Teaching Guide				
Identifying Data				2023/24
Subject (*)	Ecotoxicology		Code	610G02042
Study programme	Grao en Bioloxía			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	Fourth	Optional	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Bioloxía			
Coordinador	Barreiro Lozano, Rodolfo	E-mail	rodolfo.barreiro@udc.es	
Lecturers	Barreiro Lozano, Rodolfo	E-mail	rodolfo.barreiro@udc.es	
Web				
General description	This subject studies the effects of pollutants on organisms. This study includes (i) the analysis and detection of these effects and (ii) the prediction of the possible damage that pollutants may cause. A substantial portion of the contents is devoted to biomonitoring (i.e. using the organisms themselves to detect pollution), a tool that has become increasingly important for environmental protection and management.			

Study programme competences	
Code	Study programme competences
A9	Identificar e utilizar bioindicadores.
A17	Realizar bioensaios e diagnósticos biolóxicos.
A21	Deseñar modelos de procesos biolóxicos.
A23	Avaliar o impacto ambiental. Diagnosticar e solucionar problemas ambientais.
B1	Aprender a aprender.
B4	Traballar de forma autónoma con iniciativa.
B6	Organizar e planificar o traballo.
B7	Comunicarse de maneira efectiva nunha contorna de traballo.
B8	Sintetizar a información.
B9	Formarse unha opinión propia.
B10	Exercer a crítica científica.
B11	Debater en público.

Learning outcomes			
Learning outcomes	Study programme competences		
Distinguish and identify the techniques of retrospective and prospective ecotoxicology.		B9	
Describe the common effects of pollution on individuals, populations and communities.	A9 A17 A23		
Assess the advantages and limitations of each level of organisation in detecting pollution impacts.		B9 B10	
Understand the results of basic toxicity testing techniques, accumulation-depuration studies, biomarkers	A9 A17 A21		
Describe the mechanisms by which an organism copes with pollutants.	A21	B1 B4	
Critically appraise the relevance of information derived from toxicity tests.	A17	B9 B10	

Critically appraise results of studies on the effects of pollutants on natural communities.	A23	B9 B10	
Conduct a literature search on an ecotoxicological topic and summarise the information obtained.		B1 B4 B6 B7 B8 B9 B10 B11	
To deal with the specialised literature by being able to frame it in a specific topic of ecotoxicology.		B1 B4 B8 B9 B10	

Contents	
Topic	**Sub-topic**
Introduction	Human population growth. Major environmental problems in Europe. Ecotoxicology.
Pollutants	Major types and features Inorganic pollutants: metals and anions Organic pollutants Organometals Gases
Toxicokinetics	Mechanisms for pollutant accumulations. Uptake. Biotransformation and detoxification of metals and metaloids. Biotransformation of organic pollutants. Excretion. Bioaccumulation Factor (BAF), Bioconcentration Factor (BCF), and Accumulation Factor. Kinetics.
Bioamplification along the trophic chain	Bioamplification. Trophic transfer and Bioamplification factor. Examples of bioamplification in metals and organic pollutants.
Bioaccumulation and pollutant detection (Retrospective Ecotoxicology I)	Bioavailability. Factors of pollutant bioavailability. Use of bioaccumulators. Requisites of a good bioacumulator.
Toxicodynamics: biochemical and histological effects	Protective and non protective bgiochemical changes. Molecular toxicity mechanisms. Modes of toxic actions in organic pollutants. Examples of molecular mechanisms. Cytotoxicity and necrosis. Damage to genes and chromosomes.
Physiological effects	Subletal effects. Effects on growth, development, reproduction, physiology and behaviour. Trade-off between detoxification and production.

Biomarkers (Retrospective Ecotoxicology II).	Classification, especificity and relationship with damaging effects. Requisites of a good biomarker. Examples of biomarkers. Use of biomarkers.
Toxicity assays (Porspective Ecotoxicology I).	Dose-response relationship. Types of assays. Data analyses. Toxicity curves, mean lethal time and threshold LC50. Data analyses in chronic assays: NOEC, LOEC y MATC. Application Factor.
Prediction (Prospective Ecotoxicology II)	Prediction at individual level: QSAR. Prediction at ecosystem level: SSR.
Changes in community composition (Retrospective Ecotoxicology III).	Indicator species. Relative abundance. Saprobic systema and biotic indexes. Diversity. Comparisson with reference communities.

