

Academic Year/course: 2022/23

## 25256 - Toxicology and public health

### Syllabus Information

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**Academic Year:** 2022/23

**Subject:** 25256 - Toxicology and public health

**Faculty / School:** 201 - Escuela Politécnica Superior

**Degree:** 571 - Degree in Environmental Sciences

**ECTS:** 6.0

**Year:** 3

**Semester:** First Four-month period

**Subject Type:** Compulsory

**Module:**

## 1. General information

### 1.1. Aims of the course

The aim is that the student learns to know and analyse the possible causes and environmental factors that act on human health and their effects, as well as the means for their evaluation and forms of action within the environmental sciences that are aimed at improving individual and community health.

Special attention will be paid to the Sustainable Development Goals (SDGs) of the 2030 Agenda (<https://www.un.org/sustainabledevelopment/en/>) related to the subject directly or indirectly and to certain specific goals. Specifically:

Goal 3: Good health and well-being. Ensure healthy lives and promote well-being for all at all ages.

Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination.

Goal 6: Clean water and sanitation. Ensure access to water and sanitation for all.

Target 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and substantially increasing recycling and safe reuse globally.

### 1.2. Context and importance of this course in the degree

As the interdisciplinary approach is essential to develop the fundamental competencies of the basic professional profiles of graduates in Environmental Sciences, this approach must always integrate the health perspective, both for carrying out environmental assessments and for the implementation of environmental projects and plans, the coordination of environmental management in companies and institutions, and the planning and projects of environmental awareness, education, and information.

The syllabus of the subject interacts with the subjects that include the contents on society and territory, soil degradation and pollution, waste management and recovery, environmental audits, radioactive pollution, noise and vibrations; and serves for other subjects in which the contents of atmospheric pollution, water pollution, environmental impact assessment, and environmental chemistry are dealt with.

### 1.3. Recommendations to take this course

It is highly recommended to attend both theoretical and practical sessions and to dedicate sufficient time to study, consulting with the teaching staff if you have any doubts. It is recommended to have taken the subjects that provide basic knowledge of the chemical bases of the environment, biology, and statistics.

User-level computer skills are required to search for information on the Internet, consult bibliographic databases and use the teaching platform on a regular basis.

A sufficient level of English is required to be able to search for, evaluate and synthesise scientific articles without difficulty.

## 2. Learning goals

### 2.1. Competences

CE9. Mastery of criteria, regulations, procedures and techniques in environmental management and quality systems. This includes the capacity to identify and assess environmental costs; management of water supply and treatment systems;

energy optimization with the use of clean and renewable technologies; management of air quality and cleansing of atmospheric emissions; integrated management of health, hygiene and occupational hazard prevention.

CG1. Comprehension and mastery of fundamental knowledge in the area of study and the ability to apply this fundamental knowledge to specific tasks of an environmental professional.

CG2. Communication and argumentation, oral and written, of stances and conclusions, to expert audiences or broadcasting and information to non-expert audiences.

CG3. Capacity to solve problems, both generic ones and ones typical of the area, using the interpretation and analysis of relevant data and evidence, the issuing of evaluations, decisions, reflections and pertinent diagnoses, with the consideration suitable to scientific, ethical or social aspects.

CG4. Capacity of consistent decision-making.

CG5. Capacity of critical reasoning (analysis, synthesis and assessment)

CG6. Capacity to apply theoretical knowledge to an analysis of situations.

CG7. Mastery of IT applications related to the field of study, as well as the use of the internet as medium and source of information.

CG8. Capacity to autonomously organize and plan work and manage information.

CG9. Capacity to work on a team, in particular teams of an interdisciplinary and international nature typical of the work in this field.

CG10. Capacity to lead, to organize working teams and fundamental skills in interpersonal relationships.

CG11. Capacity of communication, argumentation and negotiation both with specialists of the area as well as non-experts on the subject.

CG12. Ethical commitment to all aspects of one's professional performance.

CG14. Creativity, initiative and enterprising spirit.

CG15. Capacity to adapt to new situations.

CG16. Motivated by quality.

CG17. Sensitivity towards environmental theme.

CB2. That students know how to apply their knowledge to their work or vocation professionally and possess skills that tend to be shown by the elaboration and defence of arguments and problem-solving within their area of study.

CB3. That students have the capacity to bring together and interpret relevant data (normally within environmental sciences) in order to make decisions that include a reflection on socially, scientifically or ethically relevant subjects.

