zeman, PhD, senior lec.	Contact	
		Contact	
Assistant / and-title		Contact	
		Contact	
Contractor / title	Dorotea Žvorc, prof.. chemistry and biology	Contact	dorotea.zvorc@mev.hr
		Contact	

3. COURSE DESCRIPTION

Course objectives	Mastering the basics of chemistry, chemical calculus and acquiring basic skills and understanding of chemical changes and natural laws of interaction of particles in the process of formation of inorganic and organic matter.
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Requirements for enrollment and taking the course																									
Learning outcomes	Apply the acquired knowledge necessary to understand other branches of chemistry Solve chemical calculations based on basic chemical principles Analyze the structure of three different states of matter Evaluate the properties of individual elements with respect to the position of the element in the periodic table of elements Connect the most significant reactions characteristic of the elements of the main groups Analyze the chemical bond, name and write the formulas of complex compounds																								
Course content																									
Types of teaching	x	Lectures	x	Exercises		Blended e-learning		Independent tasks	x	Laboratory															
		Seminars and workshops		Distance education		Field work		Multimedia and network		Mentoring work															
		Other:																							
Performance language	Croatian																								
Monitoring student work (enter the number of ECTS credits for each activity so that the total number of ECTS credits corresponds to the credit value of the course, 1 ECTS = 30 hours)	1.5	Class attendance				Seminar paper			Essay																
	0.5	Teaching activity				Project			Report																
	1,0	Colloquia				Practical work			Continuous assessment																
		Written exam				Experimental work																			
	1,0	Oral exam				Research																			
Assessment and evaluation of student work during classes and at the final exam																									
	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Activity specification</th> <th>Percentage%</th> <th>points</th> </tr> </thead> <tbody> <tr> <td colspan="3" style="text-align: center;">Evaluation during classes</td> </tr> <tr> <td>Class attendance</td> <td>5%</td> <td>5</td> </tr> <tr> <td>Teaching activity</td> <td>5%</td> <td>5</td> </tr> <tr> <td>Colloquium 1</td> <td>45 %</td> <td>45</td> </tr> </tbody> </table>										Activity specification	Percentage%	points	Evaluation during classes			Class attendance	5%	5	Teaching activity	5%	5	Colloquium 1	45 %	45
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	Evaluation during classes																								
	Class attendance	5%	5																						
Teaching activity	5%	5																							
Colloquium 1	45 %	45																							

Colloquium 2	45 %	45
<i>Evaluation of exam work for students who did not take the colloquium</i>		
Written exam	9 0%	90
In total:	100%	100

Evaluation criteria - elaboration by outcomes

Method of passing the outcome						
	Class attendance	Teaching activity	Colloquium 1	Colloquium 2	Exercises seminars	In total
Outcome 1			10		5	15
Outcome 2			10	10	5	25
Outcome 3			5	15	5	25
Outcome 4				10	5	15
Outcome 5					5	5
Outcome 6					5	5
Outside the outcome	5	5				10
In total	5	5	25	35	30	100

Scoring outcomes (in order to pass the colloquium / exam the student must achieve at least 50% points for each learning outcome)

Rating Points

8 9 - 100 Excellent (5)

7 6 - 8 8 Very good (4)

6 3 - 7 5 Good (3)

	50 - 62 Sufficient (2) 0 - 49 Insufficient (1)		
0. Specifics related to taking the course	<p>During the semester, through two written partial tests (colloquium), students' knowledge of the material will be tested. After completing the semester, students take a written exam from the completed material. If a student collects 50% of the points of each outcome, he / she directly takes the exam, provided that he / she has done practical work (exercises). After passing the written part of the exam, the student takes the oral part of the exam. 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 exercises before taking the exam. During the exam, it is possible to check the knowledge from practical work (exercises). The final grade is obtained on the exam period and is the sum of points earned during classes.</p> <p>A student cannot access the exam period if he / she has not achieved a min for each exercise. 60% correct answers. The final grade of students who have passed the test will be the arithmetic mean of the grades from the test.</p>		
1. Student obligations	<p>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.</p> <p>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.</p> <p>If the student has not fulfilled all the obligations provided by the course, he is obliged to attend the lectures again and meet the conditions for taking the exam.</p> <p>Attendance can be offset by online consultations, organized 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.</p>		
2. Written works	Seminar papers (laboratory diaries) are prepared according to the instructions published on the Merlin system.		
3. Required reading	<table border="1"> <tr> <td>1.</td> <td>Filipović, Lipanović: General and Inorganic Chemistry, Part I, Školska knjiga Zagreb, 1995 , selected chapters</td> </tr> </table>	1.	Filipović, Lipanović: General and Inorganic Chemistry, Part I, Školska knjiga Zagreb, 1995 , selected chapters
1.	Filipović, Lipanović: General and Inorganic Chemistry, Part I, Školska knjiga Zagreb, 1995 , selected chapters		