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A9 A23 B8 B9	22	77	99
Seminar	B1 B4 B6 B7 B8 B9 B10 B11	7	26	33
Laboratory practice	A17	4	0	4
ICT practicals	A21 A23	12	0	12
Multiple-choice questions	A9 A17 A21 A23	1	0	1
Personalized attention		1	0	1
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	Lectures supported by graphic information available to students through Campus Virtual.
Seminar	Problem solving and bibliographic review.
Laboratory practice	Lab work under the guidance of the teacher and with a protocol that comprehensively details the exercises to be performed (also available in Campus Virtual)
ICT practicals	IT work under the guidance of the teacher and with a protocol that comprehensively details the exercises to be performed (also available in Campus Virtual)
Multiple-choice questions	Test of theory and practice contents.

Personalized attention	
Methodologies	Description
Seminar	The personalized attention will consist of solving doubts in the corresponding tutorial schedules. Part-time students and students with attendance dispensation: resolution of doubts through official tools for teledocency and telecommunication (virtual campus, Teams, e-mail).

Assessment			
Methodologies	Competencies	Description	Qualification
Guest lecture / keynote speech	A9 A23 B8 B9	In some lectures, questions will be asked (orally and/or in writing) to the students on aspects dealt with in the session, which they will have to answer on the spot in order to assess the individual performance of the session.	5
Laboratory practice	A17	Attendance is mandatory. Each day of unexcused absence will mean 0.5 points less in the final grade.	0
Multiple-choice questions	A9 A17 A21 A23	Knowledge acquired in theory and practice sessions is assessed with a multi-option test.	65
Seminar	B1 B4 B6 B7 B8 B9 B10 B11	First chance: Presenting a bibliographic review paper at the last seminar session. Second chance: Students who have not presented a paper at the first opportunity may submit their paper in WRITING on the date of the second opportunity test (detailed guidelines for submitting a paper are available in Moodle). SECOND CHANCE PAPERS MAY GET A MAXIMUM GRADE OF 5 (passed).	30
ICT practicals	A21 A23	Attendance is mandatory. Each day of unexcused absence will mean 0.5 points less in the final grade.	0

Assessment comments
In order to pass the course it is REQUIRED to pass the theory exam with a grade of at least 4. Otherwise, the course will be suspended regardless of the remaining grades and the lowest numerical grade will be placed (i) the average grade with the above percentages or (ii) the grade of the theory exam). Failure to attend the theory exam will result in no final grade ("No presentado"). Students with dispensation from attendance: it will be possible to take the tests using teledocency tools. Fraudulent completion of exams or evaluation activities, once verified, will directly result in a failing grade in the corresponding call: the student will be graded as ?failed? (numerical grade 0) in the corresponding call of the academic year, whether the offense is committed in the first or second opportunity. For this, their grade will be modified in the first opportunity record, if necessary.

Sources of information	
Basic	- Newman, M. C. (2010). Fundamentals of Ecotoxicology, 3 edition. CRC Press - Newman, M. C.; Clements, W.H. (2008). Ecotoxicology: A Comprehensive Treatment. CRC Press - Sparling, D. W. (2016). Ecotoxicology essentials : environmental contaminants and their biological effects on Animals and plants. Academic Press - Walker, C. H., S. P. Hopkin, R. M. Sibly, and D. B. Peakall. (2006). Principles of Ecotoxicology, 3rd edition. Taylor & Francis, London
Complementary	La bibliografía básica es suficiente para una asignatura de licenciatura. Además, el alumno debe buscar trabajos científicos para realizar el trabajo tutelado; los trabajos concretos varían para cada alumno.

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments
Students are encouraged to use tutorial sessions to solve doubts/questions with the teacher.Green Campus Programme Faculty of Science: to contribute to achieving an immediate sustainable environment and to comply with point 6 of the "Environmental Declaration of the Faculty of Science (2020)", written assignments will be mainly requested in electronic format.

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.