Course Unit Descriptor

Study Programme: Chemistry

Course Unit Title: Instrumental Analysis

Course Unit Code: ZMH-403

Name of Lecturer(s): Assistant Professor Jasmina Anojčić

Type and Level of Studies: Bachelor Academic Studies

Course Status (compulsory/elective): Elective

Semester (winter/summer): Winter

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): Face-to-face

Number of ECTS Allocated: 8

Prerequisites: Principles of Instrumental Analysis

Learning objectives

Expanding the knowledge base of the physical and physico-chemical principles necessary for understanding the principles of analytical instruments. Expanding the understanding of the role, importance and application areas of instrumental analysis. Enabling deeper understanding of the specialized branches of instrumental chemical analysis. Training in practical skills that enable professional handling of the devices during instrumental analysis. Advanced training of students in solving problems and tasks using instrumental analysis.

Learning outcomes

Application of knowledge of instrumental analysis techniques to understand the methodology for the selection of suitable measurement techniques and methods to solve complex analytical tasks/problems. Independently and critically apply knowledge and understanding of facts, concepts, principles and theories in solving analytical problems unknown. Independently operated instruments for physico-chemical analysis of various samples. Choose, and if necessary, optimize / modify / adapt and implement appropriate laboratory procedures/methods (optical, electroanalytical, thermoanalytical and other methods) when solving practical problems by applying instrumental chemical analysis. Evaluate and present research results.

Syllabus

Theoretical instruction

Trends in the Instrumental analysis, Chemical analytical systems, Processing of the Analytical Signals, Enhancement of the signal-to-noise ratio. Calibration of instruments, Errors of measurements, Quality of measurements and validation of analytical methods, Röntgen spectrometry, Microscopy and microanalysis, Reflection spectrometry, Rahman spectrometry, Electron spin resonance spectrometry, Newer spectroscopic methods. Photoacoustic spectrometry, Thermal lens spectrometry, Dielectrometry, Chemical Sensors, Analytical application of magnetic susceptibility, Selection of the optimal method of analysis.

Practical instruction

Auditory exercise: Processing of the analytical signals. Enhancement of the signal-to-noise ratio. Errors of measurements. Quality of measurements and validation of analytical methods, Selection of the optimal method of analysis. Experimental exercise: Calibration of instruments. Röntgen spectrometry. Microscopy and microanalysis. Dielectrometry. Electron spin resonance spectrometry. Chemical sensors. Analytical application of magnetic susceptibility.

Required Reading:

1. Skoog, Holler, Nieman: Principles of Instrumental Analysis, Harcourt Brace College Publishers, 1998
2. R. Kellner, J. Mermet, M.Otto, H. M.Widmer, Analytical Chemistry, Wiley/VCH, 1998

Weekly Contact Hours: 105	**Lectures:** 45	**Practical work:** 45+15

Teaching Methods:

Lectures and laboratory work

Knowledge Assessment (maximum of 100 points): 100

Pre-exam obligations	points	**Final exam**	points
Activities	10	Test	30
Lab. work	10	Oral exam	50