## 2.2. Learning goals

1. Explain the fundamentals and the most important aspects of environmental toxicology as applied to the prediction of the impact of toxicants on environmental pollution and human health.
2. Design toxicity tests and be able to solve problems of toxicokinetics, risk assessment, exposure assessment, dose-response relationship, and toxicological risk characterisation.
3. Define the fundamentals and basic concepts of Public Health and, within this, of Environmental Health.
4. Differentiate the main interactions between the environment and human health and the main risk factors for human health present in a given environment.
5. Define the fundamentals and basic concepts of epidemiology and differentiate the types of epidemiological studies that are used in the field of environmental epidemiology.
6. Solve problems of calculation and interpretation of the different descriptive and analytical epidemiological parameters: incidence, prevalence, relative prevalence ratio, relative risk, attributable risk, odds ratio, etiological risk fraction.
7. Locate and manage Health Information Systems and health indicator systems. Be able to define and calculate health indicators.
8. Locate scientific evidence in bibliographic databases on the Internet in the field of environmental health and be able to make a critical reading and analysis of them.
9. Be able to present and argue orally and in writing the fundamentals, material and method, results and conclusions of practical work, and bibliographic searches.

All these learning outcomes are part of SDG 3 (good health and well-being) and 6 (clean water and sanitation). By achieving these, students will have acquired the basic theoretical and practical knowledge necessary to promote sustainable development in relation to environmental toxicology and its consequences on pollution and human health.

## 2.3. Importance of learning goals

These learning outcomes have a very important practical application in the exercise of the profession as they provide the minimum health training necessary for the graduate in environmental sciences to be able to integrate health variables in the diagnosis, interpretation, and management of the environment.

Graduates in environmental sciences must be able to locate scientific evidence and apply the techniques and working procedures of toxicology and public health to resolve health issues and problems related to the environment that arise in the course of their profession.

This implies the acquisition of knowledge and the ability to address issues related to the targets associated with SDGs 3 and 6 developed in the objectives of this guide.

### 3. Assessment (1st and 2nd call)

#### 3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

3.1 Type of tests and their value on the final mark and assessment criteria for each type of test

The student must demonstrate that he/she has achieved the expected learning outcomes through the following assessment activities.

The student may opt for continuous assessment or final assessment.

Continuous assessment\*:

Designed for those students who attend class assiduously and opt for continuous monitoring of the subject throughout the semester.

Type of tests:

Part A (70%): a written theoretical-practical exam which may include a multiple-choice or short-answer test and another test of exercises or cases. All in accordance with the syllabus of the subject.

Part B (30%): This may include tests with exercises involving the application of techniques and/or procedures demonstrated in lectures and practical classes, as well as critical reading of scientific articles in Spanish and/or English, and the design of epidemiological studies or simple interventions in the field of environmental health.

\*When the student opts for continuous assessment, he/she undertakes to:

- Submit assignments on time
- Attend all face-to-face sessions (at least 80% of the practical sessions).
- Obtain at least 50% of the maximum weighting given for both parts (obtaining at least 40% in one of them may be compensated if the weighted average exceeds 50%).

Overall assessment:

Students who do not opt for continuous assessment or who do not pass the subject by this procedure or who would like to improve their grade will have the right to sit the overall exam, with the best of the grades obtained prevailing in any case.

In the case of not taking the continuous assessment, it is recommended to request a tutorial at the beginning of the semester to establish a means of communication and to know the dynamics of the subject and the most important aspects for passing it.

Type of tests:

Part A (70%). The theoretical-practical exam which may include a multiple-choice or short-answer test and another test of exercises or cases.

Part B (30%). Tests with individual/group work reviewing documents and/or scientific publications on environmental health and/or epidemiological study design in the field of environmental health.

Assessment criteria and levels of demand:

Obtaining at least 50% of the maximum weighting given for both parts (obtaining at least 40% in one of them may be compensated if the weighted average exceeds 50%).

The following will be assessed in the written exams: mastery of the basic concepts of the subject; accuracy in their use and in the calculation of rates and indicators, and the ability to relate the concepts acquired in the practicals with the theoretical concepts.

The following will be assessed in the assignments: Clarity in the exposition of objectives, methodology, and results; the ability to critically analyse the information obtained and to obtain reasoned conclusions; order; correct written expression; and the ability to answer the questions posed during the exposition before the lecturer and the rest of the course.

