| 1. COURSE DECRIPTION – GENERAL INFORMATION | | | |
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| 1.1. Course teacher | Assoc. Prof. Mario Gabričević, PhD<br>Assis. Prof. Ana Budimir, PhD | 1.6. Year of study | 1st |
| 1.2. Name of the course | **General Chemistry with Stoichometry** | 1.7. Credit value (ECTS) | 11 |
| 1.3. Associate teachers | Assistant Professor Tin Weitner, PhD<br>Davor Šakić, MPharm | 1.8. Type of instruction (number of hours L+E+S+e-learning) | 60+30+45 |
| 1.4. Study programme (undergraduate, graduate, integrated) | Medical Biochemistry integrated study programme | 1.9. Expected enrolment in the course | 25 |
| 1.5. Status of the course | Compulsory | 1.10. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum) | 2nd |
| **2. COURSE DESCRIPTION** | | | |
| 2.1. Course objectives | Establish a foundation for understanding the basic laws of chemistry, and laws governing structure and reactivity of chemical compounds. During the adoption of the course material, students should acquire general knowledge and generic skills underlying the majority of quantitative studies in the chemical and biochemical sciences. Students should be able to describe and distinguish the elements that influence the properties of chemical substances and their reactivity. After solving various numerical problems students will be able to define and analyze the physical-chemical quantities and equations, and thus develop a sense of their size. After completing the laboratory work, the students will be well acquainted with the basic techniques used in the laboratory. | | |
| 2.2. Enrolment requirements and required entry competences for the course | Unconditional | | |
| 2.3. Learning outcomes at the level of the study programme to which the course contributes | • Application of basic knowledge of chemistry (chemical-physical size and equations, properties of chemical substances and their reactivity, basic laws of chemistry) necessary for defining, analyzing and proposing procedures related to production, quality assurance and implementation of new laboratory methods for the detection and monitoring of diseases and efficacy of therapy. | | |
| 2.4. Expected learning outcomes at the level of the course (4-10 learning outcomes) | Upon completion of the course the student will/should be able to:<br>1. Describe, and be able to distinguish elements that affect the properties of chemical substances and their reactivity;<br>2. Define and analyze the physical-chemical quantities, properties, equations and develop a sense of the size of certain | | |

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| | property;<br>3. Explain and apply chemical laws;<br>4. Describe the electronic structure of atoms and chemical bond, intermolecular forces, and properties of solutions, solids and gases;<br>5. Define the theory of acids and bases;<br>6. Describe the basics of interactions of matter and radiation, and understand Beer-Lambert law;<br>7. Explain the concepts of chemical kinetics and electrochemistry;<br>8. Apply chemical calculations-stoichiometry;<br>9. Apply basic techniques in the laboratory. |
| 2.5. Course content broken down in detail by weekly class schedule (syllabus) | LECTURES AND SEMINARS:<br>• Preview of general chemistry.<br>• Calculation of quantities.<br>• Electronic structure of atoms, atomic orbitals.<br>• Chemical bond - covalent, ionic, metallic, covalent-coordinative.<br>• Molecular orbital theory.<br>• Properties of complex compounds.<br>• Gases and their properties, general gas equation, the equation of real gas.<br>• Intermolecular forces; London, Van der Waals, ion-dipole, dipole-dipole, hydrogen bonding.<br>• Properties of matter: solid, liquid, gas.<br>• Colligative properties of matter: vapor pressure, melting point depression (cryoscopy), boiling point elevation (ebullioscopy), osmosis and osmotic pressure.<br>• Acids and bases, Lewis theory.<br>• Interactions of matter and radiation, color of inorganic compounds.<br>• Basics of chemical kinetics, rate of a chemical reaction, rate constant.