<table>
<tr><td colspan="2">NAME OF THE COURSE</td><td colspan="5">GENERAL AND INORGANIC CHEMISTRY</td></tr>
<tr><td>Code</td><td>PMC221</td><td>Year of study</td><td colspan="4">1</td></tr>
<tr><td>Course teacher</td><td>Barbara Soldo
Assistant Professor</td><td>Credits (ECTS)</td><td colspan="4">8.0</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Linda Mastelić</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>45</td><td>15</td><td>45</td><td>0</td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="4"></td></tr>
<tr><td colspan="7">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="6">Introducing students to the basic chemical laws and principles, which will enable them to adopt more advanced chemical topics following General and Inorganic Chemistry. Develop student's ability to think critically about experiments conducted in the laboratory and the involvement of chemistry in everyday life.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="6">Prerequisite for the exam are completed laboratory practices in General and Inorganic Chemistry.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="6">After completing the course, students will be able to:

1) distinguish elemental substances from compounds, physical and chemical properties of substances and physical and chemical changes of matter

2) explain the electronic structure of atoms and the electronic configuration of elements

3) distinguish and define different types of chemical reactions, types of chemical bonds, and types of intermolecular interactions

4) explain and understand gas laws

5) perform some basic laboratory experiments

6) explain and understand the colligative properties of solutions and buffer solutions

7) explain the factors that affect the speed and balance of chemical reactions

8) explain energy changes during a chemical reaction

9) describe the properties of chemical elements of the main groups of the periodic table of elements and their compounds

10) solve simple numerical problems</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">Lectures:

1. Properties of substances, aggregation states of substances, chemical analysis and synthesis. SI units, physical and chemical changes of matter. Laws of chemical coupling (3 hours)

2. Atom structure, electron and atomic nucleus. Thomson and Rutherford model of atoms, isotopes, atomic mass, chemical formulas (3 hours)</td></tr>
</table>

	3. Writing and balancing chemical reactions. Types of chemical reactions: precipitation reactions, acid-base reactions, oxidation and reduction reactions. Stoichiometry, relevant reactant and yield (3 hours) 4. Thermochemistry and thermochemical equations. Enthalpy and entriopia, Gibbs energy, Hess's law (3 hours) 5. Electronic structure of atoms, Bohr and quantum-mechanical model of atoms. Orbitals, quantum numbers, electronic configuration. PSE, periodicity of properties: atomic radius, ionization energy and electron affinity energy (3 hours) 6. Ionic bond. Ionic radius of atoms, crystal lattice energy (3 hours) 7. Covalent bond. Lewis structural formulas. Octet rule, multiple connections, VSEPR model. Dipole moment and molecule structure. Valence bonds and the theory of hybrid orbitals (3 hours) 8. Metallic bond. Metal puzzles. Intermolecular interactions. Coordination componds (3 hours) 9. Phase conversions, vapor pressure, boiling point and melting point. Phase diagram of water. Solid and liquid state of aggregation (3 hours) 10. Gases. Ideal gas laws for gases and gas mixtures. Dalton's law. Van der Waals equation for real gases (3 hours) 11. Solutions, expression of composition and preparation of solutions. Influence of pressure and temperature on solubility and colligative properties of ionic solutions (3 hours) 12. Kinetics of chemical reactions. Factors affecting the rate of a chemical reaction. Equilibrium of chemical reactions. Equilibrium constant. Homogeneous and heterogeneous balance. Le Chatelier's principle (3 hours) 13. Acids and bases (Arrhenius, Bronsted-Lowry and Lewis definition). Relative strength of acids and bases, autoionization of water, solutions of strong acids and bases, pH of solution, buffers. Acid-base properties of salt solutions (3 hours) 14. Electrochemistry. Galvanic cells and electrolyte cells. Electrochemical reactions, electrode potential (3 hours) 15. Systematics of elements: main properties of groups in the periodic table (3 hours) **Seminars:** 1. Significant digits, SI system of units, physical and chemical changes on the atomic scale, subatomic particles (1 hour) 2. Plurality of substances, relative atomic and molecular mass, nomenclature of chemical (1 hour) compounds, expression of substance composition (proportions) (1 hour) 3. Elementary analysis. Determination of empirical and molecular formula of a compound (1 hour)

