

Academic Year/course: 2022/23

27226 - Environmental and Toxic Analysis

Syllabus Information

Academic Year: 2022/23

Subject: 27226 - Environmental and Toxic Analysis

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

1.3. Recommendations to take this course

Short summary

Environmental Analytical Chemistry is an elective course, based on the concepts learned in the courses "Química Analítica I" and "Química Analítica II", that addresses the importance and tasks of Analytical Chemistry and Instrumental Analysis in the control of environmental contamination. The course also explains the planning of analytical strategies to solve a problem related to the analytical control of environmental contamination, including analytical sampling and method selection, covering the main fields of application of analytical techniques in this subject, and establishing criteria to select the most suitable analytical technique.

Required Knowledge

To be able to follow this course the student must have conceptual foundations of all the parts of Chemistry and in particular of Analytical Chemistry and Instrumental Analysis. Basic knowledge of Geology, Biology and Biochemistry are also convenient.

2. Learning goals

2.2. Learning goals

To be able to pass the course, students should be able to:

1. Know the main analytical parameters determined in environmental samples and their meaning related with contamination processes
2. Use the terminology and concepts of environmental analysis
3. Consult the suitable legislation related with environmental control
4. Correctly apply the legal regulations for the determination of some frequent parameters in the analysis of environmental samples
5. Know the sampling methods and their relevance in the final analytical result
6. Know the particular analytical methodology to successfully carry out the determination of chemical substances in environmental samples
7. Plan and develop the analytical methods of the course regarding: study planning, sampling, sample handling, analysis and quality assurance
8. Design strategies to solve a real environmental analytical problem using the methodology shown during the course
9. Present and evaluate the results obtained from sample analysis. Produce reports with interpretation of the obtained data in the context of the sample

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, seminars, and practical exercises in the laboratory.

Students are expected to participate actively in class throughout the semester.

Further information regarding the course will be provided on the first day of class.

4.2. Learning tasks

The course includes the following learning tasks:

Theory and seminars. 4 ECTS

- Theory: lectures of main subjects given by the teacher followed by debates. Problem-based learning with practical cases. Commentaries and debates based on recent news related with the control of environmental contamination.
- Seminars: presentation of the results of activities given by students and discussions with the rest of the students. In group developing and interpretation of practical cases.

Laboratory experiments. 1 ECTS. 10 h at laboratory. 25 h in total

4.3. Syllabus

The course will address the following topics:

Theory

1. Types and general characteristics of pollutants: water, earth, air, residues.
2. Problems related with environmental contamination: environment and living beings. Origin, motility, transport, bioavailability, accumulation and toxicity of pollutants,
3. General environmental legislation. Reports, studies. Private and public scope.
4. Sampling method for environmental analysis
5. Techniques and methodologies in the analytical control of inorganic pollutants. Functional and chemical speciation.
6. Techniques and methodologies in the analytical control of organic pollutants. Chiral analysis.
7. Applications in the analysis of hydrosphere, soil, sediments, residues and living beings. Specific applications for the analysis of gaseous pollutants, atmospheric particulate matter and volatile organic compounds.
8. In situ techniques and methodologies: sensors. Automatic networks. Screening techniques. Green methodology.
9. Introduction to the analytical control of emergent pollutants: pharmaceutical residues, additives, nanomaterials, new pesticides, micotoxins.

Laboratory

Contents of the laboratory experiments:

- In situ study of water quality. Chemical parameters determination
- In situ determination of chemical pollutants in the air
- Field trip to "Estación de control medioambiental de Zaragoza"

Out of the laboratory activities:

- Statistical analysis of the data obtain in the laboratory experiments
- Design of a working protocol for the chemical characterization of a real episode of environmental contamination.

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 Facultad de Ciencias web (<https://ciencias.unizar.es/grado-en-quimica-0>).

4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=27226>