

## 27229 - Environmental Physical Chemistry and Photochemistry

### Syllabus Information

**Academic year:** 2023/24

**Subject:** 27229 - Environmental Physical Chemistry and Photochemistry

**Faculty / School:** 100 - Facultad de Ciencias

**Degree:** 452 - Degree in Chemistry

**ECTS:** 5.0

**Year:** 4

**Semester:** Second semester

**Subject type:** Optional

**Module:**

### 1. General information

The objectives of the subject are:

- To provide the student with a vision of the chemical-physical aspects of the environment, the photochemical processes that occur in the atmosphere and in the evolution of pollutants from different sources.
- To show the chemical-physical contributions to pollution prevention and the elimination of pollutants
- To consider from the chemical-physical point of view, the philosophy and principles of sustainable

Chemistry in the search for more efficient and adequate products and processes for the conservation of the environment.

Sustainable Development Goals related to the subject:

- Goal 6: Clean water and sanitation; Objective 6.3.
- Goal 7: Affordable and clean energy; Goal 7.
- Goal 9: Industry, innovation and infrastructure; Objective 9.4, 9.5, 9.
- Goal 12: Responsible production and consumption; Objective 12.8.
- Goal 13: Climate action; Objective 13.3.

In order to take this subject, it is recommended to have a solid knowledge of Chemistry and Physics.

### 2. Learning results

Upon completion of the subject, the student will be able to:

- Understand and handle the basic terminology of "Green Chemistry".
- Recognize the role of natural and anthropogenic agents in the environment and assess the risks of chemical substances
- Identify the role of chemistry in the changes that affect the environment and in the measures to be adopted to avoid its deterioration.
- Know the main chemical-physical processes that determine the composition and conditions of the atmosphere, natural waters and soils.
- Recognize the chemical-physical aspects associated with the formation, emission, dispersion and evolution of pollutants.
- Apply the methodology for the study of the photochemical processes that affect the species that are commonly present in the environment and pollutants.
- Discuss and argue about environmental issues based on scientific data.
- Undertake and learn autonomously and in groups.

### 3. Syllabus

**Lectures, problem solving and seminars:**

1. Environment: Atmosphere and hydrosphere. Basic concepts.
2. Physical Chemistry of the atmosphere.
  - Photochemical processes in the atmosphere.
  - Kinetics of tropospheric reactions.
  - Air pollution. Primary and secondary contaminants.
  - Smog. Acid rain. Destruction of the ozone layer.
3. Physical Chemistry of the hydrosphere.

- Physicochemical properties of aquatic systems.
- Acid-base and redox equilibria in natural waters.
- Photochemical processes in aquatic systems.
- Contamination of aquatic systems.

4. Chemical-physical processes for the elimination of contaminants.

**Laboratory practices:**

- Photocatalytic dye removal reaction in water.
- Electrochemical sulphide removal.

#### 4. Academic activities

The program offered to the student to help them achieve the expected results consists of lectures, problem-solving, seminars and laboratory practices with the following teaching-learning methodology.

1. Training activity 1: Acquisition of theoretical knowledge of photochemistry and Environmental Physical Chemistry (3 ECTS) in participative master classes.
2. Training Activity 2: Problem solving classes and seminars (1 ECTS) where students under the supervision of the teacher will work actively.
3. Training Activity 3: Laboratory practice (1 ECTS) where students will work in small groups under the supervision of the teacher.

#### 5. Assessment system

**The student must demonstrate that they has achieved the intended learning results through the following assessment activities:**

**Test F:** a written exam to be held during the official exam period established by the Faculty, in which the student will have to give a reasoned answer to theoretical-practical questions, which may include numerical calculations.

**Test T:** realization and presentation of a paper on a topic included in the syllabus of the subject

**Test P:** the evaluation of the performance and report of the practices

**The final grade for the subject will be the most advantageous for the student from among the following:**

$$[0.45 \cdot F \text{ Test} + 0.45 \cdot T \text{ Test} + 0.10 \cdot P \text{ Test}] \text{ or } [F \text{ Test}]$$

A **grade of 5 or higher on Test F** is required to pass the subject.