Name of the course	Chemical sensors and biosensors
Number of instruction hours	20
Outline of course/module content	Chemical sensors and biosensors – definitions, theoretical background, components of a sensing system, classification. Transducers: electrochemical, optical, electrical, thermal and mass transducers. Receptor part: mechanism of chemical and biological recognition, biomimetic systems, (bio)chemical selectivity, enzymatic biosensors, immobilization techniques, role of functional materials in sensing systems – polymers. Sensor analytical performance: selectivity, sensitivity, precision, accuracy, repeatability, reversibility, response time, stability. Electrochemical sensors and biosensors: potentiometric and amperometric: ion-selective electrodes (ISEs), modified electrodes, microelectrodes, standard electrode fabrication techniques, solid-state planar electrodes; conductometric sensors; FET (field effect transistor) sensors. Optical sensors and biosensors: techniques of optical detection, absorptiometry, UV-visible absorption spectroscopy; reflectometry, luminescence spectroscopy, light scattering techniques, direct and indirect methods, indicator based systems, fiber-optic chemical sensors and biosensors. Mass and thermal sensors: piezo-electric effect, surface acoustic waves, thermal sensors. Application of chemical sensors and biosensors: industrial processes, environmental and biomedical applications, wearable sensors. Functional (bio)chemical sensor interface architecture (materials and building principles); enabling micro and nano fabrication technologies, printed sensors. Highly integrated chemical sensing systems and microfluidics: micro-electro-mechanical systems (MEMS and Bio(MEMS), Micro-total-Analytical Systems (μTAS), Lab-on-a-chip systems, nanosensors, biochips.
Description of instruction methods	Lectures, supervisions and discussions, seminar presentations
Description of course/module requirements	Each student will be assigned one real chemical sensor problem usually related to the topic of their PhD thesis. Students have to propose a solution to the problem using knowledge and skills gained during the course. The results have to be presented to the group (20 min. presentation) and in a form of a written report.