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| **Study program** Doctoral: Chemistry | | | | |
| **Course title** Chemical Equilibria | | | | |
| **Name of lecturer/lecturers** Violeta Mitić | | | | |
| **Type of course** Elective course | | | | |
| **Number of ECTS allocated** 10 | | | | |
| **Course objectives** The objective of the course is to learn to apply equilibrium constraints to a range of systems of interest in chemistry. This course introduces the protocol for modeling chemical systems at equilibrium. The always reliable protocol for modeling equilibria is based on conservation of charge and mass and constants characterized by equilibrium constants and standard redox potentials. Various methods for visualizing information about solutions and titrations will be presented. | | | | |
| **Course outcomes**.  Training the student for  - independent scientific and professional work in solving problems in the field of analytical chemistry  - application of principles of good laboratory practice  - public presentation of new knowledge obtained through his own scientific research | | | | |
| **SYLLABUS**  Thermodynamics and equilibrium chemistry, Mass balance (MB), Charge balance (CB)  Reversible reactions and chemical equilibria. Reversible reactions and dynamic equilibria  Equilibrium constant. Disruption of equilibria. Predicting the extent of reaction  Equilibrium constants for heterogeneous equilibria. Predicting the effect of disruptions on equilibria  Equilibrium constants and temperature.  Graphical approach to determining balance in acid-base systems  Fractional concentrations. Autoprotolysis.  Acid–base equilibria. Buffers equilibria. Amphiprotic species  Complexation equilibria metal-ligand formation constants. Сomplexes with inorganic monodentate and bidentate ligands, complexes with organic monodentate and polydentate ligands  Stability constants and entropy - the chelate effect. Solubility equilibria  Oxidation/reduction equilibria. Disproportionation reactions. Graphic presentation of the balance of redox reactions. Heterogeneous balances. Gas-solid systems, solid-liquid systems, liquid-liquid systems. Equilibria in solutions of sparingly soluble salts.  Equilibria in colloid-disperse systems.  Donnan equilibrium. Balance of ion exchange.  Systematic approach to solving equilibrium problems | | | | |
| **References**  1. D. A. Skoog, D. M. West, F. G. Holler, Основе аналитичке кемије, Школска књига, Загреб, 1999  2. L. Meites, An Introduction to Chemical Equilibrium and Kinetics, Oxford, New York, Sydney, 1981  3. Д. Петерс, Џ. Хеиес, Г. Хифте, Химическое разделение и измерение (Теорија и практика аналитическои химии), Москва, 1978 | | | | |
| **Active teaching classes** | **Lectures** 105 | | **Laboratory work** | |
| **Teaching mode** Interactive lectures, e-learning, consultations. | | | | |
| **ASSESSMENT METHODS AND CRITERIA (Max 100 points)** | | | | |
| **Pre exam duties** | **Points** | **Final exam** | | **Points** |
| Activity during lectures | 10 | Written examination | | 35 |
| Practical teaching |  | Oral examination | |  |
| Teaching colloquia | 45 |  | |  |
| Seminar | 10 |  | |  |