Grading system:

In accordance with the Regulations on Learning Assessment Standards of the University of Zaragoza (Governing Council Agreement of 22 December 2010), the results obtained by the student will be graded according to the following numerical scale from 0 to 10, with the expression of one decimal place, to which the corresponding qualitative grade may be added: 0-4.9: Fail (*Suspenso* - SS). 5.0-6.9: Pass (*Aprobado* - AP). 7.0-8.9: Very Good (*Notable* - NT). 9.0-10: Excellent (*Sobresaliente* - SB). A distinction of "*Matrícula de Honor*" may be awarded to students who have obtained a grade equal to or higher than 9.0 (Excellent). Their number may not exceed five percent of the students enrolled in the corresponding academic year.

Success rates in previous years:

2018/2019	2019/2020	2020/2021
100.00%	100.00%	89.66%

### 4. Methodology, learning tasks, syllabus and resources

#### 4.1. Methodological overview

The teaching methodology used in this subject includes the theoretical sessions: the lecturer's presentation of the key ideas and concepts, followed by detailed explanations with case and problem-solving.

Theoretical-practical sessions require students to work independently outside the classroom beforehand to solve doubts and problems on the blackboard. The practical sessions focus on the revision of documents, research, and resolution of problems and cases individually and/or in groups. Class attendance and practical sessions are considered fundamental for the understanding of the subject and to achieve optimum performance in it. Emphasis is also placed on the student's previous

work at home.

Throughout the course, both in theory and practical sessions, learning activities related to SDG 3 (good health and well-being) and SDG 6 (clean water and sanitation) will be developed.

## 4.2. Learning tasks

This 6 ECTS (150 hours) course is organized as follows:

- **Lectures** (25 hours). Teacher exposition of the main ideas and concepts, detailed explanations, and problem-solving.
- **Practice sessions** (35 hours). Problem-solving in which students work in an autonomous way, present their results orally and the teacher and other students comment on it.

The learning process that has been designed for this subject is based on:

Lecture, the purpose of which is the transmission of knowledge and logical foundations of the subject. Practical work, consisting of the application of theoretical concepts in real situations (problem-solving), critical reading of scientific articles, and review of exercises, tasks, and/or cases.

Intermediate training in information skills: training activity to work on information skills at an intermediate level (specialized databases, bibliographic managers, etc.). Face-to-face, theoretical-practical, lasting 2 hours. Within the framework of the Information Skills Training Plan developed by the EPS library in the center's degrees (basic (1st), intermediate (2nd and 3rd), and advanced (4th) levels).

Non-attendance personal work, which may include: Reading and commenting on articles, viewing and commenting on videos, solving exercises and case studies in relation to the contents of the face-to-face classes.

## 4.3. Syllabus

This course will address the following topics:

- Unit 1.- Principles of Toxicology
- Unit 2.- Absorption, distribution, and excretion of poisons. Metabolism of poisons. Toxicokinetics
- Unit 3.- Poisons and cancer. Mutagenesis. Teratogenesis.
- Unit 4.- Tests for toxicity and evaluation of toxicological risk. Identification of the dangers.
- Unit 5.- Evaluation of the exposure. Relation dosage-response
- Unit 6.- Characterization of the risk
- Unit 7.- Principal environmental contaminants and effects on human health
- Unit 8.- Health and its determinants. The Environment and health.
- Unit 9.- The European Environment and Health Strategy.
- Unit 10.- Public Health. Historical background and the current concept.
- Unit 11.- Health demography. Health Information Systems.
- Unit 12.- Introduction to Epidemiology. Measurement of health and illness phenomena.
- Unit 13.- Epidemiological research. Phases and types of studies. Descriptive studies, cohort studies, case and control studies, experimental studies. Chance. Biases.
- Unit 14.- Systematic reviews and meta-analysis. Medicine based on the evidence.
- Unit 15.- Applications of environmental epidemiology.
- Unit 16.- The human setting and health. The urban environment. Health protection, promotion, and prevention.
- Unit 17.- Principles and problems of food and environmental safety.
- Unit 18.- Noise and physical contaminants. Climate change and health. Ozone and health. Pesticides and health. Waste and health.

## 4.4. Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates, and other details regarding this course will be provided on the first day of class or please refer to the Faculty of Sciences website and Moodle.

Schedule of face-to-face sessions and presentation of assignments

The subject consists of 6 ECTS credits that correspond to 150 hours of dedication by the student. In this subject, classroom hours account for 40%, i.e. 60 hours, which are approximately distributed in the activities as follows:

-25 hours of lectures

-35 hours of practicals

The timetables will be those established by the center. At the beginning of the semester, the organisation of practice groups will be made available to students.

