

COURSE UNIT DESCRIPTION

Course unit title	Course unit code
Ecotoxicology	

Lecturer(s)	Department where the course unit is delivered
Assoc. prof. dr. Virginija Kalciene	Center for Ecology and Environmental Research, Institute of Biosciences, Life Sciences Center, Saulėtekis ave. 7, Vilnius

Cycle	Level of course unit	Type of the course unit
First and second cycle		

Mode of delivery	Period when the course unit is delivered	Language of instruction
Face-to-face (lectures, seminars), self-study	Spring semester	English

Requirements for students	
Prerequisites Basics of Biology, Fundamentals of Organic chemistry.	Additional prerequisites: No applied

Course volume in credits	Total student's workload	Contact hours	Self-study hours
5 ECTS credits	133	64	69

Purpose of the course unit: programme competences to be developed		
The objective of the course is to provide knowledge: on major classes of environmental pollutants, their fate in individuals and ecosystems, on toxic effects and the mechanisms of action of inorganic and organic chemical compounds in organisms (at biochemical and physiological levels) and in ecosystems; and ecotoxicological biomarkers of environmental pollution.		
Learning outcomes of the course unit	Teaching and learning methods	Assessment methods
-will understand the adverse, toxic effects of individual chemical substances to natural environment and to human.	Problem-based teaching, interviewing of group, view of video and other visual material, presentation and discussion of individual tasks.	Evaluation of individual tasks, test and exam in a written form.
-will be able to select the measures for the registration of the exposure and effect biomarkers.		
-will gain practical skills, which are required for planning experiment and for the interpretation and summary of the research results.	Presentation and discussion of individual tasks.	Evaluation of individual tasks.
- will be able to collect, analyze, summarize the information and to prepare reports for the audience. -will be able to communicate in the interdisciplinary space.	Retrieval of the information, the summarising the data, preparation and presentation of the report.	

Content: breakdown of the topics	Contact hours							Self-study: time of and assignments	
	Lectures	Tutorials	Seminars	Exercises	Laboratory works	Internship/work placement	Contact hours	Self-study hours	Assignments
1. Introduction to ecotoxicology. Links between Medical and Environmental toxicology. International ecotoxicological databases.	2		2				4	4	Preparation for the seminar. Retrieval, analysis, summarising and presentation of the data about suggested (eco)toxicological organisation.
2. General principles of ecotoxicological research and determined parameters. Dose-response relationships. Bioassays in aquatic and terrestrial toxicology.	2	1	3				6	5	Analysis of toxicity data. Compilation of concentration-response curve.
3. Environment fate of pollutants. Uptake, distribution, accumulation, biotransformation, and excretion from organisms. Models of bioconcentration and bioaccumulation.	2	1	3				6	5	Answers to presented questions about toxicokinetic of pollutants.
4. Abiotic and biotic factors influencing bioavailability and toxicity of contaminants.	2	1	3				6	5	Reading scientific articles, where factors changing toxicity of pollutants is analysed.
5. Inorganic toxicants - heavy metals. Physiological, biochemical, molecular effects of heavy metals.	2	1	3				6	5	Reading scientific literature about metal toxicity.
6. Oxidative stress. Biomarkers of oxidative stress.	2	1	3				6	5	Preparation for the seminar about problems in measurement and evaluation of exposure and effect biomarkers of heavy metals.
7. Major classes of pesticides. Properties, physiological, biochemical, molecular effects of organophosphate pesticides. Biomarkers of neurotoxicity.	2	1	3				6	5	Answers to presented questions about toxicity of pesticides.
8. Polychlorinated biphenyls, polychlorinated dibenzo dioxins. Physical-chemical properties, toxicity, hypothesis on mechanism of action, biomarkers of exposure.	2	1	3				6	5	Preparation for seminar about response of cytochrome P-450 to polychlorinated biphenyls and to polychlorinated dibenzo dioxins exposure.
9. Polycyclic aromatic hydrocarbons. Physical-chemical properties. Physiological, biochemical, molecular effects. Biotransformation. Biomarkers of pollution.	2	1	3				6	5	Preparation for the seminar about response of cytochrome P-450 to polycyclic aromatic hydrocarbons exposure. Reading of scientific literature.

10. Endocrine disrupting substances. Sources, examples, effects in organisms and ecosystems level, mode of action, physiological and molecular biomarkers of environmental pollution.	2	1	3				6	5	Preparation for the seminar about endocrine disrupting substances. Answers to the presented questions.
11. Application of ecotoxicological data in chemical risk assessment.	2	1	3				6	5	Preparation for the seminar about fish biomarkers.
12. Test and exam.								15	Preparation for test and exam
Total	22	10	32				64	69	

Assessment strategy	Weight, %	Deadline	Assessment criteria
First test	40	During semester	Test consists of 25 open-ended and closed questions. Evaluation of test according gradation: 91-100% correct answers - 10 points, 81- 90% - 9 points, 71-80 % - 8 points, 61-70% - 7 points; 51-60 % - 6 points; 41-50 % - 5 points; 31-40% - 4 points; 21-30% - 3 points; 11-20 % - 2 points; 0-10% – 1 point.
Individual tasks	20	During semester	During the semester 4-5 practical tasks will be performed. Tasks include analysis of literature on suggested topic, retrieval of answers to given questions, preparation of short report. Task will be evaluated not only by the propriety of the answers, but also by the accuracy of the measurements and analysis of results, quality of the report, ability to make conclusions. Maximum point for task – 10. All grades for tasks are added together and averaged.
Exam	40	During the examination session	Students are allowed to pass exam if all tasks are performed and test is passed. At exam, students receive three open-ended questions; the answers to them are graded maximum 5 points. Answers to each question are evaluated. 5 points: excellent knowledge and abilities; 4 points: good knowledge and abilities, could be inessential mistakes; 3 points: average knowledge, could be inessential mistakes; 2 points: knowledge and abilities are lower than average, there are mistakes; 1 point: knowledge and abilities meet minimal requirements; 0 points: knowledge and abilities meet minimal requirements or answer to question is absence.

Author	Year of publication	Title	Issue of periodical publication or volume of a publication	Publishing place and house or web link
Required reading				
Walker C.H., Sibly R.M., Hopkin S.P., Peakall D.B.	2012	Principles of ecotoxicology		Boca Raton: CRC Press Taylor and Francis group.
Amiard-Triquet C., Amiard J.-C., Rainbow P. S.	2013	Ecological biomarkers. Indicators of ecotoxicological effects		Boca Raton: CRC Press Taylor and Francis group.
Recommended reading				
Newman M.C., Unger M.A.	2003	Fundamentals of ecotoxicology		Lewis publishers. Boca Raton: CRC Press Taylor and Francis group.

