



INTRODUCTION

Course description: The majority of the compounds used by humans in different activities end up in the environment. In several cases this phenomenon compromises our health and the health of the planet. Environmental toxicology is a multidisciplinary science that studies the effects of those compounds in the environment, from individuals and populations to the ecosystem level. It is a complex field where the evaluation of the risk-benefit is very important in the decision making process. In this course we will study the principles of the environmental toxicology, the main pollutants and their effects, and the different techniques to monitor the effects. The principles of public health and epidemiology will also be studied. Finally, an introduction is given on how to perform the human and the ecological risk assessment of environmental pollutants.

- **Degree:** ENVIRONMENTAL SCIENCES and DOUBLE DEGREE IN BIOLOGY AND ENVIRONMENTAL SCIENCES
- **Module in the Degree Program:** Module V. Business Management and Administration (Section: Environmental Management and Quality in Companies and Administrations)
- **Number of credits:** 3 ECTS
- **Year:** Third, 2º semester
- **Type of course:** Required
- **Instructors:** Amaya Azqueta Oscoz (amazqueta@unav.es, responsible of the subject); Bertrand Pourrut (bertrand.pourrut@yncrea.fr, University of Toulouse, visiting professor)
- **Language:** English
- **Department:** Pharmaceutical Sciences, School of Pharmacy and Nutrition, University of Navarra; Ecolab, University of Toulouse
- **Lecture schedule:** Mondays from 9:00 to 11:00 (Room 16), from the 12th of January to the 23rd February
- **Case-study:** 19th (9:00-11:00; 15:00-19:00), 20th (15:00-19:00), 21st (15:00-19:00) and 22nd (15:00-19:00) January

LEARNING OUTCOMES (Competencies)

General competencies

CG1 - Manage their training

CG2 - Think in an integrated manner, and to approach the problems from different perspectives.

CG3 - Have a critical way of thinking

CG4 - Work as a part of a team

CG5 - Have a sense of responsibility towards the environment and the ecosystem

CG6 - Manage the information

CG7 - Communicate about environmental issues, in a written and oral form, by using an appropriate style and language according with the situation and the interlocutor



Specific competencies

CE1 - Know the scientific basis needed to address the specific environmental training.

CE5 - Interpret the experimental and field results

CE19 - Know the basic principles of environmental toxicology and their health impacts

CE22 - Understand the human impacts on the environment

PROGRAM

MODULE 1 – ENVIRONMENTAL TOXICOLOGY

Theme 1. Introduction to toxicology, environmental toxicology and ecotoxicology. Basic concepts, history and the different areas of the toxicology.

Theme 2. Basic principles of environmental toxicology. Basic concepts. Dynamics of pollutants in the environment. Concepts of exposure, absorption, transport, metabolism, accumulation and excretion. Effects of bioaccumulation and biomagnification.

Theme 3. Effects of environmental pollutants. Types, origin, characteristics and adverse effects of the most relevant environmental pollutants. The risk-benefit ratio.

Theme 4. Monitoring and assays to studies of the effects of environmental pollutants. Principles of experimental toxicology. Study of the OECD guidelines for testing chemicals. Concepts of biomonitoring, bioindicators and biomarkers. Single Species Tests (SST) vs Species Sensitivity Distribution (SSD). Toxicological databases and legislation.

MODULE 2 – PUBLIC HEALTH

Theme 1. Introduction to Public Health. Concepts of health, sickness, public health and environmental health. Relationship between public health and the environment. Protection and promotion of health. Health indicators and surveillance of environmental risks.

Theme 2. Epidemiology. Basic concept and different types of epidemiological studies. Environmental epidemiology.

MODULE 3 – RISK ASSESSMENT

Theme 1. Introduction to risk assessment. Concepts of hazard and risk. Phases in the risk analysis process: risk assessment, risk management and risk communication.

Theme 2. Protocol for human health risk assessment. Hazard identification, dose-response and exposure assessment, and risk characterization.

Theme 3. Protocol for ecological risk assessment. Problem formulation, analysis and risk characterization.

EDUCATIONAL ACTIVITIES

I. TEACHING ACTIVITIES

1. *Dynamic lectures (12 hours)*



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Lectures are given by the professor on the themes indicated in the program with the help of the blackboard and power point presentations. They will be dynamic; active participation of the students is expected. The professor will post on ADI the power point presentation and some recommendations for further reading. Personal laptops will be required for some of the sessions.

2. Case study (Required) (18 hours)

There will be a case study that will include:

- Presentation by the professor of current scientific issues and data.
- Evaluation and discussion of the data by the students. Class will be divided in different groups to carry out this task. The number of groups will depend of the number of students and the case study.
- Short oral presentations by the students (the preparation is included in the classroom activities).
- Debate among students.
- Discussion with the student, both in groups and in general.

3. The team work (Required)

See section II (subsections 2. Team work)

4. Evaluation

Exam to assess the successful accomplishment of the objectives.

