COURSE DATA

DATA SUBJECT

Code: 33096
Name: Environmental toxicology and public health
Cycle: Undergraduate Studies
ECTS Credits: 4.5
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1104 - Degree in Environmental Sciences	Facultat de Ciències Biològiques	2	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1104 - Degree in Environmental Sciences	Environmental toxicology and public health	COMPULSORY

COORDINATION

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SUMMARY

The subject of environmental toxicology and public health (33096) is teaching in the second year of the Degree of Environmental Sciences, in the Faculty of Biology at the University of Valencia. This subject is 4.5 ECTS credits during the first semester in the year.

The main objective of this subject is to determine the fate of toxic substances and their effects on human health and the ecosystems. Toxicological testing provides guidance on the design and evaluation of product safety studies to help ensure regulatory acceptance. The ecotoxicological testing methods developed to identify contamination by toxic substances and cause and effect relationships at higher organizational levels, to assess and quantify the effect of toxic substances on such organizations and to assess the ecotoxicological risk. Thus, from prevention to intervene.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

To study environmental toxicology and public health, knowledge of a number of basic concepts of biology, chemistry and statistics are needed. These concepts are part of the contents of the subjects taught during the previous courses in the Graduate.

COMPETENCES / LEARNING OUTCOMES

1104 - Degree in Environmental Sciences

Capacidad de realizar evaluaciones de riesgos toxicológicos y ecotoxicológicos.

Conocimientos de toxicología ambiental y de aplicación de bioensayos, y conocimientos básicos de salud pública.

DESCRIPTION OF CONTENTS

1. Introduction to Environmental Toxicology and Public Health

Environmental Toxicology and Public Health: history and scope of the field. Environmental health. Qualitative aspects of toxic effects. Toxic substance in the environment. Degree in Environmental Sciences and career in relation to toxicology.

2. Toxicokinetics

Phases of toxic action. Exposure phase. Pathways for xenobiotics. Passing mechanisms of the toxins through biological membranes. Absorption. Distribution, fixation, biotranformation and excretion of toxins.

3. Use of animals in toxicology testing in vivo

Methods in toxicology testing. Dose-response relationship. Acute toxicity, short-term and long-term toxicity studies. Background and basic principles. Experimental design and study parameters. Carcinogenicity studies. Genetic toxicology: mutation and teratogen assays. Endocrine-active substances. Regulatory toxicology. Animal test to human extrapolation. The determination of the extent of human exposure before or after application of regulatory controls.

Predictive value of safety toxicology.

4. Alternatives to animals testing

Alternative methods to animal experimentation. In vitro test systems in regulatory toxicology. Validation and regulatory acceptance. Data evaluation and interpretation by alternative assays.

5. Environment ecotoxicological testing

Ecotoxicity tests. Protocols and regulation. Representative species ecotoxicological studies. Ecotoxicity tests with bioluminescent bacteria. Control of discharges. Ecotoxicity test of leachates. Acute ecotoxicity tests with aquatic species (invertebrates, algae and fish). Ecotoxicity tests with terrestrial organisms and birds. Other ecotoxicity testing (bees, soil microorganisms, worms, soil, et.).
Ecotoxicological risk characterization of toxic substances in water, land and air compartments. Predicted environmental concentration (PEC) and predicted no effect concentration (PNEC) to organisms in ecosystems.

6. Toxicological and Ecotoxicological risk assessment

Risk assessment paradigm. Hazard identification, dose response assessment, exposure assessment and risk characterization. Risk management. Risk communication.

7. Toxicity of organic chemical agents in the industry

Polychlorinated biphenyl¿s (PCBs), dioxins (PCDDs), furans (PCDFs), polycyclic aromatic hydrocarbons (PAHs), chlorofluorocarbons (CFCs), polymers (nano and microplastics).
Definition, exposure, dispersion, classification, mechanistic toxicology, toxic effects, ecological implications and environmental legislation.

8. Toxicity of pesticides

Pesticides: definition, exposure, dispersion, classification, mechanistic toxicology, toxic effects, ecological implications and environmental legislation.

9. Toxicity of inorganic chemical agents

Nitrates, nitrites, ammonium, phosphates, detergents; sulphur dioxide, carbon oxides, ozone, etc. Definition, exposure, dispersion, classification, mechanistic toxicology, toxic effects, ecological implications and environmental legislation.

10. Toxicity of heavy metals

Heavy metalls. Definition, exposure, dispersion, classification, mechanistic toxicology, toxic effects, ecological implications and environmental legislation.

11. Toxic substances produced by cyanobacteria and genetically modified organisms

Toxins produced by cyanobacteria. Factors that help to blooms. Types. Toxic effects and ecotoxicological contaminations. Environmental legislation. Genetically modified organisms: risks for the environment.

12. Toxicology of physic agents

Radiations and radioactive substances. Tipus. Exposure. Mechanisms of action. Toxic effects and ecotoxicological contamination. Regulation.

