



1. GENERAL INFORMATION				
1.1. Course teacher	Associate Prof. Jasna Maršić Lučić, PhD		1.6. Year of the study	1 <sup>st</sup> year (2 <sup>nd</sup> semester)
1.2. Name of the course	Ecotoxicology		1.7. ECTS credits	5
1.3. Associate teachers			1.8. Type of instruction (number of hours L + E + S + e-learning)	Total: 60 (L30,+ 0 + 30 + 0)
1.4. Study programme (undergraduate, graduate, integrated)	Graduate		1.9. Expected enrolment in the course	10
1.5. Status of the course	<input type="checkbox"/> mandatory	<input checked="" type="checkbox"/> elective	1.10. Level of application of e-learning (level 1, 2, 3), percentage of online instruction (max. 20%)	2
2. COUSE DESCRIPTION				
2.1. Course objectives	To acquire theoretical and practical knowledge of direct and indirect effects of xenobiotics on the environment, all living organisms, and their relationship with inanimate matter.			
2.2. Enrolment requirements and/or entry competences required for the course				
2.3. Learning outcomes at the level of the programme to which the course contributes	<ul style="list-style-type: none"> <li>• Compile and apply advanced knowledge of natural and technical sciences, particularly chemical engineering and environmental engineering in solving scientific, professional and general social problems.</li> <li>• Correlate expert knowledge from chemistry, chemical engineering and material engineering with awareness of influence on society, economy and environment.</li> <li>• Utilise advanced laboratory procedures and instruments for synthesis of new products, create sustainable processes, and solve problems of water, air and soil pollution.</li> <li>• Apply tools, methods and standards for monitoring and assessing the quality of processes and products, as well as their environmental impact, and to predict potential risks in working with technological processes and developing products.</li> <li>• Create a critical analysis, evaluation and interpretation of personal results, and compare them with existing data in scientific and expert literature</li> <li>• Investigate and analyse implementation of innovative and incoming chemical technologies in multidisciplinary environment</li> <li>• Demonstrate independence and reliability in independent work, as well as effectiveness, reliability and adaptability in team work</li> <li>• Outline results of independent and teamwork in a written and oral form to non-experts and experts in a clear and coherent way.</li> <li>• Communicate with the scientific and professional community, as well as society in general in local and international surroundings</li> </ul>			



<p>2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)</p>	<ul style="list-style-type: none"> <li>- Outline basic concepts and relationships in the ecosystem,</li> <li>- Define types of pollution and mechanisms through which they enter the environment</li> <li>- Explain activity mechanisms of different types of xenobiotics,</li> <li>- Discuss molecular-cellular aspects of toxicity,</li> <li>- Discuss the role of bioindicators and biomarkers for determining the condition of environmental pollution in land and water ecosystems .</li> </ul>								
<p>2.5. Course content (syllabus)</p>	<p><b>WEEK 1.</b> Introduction to ecotoxicology. Definitions of terms and development of ecotoxicology.</p> <p><b>WEEK 2.</b> Human impact on the environment. The division of pollutants per site pollution .Persistence and detoxication.</p> <p><b>WEEK 3.</b> Classification of poisons. Factors that determine the movement and distribution of pollutants</p> <p><b>WEEK 4.</b> The pathophysiological effects of poisoning. The mode of action of poisons. Absorption and distribution of xenobiotics in the body</p> <p><b>WEEK 5.</b> Molecular-cellular aspects of toxicity.Transport of toxicants through the cell membrane</p> <p><b>WEEK 6.</b> Biotransformation. Biodynamics and excretion of toxic substances.</p> <p><b>WEEK 7.</b> Biological degradation of the toxic substances in the environment. Transport mechanisms in the environment.Bioaccumulation, bioconcentration and biomagnification</p> <p><b>WEEK 8.</b> Partial exam</p> <p><b>WEEK 9.</b> Assessment of genotoxicity.Uv radiation and marine phytoplankton. Introduction to analytical methods in ecotoxicology. Qualitative analytical methods for determination of toxicants</p> <p><b>WEEK 10.</b> Quantitative analytical methods for the determination of toxicants</p> <p><b>WEEK 11.</b> The mechanism of toxicity and detection of nitrate, nitrite and ammonia</p> <p><b>WEEK 12.</b> Methods for detection of cyanide and cyanide glycoside</p> <p><b>WEEK 13.</b> The mechanism of toxicity of heavy metals</p> <p><b>WEEK 14.</b> Methods of biomonitoring, analysis of residues (determining MRL). Biological determination of toxins from shellfish</p> <p><b>WEEK 15.</b> Partial exam</p>								
<p>2.6. Format of instruction:</p>	<input checked="" type="checkbox"/> lectures <input checked="" type="checkbox"/> seminars and workshops <input type="checkbox"/> exercises <input type="checkbox"/> online in entirety <input type="checkbox"/> partial e-learning <input type="checkbox"/> field work				<input checked="" type="checkbox"/> independent assignments <input type="checkbox"/> multimedia and the internet <input type="checkbox"/> laboratory <input type="checkbox"/> work with mentor <input type="checkbox"/> (other)			<p>2.7. Comments:</p>	
<p>2.8. Student responsibilities</p>	<p>Class attendance of at least 80% of all lectures and seminars.</p>								
<p>2.9. Monitoring student work</p>	<p>Class attendance</p>	<p>YES</p>		<p>Research</p>	<p>YES</p>		<p>Oral exam</p>		<p>NO</p>
	<p>Experimental work</p>		<p>NO</p>	<p>Report</p>		<p>NO</p>	<p>(other)</p>	<p>YES</p>	<p>NO</p>



	Essay	YES		Seminar paper	YES		(other)	YES	NO	
	Preliminary exam	YES		Practical work		NO	(other)	YES	NO	
	Project		NO	Written exam	YES		ECTS credits (total)	5		
2.10. Required literature (available in the library and/or via other media)	<b>Title</b>							<b>Number of copies in the library</b>	<b>Availability via other media</b>	
	Hoffman, D.J., Rattner, B.A., Burton, G.A.jr. , Cairns, J., jr. 1995. Handbook of ecotoxicology, CRC Press,							1		
	Kamrin, M.A.: Toxicology : a primer on toxicology principles and applications. Lewis publishers. 1988							1		
	J. Maršić Lučić, Ecotoxicology, lectures, ppt							1	Web, Institute of oceanography and fisheries	
2.11. Optional literature	Walker, C.H., Hopkin, S.P., Sibly, R.M. and Peakall, D.B.: Principles of ecotoxicology Taylor & Francis publ. 1997.									
2.12. Other (as the proposer wishes to add)										