<br>• Electrochemistry: electrolyte solutions, conductivity, electrochemical cells, redox reactions.<br>LABORATORY EXERCISES:<br>• Introduction to laboratory equipment. Handling the burner. Transfer of chemicals and measuring of liquids. Weighing, evaporation and determination of dry matter.<br>• Distillation of acidic solution of copper (II) sulafate pentahydrate. Filtering using regular filter paper. Vacuum filtration with a Buchner funnel. Sublimation of iodine. Extraction of iodine from aqueous solution with chloroform.<br>• Separation of lead, arsenic and cadmium ions using paper chromatography. Physical and chemical changes. The law of conservation of mass. The law of combining volumes. Determination of the atomic mass of zinc.<br>• Preparation of solutions. Temperature dependence of solubility. The dependence of solubility on structure. Mixing liquids with liquids. Dissolution of ammonia in water. Proof of salt dissociation. Conductivity of solutions. Evidence that |

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<tr><td></td><td colspan="6">ionic compounds conduct electricity in dissolved state.<br>• Oxidation of potassium permanganate in acidic solution. The reaction of decomposition and re-formation of complexes. Acid-base titration. Indicators and pH measurement. Copper electrolysis, Faraday's constant determination. Electrochemical cell - Danniel cell.<br>• Dependence of rate of chemical reactions on various factors. Dependence of chemical kinetics on the temperature. Dependence of chemical kinetics on the surface size of the reactants. Influence of the catalyst on reaction rate. Shifting of chemical equilibrium.</td></tr>
<tr><td>2.6. Type of instruction</td><td colspan="3"><u>lectures</u><br><u>seminars</u> and workshops<br><u>exercises</u><br>online in entirety<br>mixed e-learning<br>field work</td><td colspan="2">independent study<br>multimedia and the internet<br><u>laboratory</u><br>work with the mentor<br>(other)</td><td>2.7. Comments:</td></tr>
<tr><td>2.8. Student responsibilities</td><td colspan="6">Regular attendance of lectures, seminars, and exercises.</td></tr>
<tr><td rowspan="6">2.9. Screening of student’s work (specify the proportion of ECTS credits for each activity)</td><td>Class attendance</td><td>3</td><td>Research</td><td></td><td>Practical training</td><td></td></tr>
<tr><td>Experimental work</td><td>1.5</td><td>Report</td><td></td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td>Seminar essay</td><td></td><td>(Other--describe)</td><td></td></tr>
<tr><td>Tests</td><td>0.5</td><td>Oral exam</td><td>2</td><td>(Other—describe)</td><td></td></tr>
<tr><td>Written exam</td><td>4</td><td>Project</td><td></td><td>(Other—describe)</td><td></td></tr>
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<tr><td>2.10. Grading and evaluation of student work over the course of instruction and at a final exam</td><td colspan="6">Three partial tests, laboratory exercises test, written and oral exam.</td></tr>
<tr><td rowspan="2">2.11. Required literature (available at the library and via other media)</td><td colspan="6">Title</td></tr>
<tr><td colspan="6">I. Filipović, S. Lipanović: Opća i anorganska kemija I dio, Školska knjiga, Zagreb, 1987.<br>M. Sikirica: Stehiometrija, Školska knjiga, Zagreb.<br>D. Bach-Dragutinović, B. Mayer: Praktikum iz opće i anorganske kemije, Školska knjiga, Zagreb, 1991.<br>R. H. Petrucci et al: General Chemistry; Principles and Modern Application</td></tr>
<tr><td>2.12. Optional literature</td><td colspan="6">T. Cvitaš, I. Planinić, N. Kallay, Rješavanje računskih zadataka u kemiji, I. i II. dio, Hrvatsko kemijsko društvo, Zagreb, 2008.<br>P. Atkins, J. de Paula, Physical Chemistry, 8. izd., Oxford University Press, Oxford, 2007.</td></tr>
<tr><td>2.13. Methods of monitoring quality that ensure acquisition of exit competences</td><td colspan="6">Outcomes 1-8 are monitored by partial tests during the semester (or written final exam) and oral exam.<br>Outcome 9 is assessed during laboratory exercises and by a written test.</td></tr>
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