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| **Study program** Undergraduate Studies |
| **Course title** Physical Chemistry 3 (H126C) |
| **Name of lecturer/lecturers**  Emilija Pecev Marinković |
| **Type of course** Obligatory |
| **Number of ECTS allocated 7** |
| **Course objectives** Ability to adequately understand the structure, importance and role of representatives of natural resourcesaspects of isolation, structural characteristics, physico-chemical properties and biological effects. |
| **Course outcomes**Upon successful completion of this course, the student:- mastered the basic principles of atomistics- became introduced with the basic methods of the atomistic view of the structure of matters- learned about the properties and structure of atoms and molecules- became introduced with scientific theories that determine the properties of atoms and molecules- became introduced with the behavior of atoms and molecules in the interactions they participate- mastered the basic experimental techniques for determining certain constants  |
| **SYLLABUS***Lectures* Introduction to atomistics. Milliken's experiment. Calculation of specific charge. Black body radiation. Planck’s radiation law**.** Photoelectric effect. Frank-Hertz experiments. The Compton effect. Optical spectrum of hydrogen (series). Rutherford model of the atom. Bohr's model of the atom. A model of the atomic nucleus. The composition of the atomic nucleus, the force in the nucleus. Quantum numbers. Hydrogen-type spectra and spectroscopic displacement law. Spectra of alkali metals. X-ray radiation. X-ray spectra. Auger Crossing. De-Bronge relation (Davison Germer's experiment). Uncertainty principle. The Schrödinger equation. Solution of the Schrödinger equation for the hydrogen atom. Atomic orbitals. Electronic configuration and construction of the Periodic Table of Elements. The Russell Saunders coupling scheme. Fine structure of terms with one outer electron. A fine structure of thermals with two outers of electrons. Selection rules. An atom in a magnetic field. Weak and strong magnetic field. Normal Zeeman effect. Anomalous (complex) Zeeman effect. Classification of atomic spectra. Types of molecular spectra. Molecular rotation spectra. Vibrational molecular spectra. Rotational-vibrational molecular spectra. Electronic spectra. Intensity distribution in the Deslanders band system. Molecule terms. Hund's types of molecular terms. Selection rules. Absorption spectra of molecules. Absorption at n-π\* and π-π\* transitions. Electro-transfer spectra (ET spectra). A solid state of matter. Crystals, properties and symmetry of crystals. Natural radioactivity. α, β and γ-radiation. Radioactive isotopes and isomers. Isobars. Artificial radioactivity. Measurement and detection radioactivity. Fission and fission products. Nuclear fusion.*Laboratory work* 1. Determination of elementary electron charge 2. Determination of the Rydberg constant 3. Determination of Planck's constant 4. Electro-transfer spectra of iodine adducts in organic solvents5. Calculation and demonstration exercises in the field of particles and waves, quantum nature of light, wave properties particulate matter6. Computational and demonstration exercises in the field of atomic structures and atomic spectra7. Computational and demonstration exercises in the field of molecular spectra8. Computational and demonstration exercises in the area of laws of Aasorption of light |
| **References**1. V. Vukanović, Atomistika, Naučna knjiga, Beograd.2. V. N. Kondratijev, Struktura atoma i molekula, Naučna knjiga, Beograd, 1966.3. U. Mioč, Zbirka zadataka iz opšteg kursa fizičke hemije, PMF Univerzitet u Beogradu, Beograd 1988.4. D. Ovcin i grupa autora, Fizička hemija zbirka zadataka, Tehnološko-metalurški fakultet, Beograd, 1985.5. Atkins P., De Paula J., Physical Chemistry, 8th edition, Oxford, 2006.6. S. Macura, J. Radić-Perić, Atomistika, Beograd, 2004.7. H. J. Arnikar, Osnovi nuklearne hemije, Univerzitet u Beogradu, Beograd 1992.8. Emilija Pecev-Marinković, Praktikum iz strukture atoma i molekula, Prirodno-matematički fakultet, Niš, 2017 |
| **Active teaching classes** | **Lectures 45** | **Laboratory work 30** |
| **Teaching mode** theoretical lectures, Power point presentations, experimental exercises  |
| **ASSESSMENT METHODS AND CRITERIA (Max 100 points)** |
| **Pre exam duties** | **Points** | **Final exam**  | **Points** |
| Activity during lectures | 5 | Written examination | 10 |
| Practical teaching | 25 | Oral examination | 20 |
| Colloquiums | 40 |  |  |