## 4.5. Bibliography and recommended resources

- BB** Frutos Pérez-Surio, A. Antidotes Network. In: Erkekoglu, P., Ogawa, T., editors. Medical Toxicology [Internet]. London: IntechOpen, 2019
- BB** Manual de epidemiología y salud pública para grados en ciencias de la salud / directores, Ildelfonso Hernández-Aguado... [et al.] ; coordinadora de la edición, Blanca Lumbreras Lacarra. 2ª ed. Buenos Aires ; Madrid [etc.] : Editorial Médica Panamericana, D.L. 2011
- BB** Martín-Olmedo P, Carroquino Saltó MJ, Ordóñez Iriarte JM, Moya J. La Evaluación de riesgos en salud. Guía metodológica. Aplicaciones prácticas de la metodología de Evaluación de riesgos en salud por exposición a químicos. Madrid. Sociedad Española de Sanidad Ambiental y Escuela Andaluza de Salud Pública. Serie "De aeribus, aquis et locis", nº 3. 2016.
- BB** Medicina preventiva y salud pública / directores, Antonio Sierra López ... [et al.] ; directores asociados, Fernando Rodríguez Artalejo ... [et al.]. 11ª ed. Barcelona [etc.] : Masson, 2008
- BB** Moreno Grau, María Dolores. Toxicología ambiental : evaluación de riesgo para la salud humana / María Dolores Moreno Grau Madrid [etc.] : McGraw-Hill, D.L. 2003
- BB** Repetto, Manuel. Toxicología fundamental / Manuel Repetto Jiménez, Guillermo Repetto Kuhn. 4ª ed. Madrid : Díaz de Santos, 2009
- BC** Capó Martí, Miguel Andrés. Principios de ecotoxicología : [Diagnóstico, tratamiento y gestión del medio ambiente] / Miguel A. Capó Martí Madrid : Tébar, D.L. 2007
- BC** Epidemiología : diseño y análisis de estudios / editor Mauricio Hernández Avila. México, D.F. [etc.] : Editorial Médica Panamericana, cop. 2007
- BC** Klaassen, Curtis D. Fundamentos de toxicología / Curtis D. Klaassen y John B. Watkins. Madrid [etc.] : McGraw-Hill Interamericana, D.L. 2005
- BC** Lilienfeld, Abraham M. Fundamentos de epidemiología / Abraham M. Lilienfeld, David E. Lilienfeld ; versión española de Carlos Luis González Wilmington, Delaware [etc.] : Addison-Wesley Iberoamericana, 1988
- BC** Peña, Carlos E. Toxicología ambiental : evaluación de riesgos y restauración ambiental / Carlos E. Peña, Dean E. Carter, Felix Ayala Fierro. Arizona : Collegue of Pharmacy, cop. 2001

#### LISTADO DE URLs:

Estrategia Europea de Medio Ambiente y Salud. Agencia Europea de Medio Ambiente

[<http://sostenibilidadyprogreso.org/files/entradas/estrategia-europea-de-medio-ambiente-y-salud.pdf>]

Frutos Pérez-Surio, A. Antidotes Network. In: Erkekoglu, P., Ogawa, T., editors. Medical Toxicology [Internet]. London: IntechOpen; 2019 [cited 2022 June 01]. Available from: <https://www.intechopen.com/chapters/70492> doi: 10.5772/intechopen.89816

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Martín-Olmedo P, Carroquino Saltó MJ, Ordóñez Iriarte JM, Moya J. La Evaluación de riesgos en salud. Guía metodológica. Aplicaciones prácticas de la metodología de Evaluación de riesgos en salud por exposición a químicos. Madrid. Sociedad Española de Sanidad Ambiental y Escuela Andaluza de Salud Pública. Serie "De aeribus, aquis et locis", nº 3. 2016. [cited 2022 May 30]. Available from:

<https://www.sanidadambiental.com/wp-content/uploads/2016/11/LA-EVALUACION-DE-RIESGOS-EN-SALUD.pdf>

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Peña, C.E., Carter, D.E., Ayala, F. (2001). Toxicología ambiental. Evaluación de riesgos y restauración ambiental. The University of Arizona

[<http://www.ingenieroambiental.com/informes2/toxamb.pdf>]

The updated recommended bibliography can be consulted in:<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=25256>