NAME OF THE COURSE	General Chemistry I					
Code	PMC001	Year of study	1st undergraduate study			
Course teacher	Dr Renata Odžak, Associate Professor	Credits (ECTS)	7.0			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			45	15		
Status of the course	obligatory	Percentage of application of e-learning	20%			

COURSE DESCRIPTION

Course objectives	Students will acquire knowledge about substance composition, basic chemical laws, atomic theory and atomic structure, stoichiometry, major types of chemical reactions, thermochemistry, quantum theory and atomic structure, electronic configuration, periodicity law, chemical bonds, molecular structure, covalent bond theory, gas laws.
Course enrolment requirements and entry competences required for the course	
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After completing the course, the students will be able to: 1. to compare and distinguish between atomic, ionic and molecular substances, elements in the periodic system of chemical elements, physical and chemical changes and the legality of chemical bonding 2. Analyze and discuss atom, molecule and crystal materials at the level of classical and quantum theory 3. discuss the physic-chemical properties of gases and solids 4. Compare the models of chemical bonds and other particle interactions 5. analyze the basic legality of thermodynamics 6. Link the theoretical knowledge by solving stoichiometric tasks
Course content broken down in detail by weekly class schedule (syllabus)	Lectures: 1. Substances and mixtures of substances, physical and chemical properties of substances, aggregation states, physical and chemical changes, elements and compounds, symbols and formulas, measurement and measurement units (3 hours) 2. Basic Chemistry Laws, Dalton's Atomic Theory, Discovery of Cathodic and Ductile Air, Thomson's and Rutherford's Model Atoms, Proton and Mass Number, Isotopes, Molar Definition, Unified Atomic Mass Units and Other Quantities Required for Chemical Accounting Basics (2 hours) 3. Atomic symbolism and terminology of compounds (formulas, molecules, acids) (1 hour) 4. Stoichiometry of chemical reactions (relevant reactants and reaction yield) (1 hour) 5. Meaning and Determination of Empirical and Molecular Formula (1 hour) 6. Writing and equalizing reactions, reaction types (sediment, acid-base and redox) (1 hour) 7. Writing and solving redox reactions in acidic and alkaline medium (oxidation conditions, disproportionation reactions, oxidants and reductants) (3 hours) 8. Thermal chemistry-forms of energy and its transformation, enthalpy, calorimetry, names and interpretations of various enthalpy changes, stoichiometry of chemical reactions, Hess's law and its application, standard thermal response, connection energy, entropy, Gibs free energy (4 hours) 9. Quantum theory and atomic structure, nature of light, atomic spectrum, dual nature of matter and energy (2 hours) 10. Bohrov model of atoms, quantum mechanical model of atoms, quantum numbers, orbital and electronical configuration of transition metals (4 hours) 11. Periodicity of Element Properties in PSE (2 hours) 12. Chemical Connection Patterns, Ion Connection, Born-Haber Cycle, Crystal Grid Energy, Periodic Energy Trend Creation, ionic compounds properties (3 hours)