	2 .	DASkoog, DMWest, FJHoller: Fundamentals of Analytical Chemistry (prev: N.Kujundžić, Vlasta Živčić-Alegreti, Alemka Živković), Školska knjiga Zagreb, 1999 , selected chapters
	3 .	Sikirica, M. Korpar-Čolig , H : Exercises of General Chemistry, ence to the book of Zagreb, 2001,sSelected topics
4. Supplementary literature	1.	Sikirica, M .: Zbirka kemijskih pokusa, Školska knjiga Zagreb, 2011
	2.	Sikirica, M .: Metodika nastave kemije, Školska knjiga Zagreb, 2003
4. ADDITIONAL INFORMATION ABOUT THE COURSE		
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 standardized ways and in accordance with the acts of the Polytechnic of Međimurje in Čakovec.	
Contacting the teacher	Students can contact the teacher during the consultation period and during classes, while for short questions and explanations they can contact 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 that students come to the consultation as often as possible for any ambiguities.	
Informing about the course	It is the obligation of each student to be regularly informed about the course. All notifications about the holding 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.	
The contribution of the course to the study program	<p>Interpret information, ideas, problems and solutions to professional and general audiences</p> <p>Organize effective work in the laboratory, independently or as part of an interdisciplinary team</p> <p>Advocate an ethical approach to work and to associates in project teams</p> <p>Analyze the collected data in the field of sustainable development</p>	

5. DEVELOPMENT OF THEMATIC UNITS (the number of elaborated hours is identical to the number of lectures and exercises of the course)

LECTURES				
Hours	Topic and description of the lecture	Method of work	Lecture learning outcomes	Course learning outcome
		<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) • Group / collaborative learning • case study • field teaching... 		
	Quantum mechanics - structure of atoms and PSE , electronic configuration of atoms, valences	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) • Group / collaborative learning 	Analyze the properties, composition and type of substance	Solve chemical calculations based on basic chemical principles Evaluate the properties of individual elements with respect to the position of the element in the periodic table of elements
	Chemical binding - the structure and form of chemical compounds (chemical species they bond a)	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) 	Apply chemical terminology and symbolism to describe the composition of a substance	Connect the most significant reactions characteristic of the elements of the main groups Analyze the chemical bond, name and write the formulas of complex compounds

		<ul style="list-style-type: none"> • Group / collaborative learning 	Explain the type and properties of a chemical bond	
	Properties of matter - consequence of particle interaction (intermolecular forces, Aggregation states of matter)	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) 	Relate the structure of substances with their properties	<p>Connect the most significant reactions characteristic of the elements of the main groups</p> <p>Analyze the chemical bond, name and write the formulas of complex compounds</p>
	Fundamentals of chemical calculus - SI units of measurement , abundance, molar mass, plurality	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) 	Apply mathematical knowledge and skills	<p>Apply the acquired knowledge necessary to understand other branches of chemistry</p> <p>Solve chemical calculations based on basic chemical principles</p> <p>Analyze the structure of three different states of matter</p>
	Periodicity of metal properties	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) 	Associate the properties of a substance with the type of chemical bond and interparticle actions. Analyze chemical	<p>Apply the acquired knowledge necessary to understand other branches of chemistry</p> <p>Evaluate the properties of individual elements with respect to the position of the element in the periodic table of elements</p>

			changes of inorganic substances.	Identify the most significant reactions characteristic of the elements of the main groups
	Periodicity of nonmetal properties	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) 	Associate the properties of a substance with the type of chemical bond and interparticle actions. Analyze chemical changes of inorganic substances.	<p>Apply the acquired knowledge necessary to understand other branches of chemistry</p> <p>Evaluate the properties of individual elements with respect to the position of the element in the periodic table of elements</p> <p>Identify the most significant reactions characteristic of the elements of the main groups</p>
	Fundamentals of thermodynamics of chemical reactions	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) 	Investigate the properties, composition and type of substance.	Apply the acquired knowledge necessary to understand other branches of chemistry
	Fundamentals of chemical kinetics	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) 	Investigate the properties, composition and type of substance.	Apply the acquired knowledge necessary to understand other branches of chemistry

