

Course title	HEAVY METALS AND METABOLISM						
Code	ZDIB25						
Study program	Postgraduate Interdisciplinary University Programme Environment protection and Nature Conservation						
Semester	III.						
ECTS credits	5						
Course status	elective						
Course teacher	assistant professor Valentina Pavić, PhD						
Collaborators							
Prerequisites for course enrolment	no						
Course goal	The goal of the course is to provide students with fundamental biochemical knowledge necessary for the understanding of mechanisms of heavy metals influence on certain metabolic processes of plant and animal living organisms, as well as the possibilities of efficient defense and protecting mechanisms development in the process of adaptation.						
Course outcomes	<ol style="list-style-type: none"> 1. to specify the heavy metals sources (geogenic and anthropogenic), as well as their accessibility from the environment; 2. to identify and connect the interactions between heavy metals, and detect their origin; 3. to perceive chemical factors influencing bioavailability of heavy metals; 4. to adopt the actions necessary for the minimization of deleterious contamination outcomes; 5. to connect theoretical knowledge attained in the lectures and recognize potential harmful consequences of exposure to heavy metals; 6. to prevent intoxication by heavy metals in certain environment. 						
Connection between learning outcomes and teaching / students activity	Students activities	ECTS	Teaching outcomes	Teaching activities	Assessment methods	Points	
						min	max
	Presence on lectures with active participation	0,5	1-3	Lectures	Evidention, evaluation	5	10
	Presence on lab with active participation	1	2-3	Laboratory work (lab)	Evidention, evaluation	15	20
	Writing of seminar work	2	1-3	Consultations	Written exam	25	40
	Presentation of seminar work	1,5	1-3	Final exam	Oral exam	15	30
	Total					60	100
Consultations	Once in a week 2h (defined exactly at the beginning of each academic year), and, if necessary, additionally in agreement with students.						
Teaching form	Predavanja		Seminari		Vježbe		
Hours / total	10		-		5		
Content / teaching units	LECTURES: Identification of heavy metal sources; inorganic pollutants of either geogenic (parent rock) or anthropogenic origin; the most common heavy metals (copper, mercury, cadmium and metalloid arsenic), and less frequent as well as some essential elements (zinc, nickel, cobalt, chromium, iron, vanadium and argentum); the way of heavy metals introductions to the living organisms, their target biological structures and action mechanisms; the influence of heavy metals on the human health; remediation; metal – microbial interactions; biomobilization.						

	LABORATORY: Preparation of samples for heavy metals analysis; introduction and presentation of fundamental theoretic methods for measuring trace elements concentrations using atomic absorption spectrophotometry and X-rays fluorescence, with demonstration of analytical process.
Main literature	<ol style="list-style-type: none"> Schlee D., 1992: Ökologische biochemie. Gustav Fischer Verlag Jena, Stuttgart, New York. Thomas L., 1998: Clinical Laboratory Diagnostics. TH – Books Verlagsgesellschaft mbH, Frankfurt/Main
Additional literature	<ol style="list-style-type: none"> Kennedy, C.J., Fraser, S. (2011). The Toxicology of metals in Fishes. In: Encyclopedia of Fish Physiology: from Genome to Environment, Ed. Farrell, A.,P., Volume 3: Applied Aspects of Fish Physiology (p.p. 2061-2068). Elsevier Inc., Amsterdam, Netherlands. Jeziarska, B., Witeska, M. (2001). Metal Toxicity to Fish, Wydawnictwo Akademii Podlaskiej, Siedlce.
Prerequisites for course completing	Students are obliged to participate actively in teaching process and fulfill all postulated obligations.
Exam	All obligations performed during teaching process are valued with 15%, seminar work 30%, presentation of seminar work 30%, oral part of exam 25%.
Course language and possibilities of teaching in other languages	Croatian and English
Follow up process including the quality and success of course implementation	Student survey after the lectures; questioning during the teaching process with possibilities of applying oral or written comments afterwards; follow up of exam successfulness.