

Level: master				
Course title: Spectroscopic methods of materials investigation				
Status: elective				
ECTS: 9				
Requirements:				
Learning objectives Introducing students to the field of materials examination by the use of spectroscopic methods. Acquiring modern knowledge in the field of spectroscopy of condensed matter.				
Learning outcomes After completing and mastering the course, students should have: <ul style="list-style-type: none"> – Ability to read professional literature and prepare of scientific presentations; – Ability to independently perform measurements and experiments for characterization of materials; – Ability to realize certain technical solutions. 				
Syllabus <i>Theoretical instruction</i> <p>Spectroscopy and quantum mechanics. Schrodinger equation, the orbital and spin momentum of electrons and nuclei. Born-Oppenheimer approximation. Harmonic oscillator. Electrons in a periodic potential. Electromagnetic radiation and interactions of electromagnetic radiation with atoms and molecules. Fourier transformation.</p> <p>Dielectric function. The optical constants and the dispersion relation. Dielectric function which include phonon, plasmon and magnon interaction.</p> <p>The molecules and crystals symmetry. Selection rules. Representation of groups. Irreducible representations.</p> <p>Phenomenological working principle:</p> <ul style="list-style-type: none"> - absorption spectroscopy and Diffuse-Reflectance Spectroscopy - emission spectroscopy - vibrational (Raman and IR) spectroscopy - X-ray spectroscopy - neutron spectroscopy - NMR and EPR spectroscopy - Gamma-ray spectroscopy <i>Practical instruction</i> <p>Application of selected methods for characterization of spectroscopic properties of materials.</p>				
Weekly teaching load				Other:
Lectures: 3	Exercises: 1	Other forms of teaching: 1	Student research:	