Universitat Autònoma de Barcelona

2018/2019

Ecotoxicology and Pollution

Code: 100818
ECTS Credits: 10

Degree	Type	Year	Semester
2500251 Environmental Biology	OB	3	1

Contact

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Use of languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Eva Castells Caballé
Àngela Ribas Artola

Prerequisites

Although there are no official prerequisites, the student would require a background in the following subjects: Chemistry, Cell Biology and Histology, Ecology, Plant Physiology and Animal Physiology. A significant proportion of the recommended bibliography, readings and materials worked in class will be in English, so it is recommended that students have minimal skills in this language.

Objectives and Contextualisation

Pollution and its harmful effects on living organisms, including man, is one of the main current environmental problems. The scope of this problem is global due to transport processes between environmental compartments, seriously affecting the health of ecosystems and therefore of humanity. In this subject, the student will identify the pollution processes and their effects, while being able to decide and use the most appropriate laboratory and field techniques to evaluate them in each case.

The objectives of the subject are the student to be trained in the following skills:

A) Knowledge: to identify the environmental chemistry of the main environmental pollutants, as well as the indices that allow either the prospective or retrospective risk assessment of the potential impacts of pollution, from the effects at the molecular level to the ecosystem level.

B) Procedures: be familiar with laboratory and field techniques for assessing the impacts of pollution, solving problems and making decisions.

C) Attitudes: raise awareness and adopt critical positions regarding pollution issues.

Skills

- Adapt to new situations.

- Catalogue, assess and manage natural biological resources.
- Communicate efficiently, orally and in writing.
- Develop a sensibility towards environmental issues.
- Develop bioassays and apply biotechnological processes.
- Develop strategies of analysis, synthesis and communication in order to teach biology and environmental studies.
- Diagnose and solve environmental problems regarding the biological environment.
- Identify and use bioindicators.
- Make decisions.
- Manage, conserve and restore populations and ecosystems.
- Perform biological diagnoses.
- Sample, characterise and manipulate populations and communities.
- Solve problems.

Learning outcomes

1. Adapt to new situations.
2. Apply knowledge of the functioning of aquatic (lakes and oceans) and aerial environments to diagnosing and solving problems caused by pollution in living beings.
3. Collect and analyse biological samples, as bioindicators.
4. Communicate efficiently, orally and in writing.
5. Develop a sensibility towards environmental issues.
6. Identify the principal mechanisms of spreading, transformation and accumulation of the principal contaminants in the natural environment and in the biota.
7. Identify the principal types of contaminants in the aquatic and atmospheric environments.
8. Know the principal techniques for identifying the state of contamination of an ecosystem.
9. Make decisions.
10. Manage the different techniques for identifying the impacts that different types of pollution have at the level of organisms, towns, communities and ecosystem.
11. Recognise the basic principles of biology that must be conveyed in the field of secondary education.
12. Solve problems.
13. Use indices to determine the state of conservation of an ecosystem.

Content

Theoretical classes

BLOCK A. ENVIRONMENTAL CHEMISTRY

Chapter 1. From the pollution sources to the effects to ecosystems.

Chapter 2. Pollution sources and main pollutants.

Chapter 3. Pollution transportation and transference between environmental compartments.

Chapter 4. Abiotic and biotic transformation of pollutants.

BLOCK B. TOXICOLOGIA: INDIVIDUO

Chapter 5. Basic concepts in toxicology.

Chapter 6. Dose-reponse relationship and toxicity indices.

Chapter 7. Toxicokinetics.

Chapter 8. Toxicodynamics: the toxic effects.

BLOCK C. ECOTOXICOLOGIA: DEL INDIVIDU AL ECOSISTEMA

Chapter 9. Introduction to ecotoxicology.

Chapter 10. Effects on populations.

Chapter 11. Effects on communities.

Chapter 12. Effects on ecosystems.

BLOCK D. METODOLOGIAS DE ESTUDIO EN ECOTOXICOLOGIA

Chapter 13. Chemical monitoring: assessment of pollution concentrations.

Chapter 14. Biological monitoring: biomarkers, bioindicators and ecological indicators.

Chapter 15. Ecological risk assessment of pollution.

Chapter 16. Remediation of polluted sites.

Laboratory and field practices

Practice 1. Laboratory indicators: ecotoxicological tests and pollutants analysis.

Practice 2. Aquatic macroinvertebrates as field bioindicators (field trip+laboratory).

Methodology

The guided sessions will consist of lecture sessions supplemented with practical exercises or case studies associated at the individual or the group level, together with a field trip and two laboratory practices periods, the first at the beginning of the semester and the second just after the field trip. There will be no need to deliver any written report of the laboratory practices, but questions about the contents will be present in the corresponding tests.

At the end of the semester, once the theoretical part is finished, students will prepare a group seminar, consisting of an oral presentation + written report. The preparation of the seminar will be done in two work sessions (seminars 1 and 2), with the corresponding professor, with the aim to resolve doubts arising during the preparation of the seminar by each group of students. Each group will hand-out the report and, a few weeks later, an individual and group appraisal will be carried out (seminar 3).