0	Solutions	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) 	Associate the properties of a substance with the type of chemical bond and interparticle actions.	Apply the acquired knowledge necessary to understand other branches of chemistry
	Fundamentals of chemical reaction equilibrium	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) 	Investigate the properties, composition and type of substance.	Apply the acquired knowledge necessary to understand other branches of chemistry Analyze the structure of three different states of matter
/13.	Chemistry of aqueous solutions - acids and alkalis	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) 	Associate the properties of a substance with the type of chemical bond and interparticle actions. Analyze chemical changes of inorganic substances.	Apply the acquired knowledge necessary to understand other branches of chemistry Analyze the chemical bond, name and write the formulas of complex compounds
	Redox processes	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) 	Apply mathematical knowledge and skills	Apply the acquired knowledge necessary to understand other branches of chemistry Analyze the chemical bond, name and write the formulas of complex compounds

				ve chemical calculations based on basic chemical principles
	Fundamentals of organic chemistry	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) 	Associate the properties of a substance with the type of chemical bond and interparticle actions. Analyze the chemical changes of organic matter.	<p>Apply the acquired knowledge necessary to understand other branches of chemistry</p> <p>Analyze the chemical bond, name and write the formulas of complex compounds</p>
EXERCISES / SEMINARS				
Hours	Topic and description of the lecture	<p>Method of work</p> <ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) • Group / collaborative learning • case study • field teaching... 	Lecture learning outcomes	Course learning outcome
2.	Chemical bonding - Lewis structures, bond spatial structure, valence determination	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) 	Investigate the properties, composition and type of substance.	<p>Apply the acquired knowledge necessary to understand other branches of chemistry</p> <p>ve chemical calculations based on basic chemical principles</p>

		<ul style="list-style-type: none"> • Discovery learning (independent, guided, discussion, debate) • Group / collaborative learning 		
	Intermolecular forces - determination of polar and nonpolar molecules	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) • Group / collaborative learning 	Relate the structure of substances with their properties	Apply the acquired knowledge necessary to understand other branches of chemistry
	Basics of chemical calculus - abundance, molar mass, plurality.	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) • Group / collaborative learning 	Apply mathematical knowledge and skills	Perform chemical calculations based on basic chemical principles
7.	Characteristic reactions of some metals	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) 	Associate the properties of a substance with the type of chemical bond and interparticle actions.	Apply the acquired knowledge necessary to understand other branches of chemistry Evaluate the properties of individual elements with respect to the position of the

		<ul style="list-style-type: none"> • Group / collaborative learning 		<p>element in the periodic table of elements</p> <p>Identify the most significant reactions characteristic of the elements of the main groups</p> <p>Analyze the chemical bond, name and write the formulas of complex compounds</p>
9.	Characteristic reactions of some nonmetals	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) • Group / collaborative learning 	Associate the properties of a substance with the type of chemical bond and interparticle actions.	<p>Apply the knowledge necessary for understanding other branches of chemistry</p> <p>Evaluate the properties of individual elements with respect to the position of the element in the periodic table of elements</p> <p>Identify the most significant reactions characteristic of the elements of the main groups</p> <p>Analyze the chemical bond, name and write the formulas of complex compounds</p>
/11.	1. Colloquium			
-13.	Expressing the composition of mixtures - density, mass fraction, volume fraction	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) • Group / collaborative learning 	Apply mathematical knowledge and skills	Perform chemical calculations based on basic chemical principles

17.	Quantitative composition of solutions - mass and mass concentration, molarity	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) • Group / collaborative learning 	Apply mathematical knowledge and skills	Solve chemical calculations based on basic chemical principles
19.	Gas laws	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) • Group / collaborative learning 	Apply mathematical knowledge and skills	<p>Apply the acquired knowledge necessary to understand other branches of chemistry</p> <p>Solve chemical calculations based on basic chemical principles</p>
21	Neutralization - acid-base reactions	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) • Group / collaborative learning 	Associate the properties of a substance with the type of chemical bond and interparticle actions.	Apply the acquired knowledge necessary to understand other branches of chemistry
24.	Redox reactions	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) 	Apply mathematical knowledge and skills	Apply the acquired knowledge necessary to understand other branches of chemistry

		<ul style="list-style-type: none"> • Discovery learning (independent, guided, discussion, debate) • Group / collaborative learning 		<p>ve chemical calculations based on basic chemical principles</p>
-28.	Nomenclature and isomerism of organic compounds	<ul style="list-style-type: none"> • direct teaching (presentation, instruction, pp presentation) • Discovery learning (independent, guided, discussion, debate) • Group / collaborative learning 	<p>Apply chemical terminology and symbolism to describe the composition of a substance.</p>	<p>ply the acquired knowledge necessary to understand other branches of chemistry ve chemical calculations based on basic chemical principles</p>
/ 30 .	2. Colloquium			