IMAT Chemistry syllabus

- **The constitution of matter:** the states of aggregation of matter; heterogeneous systems and homogeneous systems; compounds and elements.
- Laws of perfect gases.
- **The structure of the atom**: elementary particles; atomic number and mass number, isotopes, electronic structure of atoms of various elements.
- **The periodic system of elements**: groups and periods; transition elements. Periodic properties of the elements: atomic radius, ionization potential, electronic affinity, metallic character. Relationships between electronic structure, position in the periodic system and properties of the elements.
- **The chemical bond:** ionic bond, covalent bond and metallic bond. Bond energy. Polarity of the bonds. Electronegativity. Intermolecular bonds.
- **Fundamentals of inorganic chemistry**: nomenclature and main properties of inorganic compounds: oxides, hydroxides, acids, salts.
- **Chemical reactions and stoichiometry**: atomic and molecular mass, Avogadro's number, mole concept and its application, elementary stoichiometric calculations, balancing simple reactions, the different types of chemical reactions.
- **Solutions**: solvent properties of water, solubility, the main ways of expressing the concentration of solutions.
- Equilibria in aqueous solution.
- Elements of chemical kinetics and catalysis.
- **Oxidation and reduction**: oxidation number, concept of oxidant and reductant. Balancing of simple reactions.
- **Acids and bases**: the concept of acid and base. Acidity, neutrality and basicity of aqueous solutions. pH. Hydrolysis. Buffer solutions.
- **Fundamentals of organic chemistry**: bonds between carbon atoms, crude and structure formulas, concept of isomeria. Aliphatic, alicyclic and aromatic hydrocarbons. Functional groups: alcohols, ethers, amines, aldehydes, ketones, carboxylic acids, esters, amides. Elements of nomenclature.