

<b>Name of the course</b>	<b>Chemistry and polymer engineering</b>
Number of instruction hours	20
Outline of course/module content	<p>Polymer molecular structure: nonuniformity, molecular weight distributions and averages, chemical composition distribution.</p> <p>Polymerization reactions: radical polymerization, step polymerization, ionic polymerization, ring-opening polymerization. Polymerization kinetics fundamentals. Kinetic parameters vs. molecular weight distribution relations.</p> <p>Polymerization thermodynamics.</p> <p>Physical chemistry of polymers. Ideal and real polymer chains, ideal chain models, configurations and conformations, macromolecular coil dimensions, excluded volume. Polymer solutions: swelling and dissolution of polymers, theta solvent, solubility parameter. Thermodynamics of polymer solutions: peculiarities of thermodynamic functions – enthalpy, entropy and Gibbs free energy of mixing. Thermodynamic stability, phase equilibria, phase diagrams. Theories of polymer solutions: Flory-Huggins theory, Prigogine theory, Flory new theory.</p> <p>Surface and interface effects in polymer systems, interactions at phase boundary, surface free energy. Surface modification in natural and synthetic polymer systems by surface treatment or by polymeric (plastomeric, elasomeric) and other (microfillers, nanofillers, compatibilizers, stabilizers) additives.</p> <p>Industrial polymerizations: bulk and solution polymerization, suspension polymerization, emulsion polymerization. Crosslinking reactions. Interfacial polymerization.</p> <p>Polymerization reactors, modeling at the macro-, meso- and microlevel. Modeling and optimization of the polymerization process according to preset product properties.</p>
Description of instruction methods	Instruction methods adapted individually to the students: lectures and/or consultations, optional laboratory syntheses of polymeric materials.
Description of course/module requirements	ormulation of the individual seminar paper related with the topic that is of the scientific or professional importance for the student. Written examination.