



No. \_\_\_\_\_ of \_\_\_\_\_

USAMV form 0107030111

### SUBJECT OUTLINE

#### 1. Information on the programme

1.1. Higher education institution	University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca
1.2. Faculty	Agriculture
1.3. Department	III - Environment and Plant protection
1.4. Field of study	Environmental Engineering
1.5. Cycle of study <sup>1</sup>	Bachelor
1.6. Specialization/ Study programme	Environmental Engineering
1.7. Form of education	Full time

#### 2. Information on the discipline

2.1. Discipline name	Ecotoxicology							
2.2. Course coordinator	Senior Researcher I. Valentin PETRESCU-MAG							
2.3. Seminar/ laboratory/ project coordinator	Senior Researcher I. Valentin PETRESCU-MAG							
2.4. Year of study	III	2.5. Semester	II	2.6. Evaluation type	continuous	2.7. Discipline status	Content <sup>2</sup>	DD
							Compulsoriness <sup>3</sup>	DI

#### 3. Total estimated time (teaching hours per semester)

3.1. Hours per week - full time programme	4	out of which: 3.2. lecture	2	3.3. seminar/ laboratory/ project	2
3.4. Total number of hours in the curriculum	56	out of which: 3.5. lecture	28	3.6. seminar/laboratory	28
Distribution of the time allotted					hours
3.4.1. Study based on books, textbooks, bibliography and notes					22
3.4.2. Additional documentation in the library, electronic platforms and field experiences					15
3.4.3. Preparing seminars/ laboratories/ projects, subjects, reports, portfolios and essays					15
3.4.4. Tutorials					4
3.4.5. Examinations					10
3.4.6. Other activities					
3.7. Total hours of individual study	64				
3.8. Total hours per semester	120				
3.9. Number of credits <sup>4</sup>	4				

#### 4. Prerequisites (if applicable)

4.1. curriculum-related	Botany, Zoology, Microbiology, General Ecology, Chemistry
4.2. skills-related	The student must have knowledge regarding the relationships of the living organisms with the abiotic factors and the functioning of the natural and anthropic ecosystems.

#### 5. Conditions (if applicable)

5.1. for the course	The course is interactive, students will ask questions about the content of the lesson or they will be able to find some key answers themselves. Capturing the student's attention and constructive channeling of the dialogue towards achieving the objectives and achieving a pleasant lesson will be considered essential.
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5.2. for the seminar/ laboratory/ project	In the practical works it is mandatory to involve each student in the practical-experimental part; each student will carry out at least individual activity with the laboratory materials made available or will elaborate and present materials with practical purpose during the laboratory/seminar hours.
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## 6. Cumulated specific competences

Professional competences	<p>To acquire the scientific language specific to Ecotoxicology, to know the scope of ecotoxicology and of the elementary notions about the toxicities with which man and living organisms may come into contact, of their consequences on human health, animals, plants, microorganisms and the environment;</p> <p>To understand the functioning of ecosystems in the context of anthropization and to understand how they respond to the presence of toxic substances in air, water, soil and implicitly in interior of the living organisms;</p> <p>To know the main groups of toxicants, according to the toxicological classification as well as the normal and maximum permissible concentrations / doses for the most dangerous toxicities in the environment;</p> <p>To thoroughly understand the usual procedures of experimental ecotoxicology, to know the main plant and animal model organisms used in ecotoxicology, according to the purpose and objectives pursued, the methodology of working on groups and subgroups of toxic substances;</p> <p>To understand the dynamic, experimental nature of ecotoxicology and the specific processes of ecotoxicology.</p>
Transversal competences	<p>To calculate by simple procedures the most important lethal doses (DL50, DL100, DL0 etc.) of some toxicants in certain organisms;</p> <p>To develop theoretically practical projects to test the sublethal effects of some pesticides on fish species.</p> <p>To recognize the main model organisms, up to date in ecotoxicology;</p> <p>To demonstrate the harmful effect of some major and dangerous groups of toxicants based on studies from the scientific literature.</p>