	4. Stoichiometry of chemical reactions, relevant reactant and recovery of chemical reaction (1 hour) 5. Oxido-reduction (redox) reactions (1 hour) 6. Electronic configuration of atoms and ions, orbitals and quantum numbers, PSE and periodicity of properties (1 hour) 7. Chemical bonds: Representation of the formation of ionic and covalent bonds by Lewis symbols Representation of molecules according to the VSEPR model (1 hour) 8. Crystal lattices of a cubic system (1 hour) 9. Gas laws (1 hour) 10. Solutions: expression of solution composition, preparation of solutions and dilution (1 hour) 11. Colligative properties of solutions (1 hour) 12. Acid-base equilibria. pH (1 hour) 13. Buffer solutions (1 hour) 14. Electrochemistry: Galvanic cells and electrolytic cells. Electrochemical reactions, electrode potential (1 hour) 15. Reactions characteristic of the representatives of the main groups in PSE (1 hour) **Exercises:** 1. Basic laboratory equipment and chemicals, precautions and protection during work in the laboratory. Mass and volume measurement. Working with a gas burner (3 hours) 2. Separation of the components of the mixture: decantation, filtration, distillation, sublimation, recrystallization and chromatography (3 hours) 3. Physical and chemical changes (3 hours) 4. Types of chemical reactions: precipitation reactions, acid-base reactions, redox reactions (3 hours) 5. Stoichiometry: relevant reactant and chemical reaction yield (3 hours) 6. Determination of melting point and boiling point (3 hours) 7. Preparation and detection of oxygen, hydrogen and carbon dioxide (3 hours) 8. Preparation of a solution of a given composition. Dilution and titration of acids (3 hours) 9. Chemical kinetics, influence of reactant concentration, temperature and catalyst on the rate of chemical reaction (3 hours) 10. Determination of pH. Hydrolysis reactions in aqueous solutions of various salts. Buffer solution, preparation and its action (3 hours)

	11. Determination of molar enthalpy of salt dissolution (3 hours) 12. Galvanic cell and electrolysis of aqueous salt solutions (3 hours) 13. Properties of transition metals (3 hours) 14. Preparation of double salts (3 hours) 15. Compensation (3 hours)

Format of instruction	☒ lectures ☒ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☐ multimedia ☐ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	Attendance to at least 80% lectures and seminars and all laboratory exercises are completed	

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	1.0	Research		Practical training	
	Experimental work	1.5	Report		(Other)	
	Essay		Seminar essay		(Other)	
	Tests	1.0	Oral exam	2.0	(Other)	
	Written exam	2.5	Project		(Other)	

Grading and evaluating student work in class and at the final exam	For pitup laboratory exercises it is mandatory to pass the entrance colloquium. A student who completes laboratory exercises from the course in its entirety and who is present at 80% of lectures and seminars can take the exam. The exam from the mentioned course consists of a written and an oral part. The written exam is elimination. Taking the exam is made possible through two partial tests during the semester. Tests (partial and complete) include material presented in lectures, seminars and exercises. The written exam lasts two hours and is graded as follows: Exactly solved more than 50% -sufficient Exactly solved more than 65% - good Exactly solved more than 80% - very good Exactly solved more than 90% - excellent It is necessary to pass both partial tests in order to access the 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**
	M. S. Silberberg, Chemistry the Molecular Nature of Matter and Change,4-th edition, McGraw-Hill, New York, 2006.	2	

	I. Filipović, S. Lipanović, Opća i anorganska kemija I i II dio, Školska knjiga, Zagreb, 1997.	10	
	M. Sikirica, Stehiometrija, Školska knjiga, Zagreb, 1987.		
Optional literature (at the time of submission of study programme proposal)	R. Chang, Chemistry, 10th edition, McGraw-Hill, New York, 2010. Vježbe iz Opće i anorganske kemije (interna skripta), Kemijsko-tehnološki fakultet, Split, 2013.		
Quality assurance methods that ensure the acquisition of exit competences	Information from conversations, remarks and consultations with students during classes - student survey		
Other (as the proposer wishes to add)			