

Academic Year/course: 2021/22

## 66855 - Ecology and Ecotoxicology

### Syllabus Information

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**Academic Year:** 2021/22

**Subject:** 66855 - Ecology and Ecotoxicology

**Faculty / School:** 105 - Facultad de Veterinaria

**Degree:** 617 - Master's in Global Health: Integration of Environmental, Human and Animal Health

**ECTS:** 3.0

**Year:** 1

**Semester:** Second semester

**Subject Type:** Optional

**Module:**

## 1. General information

### 1.1. Aims of the course

**The subject and its expected results respond to the following approaches and objectives:**

In this course, students will learn the basics of how biological systems - aquatic and terrestrial - function in the population, community, ecosystem and biosphere level, focused on their influence on ecotoxicity and human health. They will acquire a basic knowledge of Ecotoxicology, a discipline that studies the origin, effects and interactions of pollutants with living beings and their ecosystems. Emphasis will be placed on the effects on the aquatic and terrestrial environment. Furthermore, students will understand the role of Ecotoxicology in the legislative process.

Population dynamics and their interactions, mechanisms for the assembly of biological communities and biodiversity, as well as ecosystem processes, constitute the natural capital from which the environmental services that society receives from natural systems, which are key to human health and well-being, are derived.

This will enable students to: a) understand the ecosystem services that influence human well-being; b) understand the ecological processes that sustain these services; c) identify global and local scale threats to ecosystem services; d) approach nature conservation and restoration as tools for the preservation of environmental services that support human well-being; e) understand the scientific basis for legislation to protect human health and nature.

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

Services provided by technology (well known to all), culture (in its broadest sense) and nature, underpin human welfare. Since the 1990s the concepts of natural capital and ecosystem service have been coined to address a fundamental component of human well-being (and survival). This is society's use of biological species and ecological processes from ecosystems (natural capital). These are provisioning, regulating and cultural services that have a critical influence on people's physical and emotional health. This course will provide students with knowledge of these services, their ecological bases, as well as their threats and tools for their management.

On the other hand, pollutants derived from human activity and natural processes modify ecosystems, and can have adverse effects on human and animal health, which it is important to know in order to avoid, control or remedy. In the module of Ecotoxicology we will take as a starting point the basic principles taught in the subject One Welfare, and we will deepen in more specific aspects of Ecotoxicology of the aquatic and terrestrial environment, reviewing, in addition, the standardized tests for evaluation.

The aims of the course align with the goals and objectives of Sustainable Development (ODS) of the United Nations and with the State Strategy for Green Infrastructure and Ecological Connectivity and Restoration.

### 1.3. Recommendations to take this course

The course is open to all students enrolled in the master's degree.

## 2. Learning goals

### 2.1. Competences

**On successful completion of this course, students will be able to:**

### **Basic competences**

- CG01. Know and apply informatic tools and Information and Communication Technologies to gather and analyze data related with Health.
- CG04. Communicate to society the sensitivity towards environmental and sustainable development issues.
- CG02. Interpret, analyze and assess theories and results of scientific papers in the Health field.
- CB6. Understand knowledge with a potential for originality in the development and/or application of ideas, often in a scientific context.
- CB8. Integrate knowledge and cope with the complexity of judgement of data, including reflections on the social and ethic responsibilities associated to the application of their knowledge and statements.
- CB10. Develop learning skills that enable them for autonomous and self-driven continuing education.

### **Specific competences**

- To understand the basis of Ecology and aquatic and terrestrial Ecotoxicology.
- To understand the experimental sources that sustain the legislation on Ecotoxicology.

### **Generic competences**

- CG4. Capacity for consistent decision making.
- CG5. Critical thinking skills (analysis, synthesis, and evaluation).
- CG6. Ability to apply theoretical knowledge to situation analysis.
- CG7. Mastery of computer applications related to the field of study, as well as the use of the Internet as a means of communication and source of information.
- CG8. Capacity for autonomous work organisation and planning and information management.
- CG13. Capacity for autonomous learning and self-evaluation.
- CG14. Creativity, initiative and entrepreneurial spirit.
- CG15. Ability to adapt to new situations.
- CG17. Sensitivity to environmental issues.

## **2.2. Learning goals**

### **If students complete the course successfully, they should be able to:**

- Assess and interpret the role of abiotic factors in the structure and functioning of ecological systems at their various organizational levels.
- Differentiate and apply different models of biological population growth.
- Analyse the influence of biological interactions on ecological complexity.
- Know the meaning of biological diversity.
- Interpret communities and ecosystems over time, incorporating the concepts of ecological determinism, contingency and disturbance.
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- Interpret communities and ecosystems over time, incorporating the concepts of ecological determinism, contingency and disturbance.
- Identify the main environmental services provided by the ecosystems.
- Identify and critically evaluate the main syndromes of Global Change.
- Know the conceptual bases and the most common practices of conservation biology and ecological restoration.
- Know the main pollutants in the aquatic and terrestrial environment, and their effects on human and animal health
- Understand the applicable evidence to the study of ecotoxicity, and its role in the legislative process.
- Understand the main methods of removing contaminants from the environment.
- Understand the legislation on the subject.
- Acquire capacity for autonomous learning in a responsible and committed way.

## **2.3. Importance of learning goals**

Knowledge of the ecological basis of human well-being and of some basic tools for its management will make possible to incorporate the environmental dimension into human health and well-being policies and practices.

