

Study Programme: Physics
Course Unit Title: Vibrational Spectroscopy
Course Unit Code: M18VS
Name of Lecturer(s): Associate Professor Sonja Skuban, Full Professor Željka Cvejić
Type and Level of Studies: Master Academic Studies in Physics
Course Status (compulsory/elective): Elective
Semester (winter/summer):
Language of instruction: English
Mode of course unit delivery (face-to-face/distance learning): Face-to-face
Number of ECTS Allocated: 8
Prerequisites: None
Course Aims: Gaining theoretical knowledge related to vibrational spectra of molecules and applying the theory by processing experimental results in IR and Raman spectroscopy.
Learning Outcomes: Students should develop: - General abilities: After completing the course and mastering the material the student is able to perform the synthesis of theoretical and experimental knowledge. - Course specific abilities: Analysis of problems related to infrared and Raman spectroscopy.
Syllabus: <i>Theory</i> The absorption of electromagnetic radiation, infrared absorption. Molecular spectra, types of vibration, vibrations of diatomic molecules, vibrations of polyatomic molecules. Normal mode of vibration. Harmonic oscillator model. IR spectra and their interpretation. IR spectrophotometers, dispersive IR spectrophotometers. Fourier Transform Infrared Spectroscopy-FTIR. Single-beam FTIR, Double-beam FTIR spectrophotometers. Advantages and application of FTIR spectroscopy. Spectral analysis (organic and inorganic molecules, polymers, biological applications, or applications in the industry and ecology). The history of Raman scattering. Raman effect. The selection rules in infrared spectroscopy and Raman spectroscopy. Raman spectrophotometers. <i>Practice</i> Preparation of samples for Raman Spectroscopy. Raman vs. IR spectroscopy. The application of Raman spectroscopy.
Required Reading: 1. Introductory Raman Spectroscopy, (second edition), Elsevier, 2003., John R. Ferraro, Kazuo Nakamoto, Chris W. Brown 2. Infrared and Raman Spectra of Inorganic and Coordination Compounds, Theory and Applications in Inorganic Chemistry, John Willey & Sons, 2008., Kazuo Nakamoto 3. Infrared Spectroscopy: Fundamentals and Applications, John Willey & Sons, 2004., Barbara H. Stuart 4. Infrared and Raman Spectroscopy, Methods and Applications, VCH, New York, 1995, Edited by Bernhard Schrader 5. Handbook of Applied Solid State Spectroscopy, Springer, 2006. D. R. Vij

Weekly Contact Hours:	Lectures: 3		Practical work: 2
Teaching Methods:			
Lectures, practical exercises and other forms of teaching.			
Knowledge Assessment (maximum of 100 points): 100			
Pre-exam obligations	points	Final exam	points
Active class participation	10	written exam	-
Practical work	-	oral exam	50
Preliminary exam(s)	-		
Seminar(s)	40		