13. Environmental epidemiology

Introduction to environmental epidemiology. Concepts of health, disease, environmental health and epidemiology. Uses and applications. Frequency measurements. Epidemiological studies. Descriptive, analytical and experimental epidemiology.

14. Laboratory Environmental toxicology and public healt

There will four hours/session. Practices are mandatory attendance. Students submit a report after completing the practice and must to pass a written exam. Practice are scheduled as follows:
Practice 1: Sources of toxicological information applied to environmental toxicology.
Practice 2: Ecotoxicological concentration of nitrates for agricultural use. Groundwater quality.
Practice 3: Evaluation of the presence of SO2 in air of industrial zone.
Practice 4: Obtaining the main ecotoxicological parameters. Predicted environmental concentration in the environment (PEC) and / or predicted no effect concentration (PNEC), after long-term exposure of organic pollutants in water.
Practice 5: Determination of toxicity in environmental discharges with the acute toxicity Microtox (bioluminescent bacteria) bioassay.

Practice 6: Assessment of toxicological risks for humans and ecotoxicological risks for wildlife.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Tutorials	2,00
Theory	27,00
Laboratory	16,00
Total hours	**45,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	11,50
Independent study and work	9,00
Preparation of lessons	26,00
Preparation for assessment activities	16,00
Resolution of case studies	5,00
Total hours	**67,50**

TEACHING METHODOLOGY

The development of the subject is structured as follows:

Lecture (theoretical classes): 2 hours per weeks in which the teacher provides students with an overview of the topic, and the information necessary to understand the contents of the subject. The students are encouraged to search supplementary information. It is recommended to review the material before to go the classroom. For the follow-up of the class, the student is recommended to review in advance the material that the professor leaves in the virtual classroom.

Specialized tutoring (sessions in group). Small groups of students are ideal for students for raising questions or issues they arise throughout the development of the theoretical classes. This session is mandatory for all students.

Seminars in group. There will be seminars involved in develop different aspects of a main subject. The professor will provide access to the material necessary to promote learning.

Laboratory classes: small groups of students will attend the laboratory classes that are mandatory for all students. Before attending the laboratory, the student must understand each laboratory

classes, review the theoretical concepts involved. At the end of the laboratory classes, it will be mandatory to submit a memory to the professor. In the laboratory, the professor will focus on the most important aspects of the experimental work and will attend to the student during the session. Students have to resolve the problems that are raised, and they show their results and discusses their toxicological interpretation.

EVALUATION

The evaluation of student learning will take into account all the aspects presented in the methodology section of this guide and will be carried out continuously by the professor. The subject is structured in three blocks: theory, practices and other activities.

In order to sit for the final written exam, it is mandatory to have completed the laboratory practices and submitted the memory of the same. To apply for the written examination is required to have completed the laboratory practical classes.

10% of the mark will be obtained of work in groups and/or presented in class. This evaluation will take into account various aspects that include:

Progress in the use of language characteristic of toxicology.

Ability to solve problems and approach questions.

Critically.

Attitude of respect for others

Lack of regular attendance to class or tutoring will be reflected negatively on the score.

20% of the mark corresponds with the laboratory practical classes, which are assessed by conducting a written exam. In addition, it is mandatory that students at the end of practice submit a placement report to be graded as fit or unfit. The memory represents 5% of the laboratory mark, which will be kept two years (for those students who do not pass the subject in the first enrollment).

70% of the mark corresponds to the results obtained in continuous evaluations corresponding to the theoretical content of the course. 50% will correspond to a written exam and 20% to the results obtained from continuous evaluation through tools such as virtual exams.

To pass the course, the student must to obtain a mark of at least 4.5 on the exam that includes

the theory and practice. Passed the examination of theoretical and practical contents will add the % in the evaluation of the professor.

Those students who fail the course in the first call, they keep the note for the work presented in class (10% of total note) for the second round (June-July). This note will be kept two years (for those students who do not pass the subject in the first enrollment).

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- http://busca-tox.com Portal de búsqueda de información toxicológica.
- http://toxnet.nlm.nih.gov/ TOXNET Toxicology Database Network Web de información internacional sobre riesgos toxicológicos
- http://rais.ornl.gov/tox/metadata.shtml Risk Assessment Information System (Web de información sobre evaluación de riesgos toxicológicos)
- http://www.istas.net/risctox/ Base de datos de sustancias básicas y peligrosas http://www.epa.gov/opptintr/
- http://www.atsdr.cdc.gov/mrls.html
- http://eur-lex.europa.eu/es/index.htm Legislación europea
- http://www.invittox.com/ Protocolos sobre métodos alternativos
- http://www.srcinc.com/
- http://www.msc.es/ciudadanos/saludAmbLaboral/home.htm Salud ambiental
- http://toxmap.nlm.nih.gov/toxmap/main/index.jsp