This will also serve to participate in the application of environmental methodologies such as impact assessments, environmental planning and restoration projects.

The introduction to Ecotoxicology will allow the student to obtain a global vision of the impact of pollutants on the ecosystem and the health of individuals, and how this impact is controlled from the regulatory point of view.

The student will acquire an integrated vision of Ecological Restoration, which will be materialized in the ability to describe

what is and what is not ecological restoration and why it is relevant in the framework of the idea "one world, one health".

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

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

Students must demonstrate that they have achieved the expected learning results by passing a **global assessment** consisting of a written test and the completion of individual work:

##### Written assessment

A global final written assessment will take place based on the answer of short questions and multiple answers. It will evaluate the acquisition of basic knowledge of the subject.

The grade for this activity will represent the 60% of the final grade of the course.

This test must be passed with a grade of at least 5 out of 10.

##### Individual work

In order to pass this activity, the student will have to present, at the end of the course, a written work on the ecological bases of some ecosystem service related to human welfare, or on a subject of Ecotoxicology, applying the concepts discussed in the face-to-face sessions.

The grade for this activity will represent the 40% of the final grade of the course.

This test must be passed with a grade of at least 5 out of 10.

##### Marking system

According with the Regulation of Learning Assessment Standards of the University of Zaragoza (Agreement of the Governing Council 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.

5.0-6.9: Pass

7.0-8.9: Good (NT).

9.0-10: Excellent (SB).

Students with a grade over 9.0 might be awarded with honours and it could be given to more than the 5% of the enrolled students during the academic year.

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

#### 4.1. Methodological overview

The learning process that has been designed for this subject is based on the following.

**Practice sessions:** The student will have access to bibliographic material and/or the presentations of each topic before its treatment in class. In the theory sessions, the students designated by the teacher will present their ideas on the topic being treated based on their own knowledge and the information provided by the teacher, which will have been studied previously.

The teacher will make a masterly presentation of each topic with questions to the students.

**Practical activities** will focus on the analysis of the ecological bases of different ecosystem services related to human well-being, as well as their sustainability in the current context of Global Change.

Students will carry out individual work directed by the teacher and will have regular tutorial sessions.

#### 4.2. Learning tasks

The programmed offered to students to help him/her achieve the expected results includes various activities.

- **Lectures:** A presentation of each topic is provided, as well as additional bibliographic material, available on the Moodle platform, which should be studied beforehand. The sessions will include student interventions and a master class presentation by the teacher.
- **Individual assignments:** A work on ecology or ecotoxicology of some aspect developed during the theory or practical sessions under the tutorship of a teacher will be carried out, presenting a final report. The rules for the elaboration of the report will be available in Moodle.
- **Tutorials:** To follow up the theory activities, personalized tutoring sessions are available.
- **Practice sessions:** Field session where the concepts taught in the theory classes will be integrated.

#### 4.3. Syllabus

##### Lectures

Lectures will address the following topics:

1. Concept of nature: Nature is in continuous change, rather than in balance (determinism and contingency)
2. Abiotic factors in aquatic and terrestrial ecosystems
3. Species interactions: importance of competition and mutuality
4. Assembly and dynamism of biological communities
5. Biodiversity: ecological function and control factors
6. Biological production (primary and secondary)
7. Matter cycle and biogeochemical cycles
8. Functioning of the Biosphere. Gaia. Great biomes of the planet
9. Conservation Biology
10. Ecotoxicity test methods
11. Biomarkers. Monitoring
12. Atmospheric Ecotoxicology
13. Aquatic Ecotoxicology
14. Terrestrial Ecotoxicology
15. Toxic risk assessment
16. Legislation in Ecotoxicology

#### **Practice sessions**

Field practice at the Sotos and Galachos del Ebro Natural Reserve (SNR) whose aim is to know experiences of work in Ecology, Ecotoxicology and Conservation of Biodiversity in the field.

### **4.4. Course planning and calendar**

#### **1. Ecology** (10 lecture hours)

Ecological bases of the functioning of natural systems at the levels of population, community, ecosystem and biosphere. 3 h

Ecosystem services and human well-being 2 hours

Climate Change and Global Change. Effects on human welfare. 2 hours

The Biology of Conservation and Ecological Restoration: tools for the sustainability of natural capital and human well-being 3 h

#### **2. Ecotoxicology** (10 lecture hours)

Ecotoxicity test methods Experimental quantification of ecotoxicological effects. 1h

Biomarkers and biomonitoring. 1h

Aquatic Ecotoxicology. Main pollutants and their effects on populations and ecosystems. 3h

Atmospheric Ecotoxicology. 1h

Terrestrial Ecotoxicology. Main pollutants and their effects on populations and ecosystems. 2h

Toxic risk assessment and legislation in Ecotoxicology 2h

#### **3. Practice session** (10 hours)

Visit to the Natural Reserve of SNR to learn about experiences in: ecological monitoring, environmental education, management of the natural environment, functioning of a Wildlife Recovery Centre, operation of a Breeding Centre for *Pseudunio auricularius*, experiences in ecological restoration.

#### **4. Tutorials**

Tutorials will be held upon previous appointment by e-mail.

Coordinators

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### **4.5. Bibliography and recommended resources**

The bibliography for the current academic year is kept up to date and can be consulted on the Library's website (search for recommended bibliography at [biblioteca.unizar.es](http://biblioteca.unizar.es)).