

Name of the course	Nanostructured surfaces and materials
Number of instruction hours	20
Outline of course/module content	<p>Methods of nanoparticle preparation: preparation and stabilization of colloidal solutions, hydrothermal synthesis, mechanochemical synthesis, sol-gel synthesis. Preparation of thin films: by dip coating, spin coating and doctor's blade, ablation by spark. Methods for characterization of nanoparticles and films: X-ray diffraction (crystallite size, thin film thickness), electron microscopy (average Feret diameter, interplanar spacing), diffuse reflection UV-Vis spectroscopy (band gap). Analysis of surface and interface phenomena. Interfacial interactions in nanostructured materials. Nanoobjects and surface modification of nanoobjects. Modifications of the polymer surface and the relationship of change in the properties of surfaces, interfaces and materials in general. Intermolecular interactions and molecular recognition. Selfconnection and self-organization. Special properties of (organic) nanomaterials – selected examples. Basics of quantum mechanics. Localized and delocalized states. Periodic potentials. Thermal and electrical conductivity in crystals. Surface phenomena. Application of programme packages Quantum Espresso and Gaussian for calculation of adsorption energies of molecules and atoms on the crystal surface, bonding energies, vibrational frequencies, charge distribution and dipole moments.</p>
Description of instruction methods	Lectures, seminars, laboratory practice
Description of course/module requirements	Oral exam, seminar paper