## 7. Discipline objectives (based on the cumulated specific competences)

7.1. General objective	<p>To acquire knowledge regarding the purpose and objectives of Ecotoxicology, toxic effects, their effects on organisms and ecosystems, their classification, normal concentrations in the environment and maximum permissible limits, as well as the basic methodologies in Ecotoxicology.</p> <p>Theoretical knowledge of the subject of ecotoxicology and of the elementary notions about the toxicants with which humans and living organisms may come into contact, their consequences on human health, animals, plants, microorganisms and the environment.</p> <p>Understanding the dynamic, experimental nature of ecotoxicology and the specific procedures of ecotoxicology.</p> <p>Knowledge of the major groups of toxicants, according to the toxicological classification as well as the maximum permissible concentrations / doses for the major groups of toxic substances in the environment.</p> <p>Practical knowledge of the usual procedures of experimental ecotoxicology.</p> <p>Knowledge of the main plant and animal model organisms used in ecotoxicology, corresponding to the purpose and objectives pursued.</p> <p>Knowledge of working methodology on groups and subgroups of toxic substances.</p> <p>Knowledge of the normal limits of the concentrations of pollutants in the environment, as well as of the maximum permissible limits on different groups and subgroups.</p>
7.2. Specific objectives	

## 8. Content

8.1. COURSE Number of hours - 28	Teaching methods	Observation
What is ecotoxicology? What are the objectives of ecotoxicology? Terminology.	Lecture	1 lecture = 2 hours
Classification of toxic substances and intoxications	Lecture/discussion	2 hours
	Lecture, Video	2 hours

Factors influencing toxicity	projection Lecture, Video	2 hours
Toxicants behavior in the organism	projection Lecture, Video	2 hours
Action of toxicants upon the organism	projection Lecture, Video	2 hours
Lead ecotoxicology	projection Lecture, Video	2 hours
Ecotoxicology of mercury and organomercuric compounds	projection Lecture, Video	2 hours
Cadmium ecotoxicology	projection Lecture, Video	2 hours
Ecotoxicology of organophosphorus pesticides	projection Lecture, Video	2 hours
Ecotoxicology of organochlorine pesticides	projection Lecture, Video	2 hours
Ecotoxicology of oil and petroleum products	projection Lecture, Video	2 hours
Elements of radio-toxicology and radiological protection	projection Lecture, Video	2 hours
Ecological and ecotoxicological restoration	projection Lecture, Video	2 hours
Assessment of the acquired knowledge	projection Evaluation	2 hours

<b>8.2. PRACTICAL WORKS</b> <b>Number of hours - 28</b>	<b>Teaching methods</b>	<b>Observation</b>
	Theoretical presentation of practical works	1 lab work (2 hours/work)
1. Labor protection measures in the Ecotoxicology laboratory	Presentation; Verification method; Observation	2 hours
2. Calculations in Ecotoxicology 2.1. Expressing the concentrations of the working solutions 2.2. Expression of the results obtained from laboratory investigations 2.3. Evaluation of data series by statistical calculation 2.4. Comparing the results obtained to the maximum permitted limits and acceptable daily doses.	Presentation, Brainstorming, Modeling, Observation, Exercise Method	6 hours
3. Collecting laboratory samples for ecotoxicological examinations	Exercise method; Group interview	2 hours
4. Heavy metal pollution (Pb, Cd, Hg, Cu, Zn) 4.1. Sources of pollution, mechanisms of action and effects ... 4.2. Methods for identifying heavy metal residues in various substrates 4.3. Methods for quantification of heavy metal residues in various substrates 4.3.1. Atomic absorption spectrometry 4.3.2. Spectrophotometry	Exercise method; Group interview, Observation	6 hours
5. Nitrate / nitrite pollution 5.1. Sources of pollution, mechanisms of action and effects 5.2. Quantitation of nitrate / nitrate residues by absorption spectrophotometry method in U.V.-VIS	Presentation, Brainstorming, Exercise method	4 hours
6. Pesticide pollution 6.1. Sources of pollution, mechanisms of action and	Exercise method; Group interview	4 hours

