R O M Â N I A
MINISTERUL EDUCAȚIEI ȘI CERCETĂRII
Universitatea din Craiova
FACULTATEA DE ȘTIINȚE/ DEPARTAMENTUL DE CHIMIE
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Subject Description

1. Program information

1.1. Institution	University of Craiova
1.2. Faculty	Science
1.3. Department	Chemistry
1.4. Study field	Chemistry
1.5. Study level	Master
1.6. Type of education	full-time
1.7. Study program	Advanced Chemistry

2. Subject information

2.1. Subject			**Ecotoxicology**				
2.2. Course coordinator			Lect. dr. Georgeta Ciobanu				
2.3. Application coordinator			Lect. dr. Georgeta Ciobanu				
2.4. Year of study	I	2.5. Semester	1	2.6. Type of evaluation	V	2.7. Subject type	DS/DOB

3. Total estimated tipe (hours/semester)

3.1. Number of hours per week	3	from which: 3.2 course	1	3.3. laboratory	2
3.4. Total hours in curriculum	42	from which: 3.5 course	14	3.6. laboratory	28
Time allocation – hours/week					
Study using textbooks, course materials, bibliographies, and notes					25
Additional documentation in the library, on specialized electronic platforms, and in the field					25
Preparation of seminars/labs, assignments, reports, portfolios, and essays					24
Tutoring					4
Examinations					5
Other activities.....					-
3.7. Total hours of individual study					83
3.8. Total hours per semester					125
3.9. Number of ECTS					5

4. Preconditions (if the case)

4.1. of curriculum	• basic/fundamental knowledge of chemistry, biochemistry, toxicology, ecology
4.2. of competences	• basic knowledge of handling chemicals, laboratory utensils and equipment; PC use

5. Conditions (if the case)

5.1. for course	• Lecture hall equipped with computer, video projection system, and internet connection
5.2. for labs	• Laboratory equipped with the materials, equipment, and reagents necessary to carry out experimental work

6. Course objectives - expected learning outcomes achieved by completing and passing the course

Knowledge	1. Graduates define, understand, explain, and apply advanced knowledge of chemistry from specialized literature in practice. 2. Graduates select and use appropriate experimental and theoretical methodologies to investigate complex scientific problems, assessing their impact on the environment and society. 3. Graduates write analysis and scientific reports, presenting the results of their research and experiments, in line with professional ethics and standards. 4. The graduate describes and integrates interdisciplinary knowledge into the implementation of research projects.
Skills	1. Graduates apply major concepts in analytical, inorganic, organic, and physical chemistry to chemical practice. 2. Graduates evaluate and analyze experimental techniques to conduct and design experiments, analyze and test (qualitatively and quantitatively) chemical elements and substances; design, coordinate, and conduct chemical experiments. 3. Graduates apply critical thinking, following the structure and principles of scientific writing to develop and present scientific reports.
Responsibility and authonomy	1. Graduates are able to adapt major scientific concepts in the field of chemistry to conduct research, improve or develop new concepts, knowledge, theories, and operational methods, products, and services in order to apply them in specific activities for product and process quality control. 2. Graduates use classical laboratory instruments/techniques and modern equipment independently, design experiments, and interpret and analyze the obtained results accurately. They design learning situations focused on developing experimental techniques and methods specific to chemical laboratories. 3. Graduates prepare and present scientific reports in line with ethical standards for collecting and interpreting results. 4. Graduates assume responsibility for managing interdisciplinary collaborations and coordinating activities within work and research teams..

7. Table of contents

7.1. COURSE	Mode of operation	Teaching methods	Allocated time (hours)
1. Introduction: The object of study of ecotoxicology and its relations with other sciences	On site (week 1)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	1
2. Pollutants and their fate in ecosystems. Main classes of pollutants (a) Inorganic pollutants	On site (week 2)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	1
3. Main classes of pollutants (b) Organic pollutantson carbon	On site (week 3)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	1
4. Routes of entry of pollutants into ecosystems. Contamination of surface water and land, emission into the atmosphere; quantification of pollutant release. Long-range movement and global transport of pollutants.	On site (weeks 4-5)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	2
5. Factors that determine the movement and distribution of pollutants. Transport through air and water. Models of distribution of	On site (week 6)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	1

