<table>
<tr><td>Name of discipline</td><td colspan="4">Analytical Chemistry</td></tr>
<tr><td>Type</td><td colspan="2">Compulsory</td><td>Credits</td><td>9</td></tr>
<tr><td>Academic year</td><td colspan="2">I-II</td><td>Semester</td><td>II-III</td></tr>
<tr><td rowspan="2">Number of hours</td><td>Course</td><td>30</td><td>Practice/laboratory work</td><td>90</td></tr>
<tr><td>Seminar</td><td></td><td>Self-training</td><td>150</td></tr>
<tr><td>Component</td><td colspan="4">Fundamental</td></tr>
<tr><td>Course holder</td><td colspan="4">Melnic Silvia, PhD, associate professor</td></tr>
<tr><td>Location</td><td colspan="4">Chișinău, 66 Malina Mică street, building 2.</td></tr>
<tr><td rowspan="2">Conditionings and prerequisites of:</td><td colspan="4">Program: The study of analytical chemistry requires some level of mathematics and physics. These disciplines are a part of the language of chemistry, and a lack of familiarity with that language can become a barrier to success in understanding analytical chemistry. The course assumes previous knowledge of chemistry. It is designed to provide students whose background includes a year of high school chemistry with stimulation and some new material.</td></tr>
<tr><td colspan="4">Competences: The ability to perform experiments, the ability to correctly understand and apply working methods in compliance with labor protection rules; digital skills; the ability to communicate and work in a team; qualities - tolerance, compassion, autonomy.</td></tr>
<tr><td>Mission of the discipline</td><td colspan="4">The mission of the discipline is to conceptualize analytical methods in the chemical control of chemicals, including drugs. The methods of analytical chemistry are necessary for all specialists in laboratories of toxicology, biochemistry, sanitary chemistry, etc., units in which many pharmacists work. For these reasons one of the main objectives of the course is to train students in theoretical knowledge in the field of analytical chemistry and to accumulate practical skills in the qualitative and quantitative analysis of chemicals. The second objective ensures the study of the qualitative and quantitative composition of simple and complex substances, isolated or from mixtures. Studying the structure of substances, namely the way atoms and ions bind in molecules. The third objective is to define the analytical control of some substances, which consists in: tracking over time the qualitative and quantitative composition of substances with direct applications in the study of substances, especially drugs and their galenic forms; tracking the characteristic properties of substances, which must not vary over time.</td></tr>
<tr><td>Overview of the topics</td><td colspan="4">Analytical chemistry and chemical analysis. Fundamentals, basic concepts, principles and methods of qualitative chemical analysis.<br>The nature of aqueous solutions. Strong and weak electrolytes. Solvent classification. Acid-base reversible reactions. Protolytic theory of acids and bases. The pH scale of hydrogen ion activity in water and non-aqua solutions. Law of mass actions for acid-base reversible reactions. Method for the calculations of pH. Buffered solutions. Mechanism of the buffered solutions action. pH of buffered solutions. Protolytic equilibrium for aqua salt solutions. Hydrolysis constant and grade. Method for the calculations of aqua salt solutions pH. Amphoteric substances in chemical analysis. Equilibrium in heterogenic «solid-solution» systems. Solubility product ($K_{sp}$). Precipitation. Relation between solubility (S, mol/l) and $K_{sp}$. Factors that influence solubility. Selective precipitation. Solubility of slightly soluble electrolytes. Analytical reactions and qualitative analysis of the I-VI analytical groups of cations. Qualitative analysis of a mixture of cations. Equilibrium in redox systems. Reduction potentials. Nernst equation. Equilibrium</td></tr>
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| | constant for redox reactions. Direction of redox reactions. Redox reactions in chemical analysis. Coordination complexes reactions in chemical analysis. Analytical reactions and qualitative analysis of the I-III analytical groups of anions. Qualitative analysis of a mixture of anions. Organic reagents in analysis. Physical-chemical methods of separation and concentration. Qualitative analysis of solid inorganic salts.<br>Introduction in quantitative analysis. Gravimetric analysis. Errors in quantitative analysis. Introduction to volumetric analysis: fundamentals, basic concepts, principles and methods of volumetric analysis. Measuring glassware, the composition of solutions, preparation of a standard solution, analysis data handling. Acid-base titration: basic concepts, classification, acid-base indicators. Titration curve for the acid-base titration. Indicator errors, non-aqueous titration. Examples of acid-base determinations. Oxidation-reduction (redox) titration: basic concepts, classification, indicators, titration curves. Permanganatometry. Iodimetry and Iodometry. Chloroiodimetry, iodatometry, bromatometry, bromometry, cerimetry, nitritometry, dicromatometry, cerimetry, nitritometry. Precipitation titration: basic concepts, classification, indicators, titration curves. Precipitation titration: argentometry, rodanometry. mercorometry, sulfatometry, hexacianoferratometry. Complexometry: basic concepts, classification, peculiarities. Complexonometry: basic concepts, peculiarities. Complexones. Specific and metalocromic indicators. Examples of determinations |
| Outcomes | • to be able to analyze and standardize medicines of synthetic origin;<br>• to know the methods and techniques of analysis used to separate and identify chemical species, which allow the study of the chemical composition of samples with unknown constituents;<br>• to become familiar with the systematic inorganic analysis;<br>• to know the principles of quantitative and qualitative analysis;<br>• to apply some methodologies and laboratory techniques specific to the study of classical methods of chemical analysis;<br>• gain experience in handling laboratory equipment and study techniques specific to analytical chemistry: use of specific analytical reagents and reactions, use of laboratory equipment, recognition of cations and anions relevant in biology, medicine and pharmacy through their specific reactions, etc. |
| Practical skills | • to be able to analyze and standardize medicines of synthetic origin and phytopreparations;<br>• to know the methods and techniques of analysis used to separate and identify chemical species, which allow the study of the chemical composition of samples with unknown constituents;<br>• to become familiar with the systematics of inorganic analysis;<br>• to know the principles of quantitative and qualitative analysis;<br>• to apply some methodologies and laboratory techniques specific to the study of classical methods of chemical analysis;<br>• gain experience in handling laboratory equipment and study techniques specific to analytical chemistry: use of specific analytical reagents and reactions, use of laboratory equipment, recognition of cations and anions relevant in medicine and pharmacy through their specific reactions, etc. |
| Evaluation form | Exam – semester II, Exam – semester III. |