effects 6.2. Detection of organochlorine and organophosphorus pesticide residues by thin layer chromatography  7. Pollution with antibiotics 7.1. Sources of pollution and effects on biocenosis. 7.2. Identification of chlor- and oxytetracyclines by reaction with Sachaguchi reagent 7.3. Identification of penicillin by reaction with potassium hydroxide and ferric chloride	Presentation, Brainstorming, Exercise Method, Modeling, Observation, Verification	4 hours
<p><i>Compulsory bibliography:</i></p> <p>1. Petrescu-Mag I. V., Oroian I. G., 2015 <i>Elemente de ecotoxicologie. Curs pentru studenții de la specializarea Ingineria și Protecția Mediului. Editura Bioflux, Cluj-Napoca. Versiunea online ISBN 978-606-8191-83-6</i></p> <p>2. Petrescu-Mag I. V., Gradinaru A. C., 2018 <i>Ecotoxicologie. Lucrari practice. Bioflux, Cluj-Napoca. Versiunea tiparita, ISBN 978-606-8887-41-8.</i></p>		
<p><i>Optional bibliography:</i></p> <p>1. Walker, C. H., Hopkin, S. P., Sibly, R. M., Peakall, D.B., 2002, <i>Principles of Ecotoxicology, 3rd Edition, Taylor &amp; Francis, Boca Raton, London, New York.</i></p> <p>2. Medical Research Council, 1995, <i>IEH assessment on environmental oestrogens: consequences to human health and wildlife. Institute for Environment and Health, University of Leicester.</i></p> <p>3. Costache, C., Modrojan, C., 2006, <i>Ecotoxicologie si evaluarea riscului. Seria: Inginerie – Mediu. Editura Agir, Bucuresti.</i></p>		

**9. Corroborating the discipline content with the expectations of the epistemic community representatives, of the professional associations and of the relevant employers in the corresponding field**

In order to identify ways of modernizing and continuously improving the teaching and the content of the courses with the most current theoretical and practical topics and problems, the (Associate) Professor participates in the periodic meeting of the Association of Breeders of Small Poultry and Small Animals of Cluj, the Society for Plant Protection Transylvania, The Romanian Society of Herpetology and the Romanian Ichthyological Society, where ecologists, botanists, farmers, biologists and small animal breeders meet, discussing current issues and perspectives of small animal production (also laboratory - laboratory studies) or toxicology aquatic, terrestrial etc (in situ studies) but also aspects of the use of pesticides in agriculture for plant protection, pest control etc.

**10. Evaluation**

Type of activity	10.1. Evaluation criteria	10.2. Evaluation type	10.3. Percentage of the final grade
<b>10.4. Course</b>	Theoretical knowledge of the subject of ecotoxicology and of the elementary notions about the toxicants with which humans and living organisms may come into contact, their consequences on human health, animals, plants, microorganisms and the environment. Understanding the dynamic, experimental nature of ecotoxicology and the specific processes of ecotoxicology. Knowledge of major groups of toxicants, according to the toxicological classification.	Continuous (VP)	70%
<b>10.5. Seminar/Laboratory</b>	Practical knowledge of the basic methods of experimental ecotoxicology. Knowledge of the main plant and animal model organisms used in ecotoxicology, corresponding to the purpose and objectives pursued. Knowledge of working methodology on groups and subgroups of toxic substances	VP	30%
<b>10.6. Minimum performance standards</b>			

Holding by the student of the scientific information transmitted through the course hours and practical work at an acceptable level. Obtaining the passing grade for on-the-spot checks is a condition of promotability.

- 1 Cycle of studies - choose one of the three options: Bachelor/Master/Ph.D.
- 2 according to the educational plan
- 3 Discipline status (compulsoriness) - choose one of the options - DI (compulsory discipline) DO (optional discipline) DFac (facultative discipline).
- 4 One credit is equivalent to 25-30 hours of study (teaching activities and individual study).

Filled in on  
04.09.2019

Approved by the  
department on  
05.09.2019

Course coordinator  
Senior Lecturer Dr. I. Valentin PETRESCU-  
MAC, PhD

Laboratory work/seminar coordinator  
Senior Lecturer Dr. I. Valentin  
PETRESCU-MAC, PhD

Head of the Department  
Professor Ioan G. OROIAN, PhD