chemicals in the environment. Fate of pollutants in the environment			
6. Effects of pollutants on individual organisms. Toxicity testing. General principles; determination of toxicity; toxicity tests with terrestrial/aquatic organisms. Risk assessment.	On site (weeks 7)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	1
7. Biochemical effects of pollutants. Protective effects; molecular mechanisms of toxicity; examples.	On site (week 8)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	1
8. Physiological effects of pollutants. Effects at the cellular, organ and organism levels; energetic costs of physiological changes; effects on plants.	On site (week 9)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	1
9. Interactive effects of pollutants. Additive effects; mechanisms of toxicity potentiation: inhibition of detoxification, activation; detection methods.	On site (week 10)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	1
10. Biomarkers - classification, specificity, biomarkers -adverse effects relationship; role of biomarkers in environmental risk assessment. In situ biological monitoring.	On site (week 11)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	1
11. Effects of pollutants on populations and communities. Population dynamics: population growth rate; factors influencing growth rate. Chronic pollution; evolution of resistance to pollution. Changes at the level of communities and ecosystems.	On site (weeks 12-13)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	2
12. Community changes in response to pollution; global processes. Biomarkers in population studies	On site (week 14)	Lecture, explanation and interactive presentation, heuristic conversation, problem solving	1
References:			
1. Walker C.H., Sibly R.M., Hopkin S.P., Peakall D.B. 2012. Principles of Ecotoxicology 4nd ed, CRC Press, Taylor & Francis Group (USA)			
2. Campbell P.G.C, Hodson P.V, Welbourn P.M, and Wright D.A. Ecotoxicology, CambridgeUniversity Press, 2022.			
3. Lecture notes, 2025			

7.2. Lab	Mode of operation	Teaching methods	Allocated time (hours)
1. Safety rules in Ecotoxicology lab	On site (week 1)	Explanation, discussion, debate, and questioning	2
2. Effects of antibiotics (penicillins, tetracyclines, etc.) on wheat caryopsis germination: preparation of experiments; collection of biometric data and highlighting dose-response	On site (weeks 2- 3)	Experiment, explanation, discussion. Solving calculations and constructing graphs; analyzing and interpreting	4

relationships; calculation of the effective concentrations for different response levels: EC_{50}, EC_{20}, EC_{10}; interpretation of results.		results	
3. Effects of antibiotics on the vegetative growth of wheat plants: preparation of experiments, biometric measurements; analysis of biomass accumulation and partition; highlighting dose-response relationships; calculation of EC_{50}, EC_{20}, EC_{10} and interpretation of results.	On site (weeks 4-5)	Explanation, conversation, problematization, experiment, observation Processing of experimental data; analysis and interpretation of results	4
4. Biochemical indicators of antibiotic toxicity in plants. Quantitative determinations of potential biomarkers of antibiotic toxicity in plants: analysis of the activity of enzymes that detoxify reactive oxygen species (catalase, peroxidase); analysis of the photosynthetic pigments content in the leaves of plants grown on antibiotic-contaminated media, etc.	On site (weeks 6-7)	Experiment, explanation, discussion.	4
5. Electrophoretic separation of peroxidase isoenzymes from wheat plants grown on antibiotic-contaminated media; documentation of the electrophoregram obtained.	On site (week 8-9)	Experiment, explanation, discussion, debate	4
6. Phytotoxicity of antibiotic mixtures: additivity *vs.* interaction (synergism, potentiation, antagonism, inhibition); identification of relevant biomarkers.	On site (week 10-11)	Experiment, explanation, discussion.	4
7. Effects on populations and communities: changes of the distribution of growth parameters, growth rate, and productivity a sa result of plant exposure to antibiotics.	On site (week 12-13)	Experiment, explanation, discussion.	
8. Lab Verification	On site (week 14)	Experiment, explanation, discussion, debate	4
References:			
1. Lab reports in printed and electronic form			

8. Corrrelation of the discipline content with the expectations of representatives of the epistemic community, professional associations, and representative employers in the field related to the program

The content of the course is in line with those of similar courses at universities in Romania and abroad, while also meeting the expectations of professional associations and representative employers in the field.

9. Evaluation

Activity	9.1. Evaluation criteria	9.2. Evaluation method	9.3. Contribution to final score

9.4. Course	theoretical concepts and mechanisms, critical analysis of literature or design of a catalytic system	Written Exam	40%
		Portofolio	30%
9.5. Lab	synthesis, characterization, data interpretation	Project Work	30%
9.6. Minimum performance standard			
• Application of fundamental theoretical notions (e.g. classes of pollutants, types of pollutant effects, the importance of biomarkers for monitoring pollutant action, environmental risk assessment) and appropriate methods in solving specific requirements. • Elaboration and presentation of a documentation project regarding a pollutant, respecting the objectives, proposed deadlines and professional ethics norms; • Synthetic presentation of the results of the laboratory activity.			

Date
22.09.2025

Course coordinator,
lect.dr. Georgeta Ciobanu
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Date of approval
25.09.2025

Head of Department,
Conf.dr. Nicoleta Cioateră