The schedule of the seminar sessions will be specified by the corresponding professor.

The student should spend time to autonomous activities such as the preparation of the seminar, the resolution of problems and cases raised in class, as well as the study.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			

Case studies and problems	18	0.72	4, 9, 12
Field trip	5	0.2	3, 13
Laboratory practices	21	0.84	10, 9, 12, 5, 13
Master classes	36	1.44	2, 8, 6, 10, 7
Type: Supervised			
Seminar session 3	4	0.16	1, 4, 6, 9, 12, 5
Seminar sessions 1+2	4	0.16	1, 2, 4, 8, 6, 9, 11, 12, 5
Type: Autonomous			
Case studies and problem solving	20	0.8	9, 12
Personal study	100	4	2, 8, 6, 10, 7, 13
Seminar preparation	30	1.2	4, 8, 6, 9, 5

Evaluation

Evaluation activities. The evaluation will be based on two midterm exams, a seminar presented at the end of the semester, and the case studies and problems raised in class. The first half of the subject, the theoretical blocks A and B and the lab practice 1, will be evaluated in the 1st midterm test. In the 2nd midterm test half, blocks C and D and the lab practice 2 will be the one evaluated. Each of the two midterm exams will weight a 35% of the final mark. The seminar will weight 20% and the case studies and problems raised during the course a 10% of the mark. Only the midterm tests can be retaken.

Test review. At the time of publication of the exam notes in the virtual campus, the date, time and place of the review will be communicated for any interested student. There will be no individual reviews outside of these hours.

Appraisal criteria. The student will be considered as 'passed' if the weighted mean mark for all the activities is over 5, with the exception of those students with a mean weighted mean of the two midterm tests below 4.5. In this last case, the students have the chance to do a retake test.

Criteria for the retake test eligibility and the 'no evaluable' consideration. The retake test will include the entire syllabus of the subject and the obtained mark will substitute that of the midterm tests, hence weighting a 70% of the global mark.

To be eligible for the retake process, the student should have been previously evaluated in a set of activities equaling at least two thirds of the final score of the course or module. Thus, the student will be graded as "No Avaluable" if the weight of all conducted evaluation activities is less than 67% of the final score. Attendance to practical sessions (or field trips) is mandatory. Students missing more than 20% of programmed sessions will be graded as "No Avaluable".

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Case studies and problems	10%	5.5	0.22	9, 12, 5
Midterm exam 1	35%	3	0.12	1, 2, 4, 6, 10, 7, 9, 12

Midterm exam 2	35%	3	0.12	4, 8, 10, 9, 3, 12, 13
Seminar	20%	0.5	0.02	4, 9, 11, 12, 13

Bibliography

Forbes VE, Forbes TL. 1994. Ecotoxicology in theory and practice. Chapman & Hall. London, UK (Ciència i Tecnologia 504.05 For).

Gestel CAM, Brummelen TC. 1996. Incorporation of the biomarker concept in ecotoxicology calls for a redefinition of terms. Ecotoxicology 5: 217-225 (http://www.springerlink.com/content/hq48823852176k14/)

Hoffman DJ, Rattner BA, Burton GA, Cairns J. 1995. Handbook of ecotoxicology. First Edition. Lewis Publishers, Boca Raton, USA (Ciència i Tecnologia 504.05 Han).

Klaassen CD, Watkins JB. 2005. Fundamentos de Toxicología. McGraw-Hill (Ciència i Tecnologia 615.9 Kla)

Moriarty F. 1999. Ecotoxicology. Third Edition. Academic Press. London, UK (Ciència i Tecnologia 504.05 Mor)

Newman MC, Clements WH. 2007. Ecotoxicology: A comprehensive treatment. First Edition. CRC Press. BocaRaton, USA

Newman MC, Unger MA. 2002. Fundamentals of ecotoxicology. Second Edition. Lewis Publishers, CRC Press, BocaRaton, USA (Ciència i Tecnologia 504.05 New)

Pepper IL, Gerba CP, Brusseau ML, Brendecke JW. 1996. Pollution Science. Academic Press. San Diego, USA (Ciència i Tecnologia 504.05 Pol).

Repetto M, Repetto G. Toxicología Fundamental. Ed. Díaz de Santos, 2009 (Ciència i Tecnologia 615.9 Rep)

Van Straalen N. 2003. Ecotoxicology becomes stress ecology. Environmental Science and Technology 37: 324A-330A (http://pubs.acs.org/doi/abs/10.1021/es0325720).

Walker CH, Hopkin SP, Sibly RM, Peakall DB. 2005. Principles of ecotoxicology. Third Edition. Taylor & Francis, London, UK. (Ciència i Tecnologia 504.05 Pri 574 Pri).

Web pages:

Toxicology Basic Principles (http://sis.nlm.nih.gov/enviro/toxtutor/Tox1/index.html)