5. Personal interviews

If required, student may have personal interviews with the professor if they need help with personal study and learning.

II. PERSONAL WORK

1. General

Students must understand themes covered early in the course to be able to comprehend information presented later in the course, and will have to be able to integrate material learnt throughout the course. Therefore, it is important that they do not fall behind and try to set aside regular times outside of class to work on the course material on a daily basis. To do so, students should conduct personal study using notes taken in lectures and recommended books if needed. Moreover, they will need to understand and handle different concepts to be able to actively participate in the case study.

2. Team work

Students will be divided in groups and each group will have to look for relevant information regarding a defined theme given by the professor. Themes are related to the course and they include environmental disasters, relevant books and scientists, and contaminants. The student will prepare a written essay with all the information collected.

Credits/hours distribution of the activities. 3 ECTS= 75 h (25 h/ECTS)



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1. Dynamic lectures: 0.48 ECTS, 12 h (16%)
2. Cases study: 0.72 ECTS, 18 h (24%)
3. Team work: 0.4 ECTS, 10 h (13.3%)
4. Study time: 1.4 ECTS, 35 h (46.7%)

Total classroom activities: 1.20 ECTS, 30 h (40%)

Total personal work: 1.80 ECTS, 45 h (60%)

ASSESSMENT

Final grade

To calculate the **final grade**, course performance and grading will be determined as follows:

- Final exam: 50 %
- Team work: 20 %
- Case-study: 30 %

The final exam will consist of short questions or test, or a mix (to be decided together with the students). Questions will be drawn from lectures and case studies.

The team work will be graded taking into account the content.

The case study will be graded considering the capacity of the student to interpret and discuss the information, the participation in the debates, and the oral presentations.

Criteria to pass the course

Students must pass the final exam, attend the case study and prepare the group work to be graded.

Students need to score 5 (out of 10) or higher to pass the final exam and be graded.

Students whose final grade is below 5 (out of 10) will not pass the course and will be graded as 'Suspenso'.

Students who do not attend the case study, do not prepare the group work, or do not take the final exam will not pass the course and will be graded as 'No presentado'.

Exams review

Students will be able to review the exams in an interview with the professor, after publication of the grades, in a day and place that will be indicated.

Students with special learning needs

Accommodation will be provided for students with special learning needs, either regarding the methodology and/or evaluation of the course, but they will be expected to fulfill all course objectives.

Evaluation in the extraordinary call



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For those who do not pass the course (grade 'Suspenso') in the first call, did not attend the case studies, did not prepare the team work, or did not take the final exam ('No presentado'), there will be an extraordinary exam and compensatory tasks. The format of this exam will be similar to the final exam. The calculation of the final grade will be made on a case-by-case basis.

OFFICE HOURS

Dra. Amaya Azqueta (amazqueta@unav.es); Despacho S200, Edificio CIFA

Individual tutoring can be arranged upon request by sending an email to the main instructor and responsible of the subject. In addition, the main instructor will be at the disposal of the students after each session.

BIBLIOGRAPHY AND RESOURCES

All the books can be found in the Library (University or Clinic) or by free access in internet:

- Klaassen, C.D. and Watkins III, J.B.: "Casarett y Doul. Fundamentos de toxicología". McGraw-Hill/Interamericana de España. Madrid, 2005. [Find it in the Library](#)

- Hoboken N.J. A textbook of modern toxicology. Wiley Interscience. 2004. [Find it in the Library](#)

- Jacobson-Kram, D. and Keller, K.A.: Toxicological testing handbook. Principles, applications and data interpretation. Informa Healthcare. Nueva York, 2006. [Find it in the Library](#)

- Wright, D.A. and Welbourn, P.: Environmental Toxicology. Cambridge Environmental Series 11. Cambridge University Press, 2002. [Find it in the Library](#)

- Peña, C.E., Carter, D.E. and Ayala-Fierro, F.: "Toxicología Ambiental. Evaluación de riesgos y restauración ambiental". Southwest Hazardous Waste Program. The University of Arizona. 2001 (<http://superfund.pharmacy.arizona.edu/toxamb/>)

- Moreno Grau, M. D.: "Toxicología Ambiental. Evaluación de riesgo para la salud humana". Mc Graw-Hill. Madrid, 2003. [Find it in the Library](#)

- Piédrola Gil, G., Rey Calero, J. and Domínguez Carmona, M.: "Medicina preventiva y salud pública". Salvat Masson. Barcelona, 2016. [Find it in the Library](#)

- Hernández-Aguado, I.: "Manual de epidemiología y salud pública para licenciaturas y diplomaturas de Ciencias de la Salud". Editorial Médica Panamericana. Buenos Aires, Madrid, 2005. [Find it in the Library](#)

- Goldstein, R., Goldstein, K. and Dwelle, T.: Introduction to public health: promises and practices. Springer Publishing Company. New York, 2015. [Find it in the Library](#)