	13. Covalent bond, Lewis theory, connection properties: energy and length, line connection (1 hour) 14. Lewis structural formulas with the rule of octets and exceptions, resonance structures, electron delocalization, formal charge, oxidation state, resonance hybrid (2 hours) 15. Molecular form, VSEPR theory, ideal angle in molecule and deviation, molecular bond linkage and molecular polarity (2 hours) 16. Hybrid orbital theory, type, origin and orientation of hybrid orbitals, formation of sigma and pi link (3 hours) 17. Molecular orbital theory, energy and molecular orbital structure, interpreting of the order of connection, existence of two-atomic species and magnetic properties of the same (1 hour) 18. Metallic bond, chemical and physical properties of metals, semiconductors (1 hour) 19. Intermolecular interactions, the influence of hydrogen bond on the properties of the compounds (2 hours) 20. Strong aggregation state, crystalline nature of matter, cubic crystal system, coordinate number, efficiency and unit cell formation, crystal type, X-ray structural crystal analysis, Bragg equation (2 hours) 21. Gaseous aggregation state, gas properties and gas laws, kinetic theory of gases, ideal and real gases, Graham's law of diffusion and diffusion (4 hours) Seminars: 1. Conversion of units, significant digits, rounding of numbers, partial representation of elements, compounds, mixtures and physical and chemical changes 2. The law of multiplied mass ratios, the proton and nucleon number of atoms and ions, the basis of the chemical account, the nomenclature of compounds and formulas of the same 3. Writing chemical reactions and their equation, stoichiometry of the same (relevant reactant and yield), determination of the empirical and molecular formula of the compound 4. Housing reactions, neutralization reactions, oxidation conditions, resolution of redox reactions in acidic and alkaline medium 5. Calculation examples of tasks from thermochemistry, specific thermal capacity of metal, combustion heat, energy diagrams for physical changes 6. Enthalpy formation, application of Hess's law, change in enthalpy and changes in entropy, spontaneous chemical reactions 7. EMS radiation, photon frequency of some radiation, quantum numbers and their values, ordinal representation 8. Electronic configuration of various species, partial orbit display of valent electrons, periodicity of properties in PSE (ionization energy, electron affinity, atomic and ions diameter), energy value of crystal grid based on formula unit structure 9. Calculation of crystalline grid energy and representation of Born-Haber cycle, Lewis symbols showing the formation of formulas, calculation of the reaction peak on the basis of connection energy, dipole moment in covalent molecules 10. Demonstration of Lewis structural molecular formulas, resonant structure, formal charges, molecular shape by VSEPR, ideal angle and deviation from it 11. Hybridization of the central atom in particular, connection between the valence connection theory and hybrid orbitals, molecular orbital diagram for the two-atom species 12. Calculation examples of tasks related to the crystal cubicle grid 13. Accounting Examples of Gas Laws, General Gas Equation, Application of the Graham Law 14. Calculation examples of tasks from the general gas equation and Dalton's law 15. Calculation examples of tasks from the application of the Graham Law	
Format of instruction	☒ lectures ☒ seminars and workshops ☐ exercises ☐ *on line* in entirety	☐ independent assignments ☐ multimedia ☐ laboratory ☐ work with mentor

	☐ partial e-learning ☐ field work	☐ (other)
Student responsibilities		

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	2.0	Research		Practical training	
	Experimental work		Report		(Other)	
	Essay		Seminar essay		(Other)	
	Tests	1.5	Oral exam	2.5	(Other)	
	Written exam		Project		(Other)	

Grading and evaluating student work in class and at the final exam	During the semester, 3 partial exams are held, and 60% of the exam is required for the passing grade, with the possibility of repeating a partial exam of 40 to 60%. Passing grade on a written exam is a prerequisite for passing an oral part of the exam.

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Martin S. Silberberg, Chemistry, The Molecular Nature of Mater and Change, 5th ed., McGraw-Hill Higher Education, 2009.	12	5
	Milan Sikirica, Stehiometrija, XX. Izd., Školska knjiga, Zagreb, 2008.	12	
	Ivan Filipović, Stjepan Lipanović, Opća i anorganska kemija I dio, 9. izd., Školska knjiga, Zagreb, 1995.	12	

Optional literature (at the time of submission of study programme proposal)	J. McMurry & R. C. Fay, General Chemistry, Atoms first., International edition, Prentice Hall, 2010. D. D. Ebbing & S. D. Gammon, General Chemistry, 9th ed., Houghton Mifflin, Boston, New York, 2007. S. S. Zumdahl, Chemical Principles, 6th ed., Houghton Mifflin, Boston, New York, 2007.
Quality assurance methods that ensure the acquisition of exit competences	Conversation with students, anonymous student survey, student success on the course, self-analysis.
Other (as the proposer wishes to add)	