

Course Unit Descriptor

Study Programme: MSc in Ecology (Ecological Risk Assessment)			
Course Unit Title: Biomarkers in Ecotoxicology			
Course Unit Code: ME21			
Name of Lecturer(s): Prof. Sonja Kaišarević, PhD			
Type and Level of Studies: Master 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: 7			
Prerequisites: Ecotoxicology, Animal physiology			
Course Aims: Presentation of specific physiological responses on different levels of organization of organisms, which appear as a response to chemical stress, and their application as biomarkers in ecotoxicological research..			
Learning Outcomes: Gaining knowledge on specific physiological responses on different levels of organization of organisms, which appear as a response to chemical stress, and their application as biomarkers in ecotoxicological research.			
Syllabus: <i>Theory:</i> Biomarkers of exposure, effect and susceptibility. Adaptation response to chemical stress – molecular mechanisms. Biomarkers in estimation of cytotoxic/proliferative effects of xenobiotics. Stress proteins. Metallothioneines. Hematological, immunological, respiratory, cardiovascular, endocrine and reproductive parameters. Biomarkers of neurotoxicity. Biomarkers of genotoxicity. Adverse outcome pathways. Bioanalyses. Effect-directed analyses. Linking biomarkers and adverse effects on higher levels of biological organization. <i>Practice:</i> Measurement of biomarkers on different levels of responses (changes in gene expression, enzyme activity) and on different experimental models (cell culture, tissue samples): determination of activity of selected enzymes of antioxidative defence, biotransformation of xenobiotics, acetilholyne-esterase, induction of heat shock proteins. Bioanalyses on cell cultures: determination of cytotoxic/proliferative effects of xenobiotics (MTT test, SRB test) and microEROD analyses. Reading of scientific literature presenting researches related to the subject of the course. Analyses of experimental approaches, methods, results and conclusions.			
Required Reading: Teodorovic I., Kaisarevic S. (2015) Ecotoxicology. University of Novi Sad, Faculty of Sciences, Department of Biology and Ecology. Scientific and review papers in the field of role and application of biomarkers in ecotoxicological research. Presentations, tekstbook and experimental protocols provided by the lecturer.			
Weekly Contact Hours:	Lectures: 2	Practical work: 6	
Teaching Methods: Lectures, laboratory classes, discussions.			
Knowledge Assessment (maximum of 100 points):			
Pre-exam obligations	points	Final exam	points
Practical work	up to 30	oral exam	up to 50
Seminar(s)	up to 20		