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| 1. Course title: General and Inorganic Chemistry I. | | | | | |
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| 2. Code: | | 3. Type (lecture, practice etc.): lecture | | | |
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| 4. Contact hours: 4 hoursper week | | 5. Number of credits (ECTS): 5 | | | |
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| 6. Preliminary conditions (max. 3): | | | | | |
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| 7. Announced:fall semester, spring semester, both | | | | | |
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| 8. Limit for participants: 100 | | | | | |
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| 10. Responsible teacher (faculty, institute and department):  László Kollár DSc (Faculty of Science, Institute of Chemistry, Department of Inorganic Chemistry) | | | | | |
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| 11. Teacher(s) and percentage: | | László Kollár | | 100% | |
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| 12. Language:English | | | | | |
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| 13. Course objectives and/or learning outcomes:  **Objectives:** The aim of this course is to provide the basic ideas of general and inorganic chemistry.  The lecture intends to introduce students to basic concepts essential to further courses.  Learning outcomes: Students completing the course will have *knowledge* on the basics of general and inorganic chemistry. They will be *able* to classify major types of chemical compounds, analyse their bonding properties and physical properties.  They will have a *competence* of evaluating readings in general and inorganic chemistry. Their positive *attitude* towards innovative methods will increase significantly. | | | | | |
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| 14. Course outline  Subject of chemistry, chemistry and other sciences, chemistry and society. Basic terms of chemistry.  Stoichiometry: mole-mass relation in chemical reactions. Molar interpretation of a chemical equation. (molecular formula, empirical formula, Avogadro’s number, kind of chemical reactions)  Atomic structure (Rutherford’s experiment, the Bohr theory of hydrogen atom, quantum mechanics model). Quantum numbers and atomic orbitals.  Electron structure of atoms. Electron configurations and orbital diagrams. Pauli exclusion principle, building-up principle, Hund’s rule. The periodic table. Periodic classification of the elements. Periodic properties (atomic radius, ionization energy, electron affinity).   1. Metallic bonding, ionic bond. Covalent bond, electron negativity, polar covalent bond, dipole moment.   Molecular geometry, VSEPR-model, valence bond (VB) theory, molecular orbital (MO) theory.  Change of state. Phase change (boiling point, melting point). Phase diagrams. Type of solids. (crystalline and amorphous solids). Intermolecular forces (London-forces, dipole-dipole-forces, hydrogen bonding). Test.  Type of solution, the solution process, concentration of solutions (mass percentage, mass fraction, molarity, mole fraction, molality). Colligative properties: boiling-point elevation, freezing-point depression, osmosis.  Colloids. Type of colloids. Type of reactions, heat of reactions. Rate of reaction. Reaction order. Reaction mechanisms, catalysis.  Week 9  Reaction of acid, bases. Neutralization. Acid-base concepts (Arrhenius, Bronsted-Lowry, Lewis, Pearson). Water self-ionization, ion-product constant for water, pH. Acid-base equilibria in solution (weak acid and base, salt, hydrolysis, common-ion effect, buffers.)  Week 10  Oxidation number, oxidation number method. Oxidation-reduction reactions. Electochemical cells, Galvanic cells. Electrode potentials, electrodes, Nernst equation. Electrolytic cells, fuel cell, lead storage cell.  Chemical equilibrium-dynamic equilibrium. (equilibrium constant, Le Chatelier’s principle). Homogeneous and heterogeneous equilibrium.  Week 11  Coordination compounds. Formation and structure of complexes. Naming of coordination complexes. Structure and isomerism in coordination compounds.  Week 12  Valence bond theory of complexes. Crystal field theory.  Week 13  Test.  Pearson acid-base concept (hard/soft acid/base). | | | | | |
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| 15. Mid-semester works  Attending lectures is highly recommended. Two tests have to be performed (see above). | | | | | |
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| 16. Course requirements and grading  Oral exam is based on lectures, accessible electronic sources and lecture materials.  Grades:  0–50% fail  51–65% acceptable  66–75% average  76–90% good  91–100% excellent | | | | | |
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| 17. List of readings  D. D. Ebbing: General Chemistry. Houghton Mifflin Company, Boston, 1988.  John W. Hill: Chemistry for Changing Times. Macmillan Publishing Company, 1988. | | | | | |
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| 18. Recommended texts, further readings  N.N. Greenwood – A. Earnshaw: Chemistry of the Elements. Butterworth-Heinemann, Oxford, 1997. | | | | | |
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| **Date** | 13 April, 2017 | **Prepared by** |  | | |
| Dr. László KOLLÁR  responsible teacher | | |
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| **Endorsed by** | | |  | | |
| Dr. László KOLLÁR program supervisor | | |