

Study Programme: Bachelor Academic Studies in Environmental Protection – Environmental Protection Analyst			
Course Unit Title: Application of AAS and ICP-MS in Environmental Analysis			
Course Unit Code: IZZS-502			
Name of Lecturer(s): Full Professor Snežana Maletić, Associate Professor Malcolm Watson			
Type and Level of Studies: Bachelor of Science Degree			
Course Status (compulsory/elective): Elective			
Semester (winter/summer): Summer			
Language of instruction: English			
Mode of course unit delivery (face-to-face/distance learning): Face-to-face			
Number of ECTS Allocated: 6			
Prerequisites: None			
Course Aims: Understanding the principles and possibilities of application of AAS and ICP-MS for the analysis of metals in environmental samples (water, air, soil, and sediment).			
Learning Outcomes: After completing the course, students should be able to define the basic principles of AAS and ICP-MS spectrometry; describe the instrumentation in AAS and ICP-MS spectrometry; analyze samples from the environment using AAS and ICP-MS spectrometer, process and interpret the results of the analysis performed.			
Syllabus: <i>Theory</i> Selection of appropriate analytical techniques for inorganic analysis. Introduction to the basic principles of atomic absorption spectroscopy, the basic instrumentation (equipment needed for the analysis of liquid, gaseous and solid samples), an overview of techniques for the determination of trace metals. Introduction to the basic principles of ICP-MS, mass spectrometry, the types of analysis (semi-quantitative scans, quantitative, isotope ratio), analytes that can be analyzed with satisfactory control of interference. Advantages and disadvantages of ICP-MS and AAS. <i>Practice</i> Techniques for the preparation of standards and environmental samples for the analysis of metals. AAS instrumentation, introduction to the software for analyzing and processing data. Application of AAS for determination metals in the environmental samples - Analysis of selected metals by flame absorption spectrometry; Determination of mercury by cold vapour technique (FIAS flow injection system); Analysis of K and Na in environmental samples by atomic emission spectrometry. Determination of metal traces in environmental samples by atomic absorption spectroscopy in a graphite furnace. Instrumentation ICP-MS, instrument optimization. Semi-quantitative scanning of environmental samples. Quantitative determination of boron, manganese, iron and arsenic in traces. Data processing, reporting and calculation results related to the application of ICP-MS and AAS.			
Required Reading: 1. C. Feldman: Atomic Absorption Spectroscopy, Applications in Agriculture, Biology, and Medicine, Robert E. Krieger Publishing Company Huntington, New York, 1979. 2. R. Thomas: Practical Guide to ICP-MS, 2004. 3. R. Reeve: Introduction to environmental analysis, John Wiley & Sons, 2002. 4. S.M. Nelms: Inductively Coupled Plasma Mass Spectrometry Handbook, 2005.			
Weekly Contact Hours: 5	Lectures: 2	Practical work: 3	
Teaching Methods: Lectures, laboratory work			
Knowledge Assessment (maximum of 100 points): 100			
Pre-exam obligations	points	Final exam	points
Active class participation	5	Written exam	30
Practical work	25	Oral exam	20
Preliminary exam(s)	20		