

Academic Year/course: 2021/22

60642 - Environmental Chemistry

Syllabus Information

Academic Year: 2021/22

Subject: 60642 - Environmental Chemistry

Faculty / School: 100 - Facultad de Ciencias

Degree: 540 - Master's in Industrial Chemistry

ECTS: 8.0

Year: 1

Semester: Annual

Subject Type: Compulsory

Module:

1. General information

2. Learning goals

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 achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as:

- Theory sessions with practical cases (7 ECTS)
- Seminars (1 ECTS)
- Tutorials to solve doubts and individual assignments follow-up.

4.2. Learning tasks

The course includes the following learning tasks:

- Activities related to the acquisition of advanced knowledge in environmental chemistry that includes theoretical aspects, problem-solving and case studies derived from the theoretical part. This type of activity is carried out in a single group classroom.
- Seminars that include the presentation of real cases related to environmental chemistry, and the oral presentation and critical discussion with professionals in the sector.

4.3. Syllabus

The course will address the following topics:

Topic 1. Introduction to the environment and its legal framework.

1. The environment: general concepts.
2. The environment in the international context. Global environmental problems.
3. Environmental legislation in the European context

4. Environmental legislation in the Spanish context.

Topic 2. Chemistry of the atmosphere and air pollution.

1. The atmosphere: general concepts, energy balance.
2. Air pollutants, power generation and associated effects.
3. Control, reduction and elimination of emissions.
4. Applicable regulations.

Topic 3. Chemistry of the hydrosphere and water pollution.

1. Water chemistry. Water cycle. Chemical processes in the aquatic environment.
2. Sources of water pollution.
3. Treatment and water purification, according to the origin of the pollutants.
4. Applicable regulations.

Topic 4. Geochemistry and soil contamination.

1. Soil. Components and properties. Weathering and leaching.
2. Main soil contaminants and their origin.
3. Treatment and recovery of contaminated soils.
4. Applicable regulations.

Topic 5. Waste.

1. Characterization and type of waste.
2. Waste management according to their type.
3. Waste treatment technologies.
4. Applicable regulations.

Topic 6. Polluting industrial products. Chemical Risk Analysis.

1. Main families of polluting industrial products: origin and characteristics.
2. Transport and accumulation of anthropogenic substances in the environment.
3. Reactions of anthropogenic substances in the environment.
4. Effects of xenobiotics and analysis of chemical risks.

Topic 7. Environmental Analysis.

1. Basic concepts in environmental analysis.
 - 1.1. Organic and inorganic contaminants.
 - 1.2. Analysis in the laboratory and in situ analysis.
 - 1.3. The general problem of sampling.
3. Analysis of water.
 - 2.1. Sampling and water conservation.
 - 2.2. Measurement of water quality: Determination of major components.
 - 2.3. Determination of trace contaminants.
5. Analysis of solid environmental samples: soil, sediment and debris.
 - 3.1. Sampling and storage of solids.
 - 3.2. Previous treatments: extraction, dissolution and cleaning.
 - 3.3. Determination of organic and inorganic analytes.
7. Atmospheric analysis.
 - 4.1. Gases. Sampling, direct analysis and remote analysis.
 - 4.2. Particulate matter. Sampling, extraction / dissolution of samples, direct analysis of solids.

Topic 8. Environmental impact assessment.

1. Introduction and concepts of environmental impact.
2. Methodology and characteristics of the environmental impact study.
3. Identification and assessment of impacts.
4. Protective and corrective of an environmental impact measures.

4.4. Course planning and calendar

Further information concerning the timetable, classroom, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the Faculty of Science <http://ciencias.unizar.es/>, <http://ciencias.unizar.es/web/horarios.do>

4.5. Bibliography and recommended resources

- Spiro, Thomas G.. Química medioambiental / Thomas G. Spiro, William M. Stigliani ; traducción, Yolanda Madrid Albarrán . - 2ª ed. Madrid [etc.] : Pearson Prentice-Hall, cop. 2004
- Manahan, Stanley E.. Fundamentals of environmental chemistry / Stanley E. Manahan . - 2nd ed. Boca Raton [etc.] : Lewis Publishers, cop. 2001
- Manahan, Stanley E.. Introducción a la química ambiental / S. E. Manahan . - 1ª ed. Barcelona ; México D. F. : Reverté, 2007
- Baird, Colin. Química ambiental / Colin baird Barcelona [etc.] : Reverté, D.L. 2001
- Chemistry of the environment / Ronald A. Bailey...[et al.] . - 2nd ed. San Diego [etc.] : Academic Press, cop. 2002
- Contaminación ambiental : una visión desde la química / Carmen Orozco Barrenetxea ... [et al.] . Madrid [etc.] : Thomson, D. L. 2002
- Figueruelo, Juan E.. Química física del ambiente y de los procesos medioambientales / Juan E. Figueruelo, Martín Marino Dávila Barcelona [etc.] : Reverté, cop. 2004
- O'Neill, Peter. Environmental Chemistry / Peter O'Neill . - 3rd ed. London [etc.] : Blackie Academic & Professional, cop. 1998
- Sierra, Miguel Ángel. Principios de química medioambiental / Miguel Á. Sierra, Mar Gómez Gallego Madrid : Síntesis, D.L. 2007
- Schwarzenbach, René P.. Environmental organic chemistry / René P. Schwarzenbach, Philip M. Gschwend, Dieter M. Imboden . - 2nd ed. New York [etc.] : John Wiley & Sons, cop. 2003
- Parker, Albert. Contaminación del aire por la industria / Albert Parker ; [versión española por José Costa López y Rubén Simarro Dorado] Barcelona : Reverté, D.L. 1983
- Contaminación atmosférica / Alejandrina Gallego Picó ... [et al.] Madrid : UNED, 2012
- Sogorb Sánchez, Miguel Angel. Técnicas analíticas de contaminantes químicos : aplicaciones toxicológicas, medioambientales y alimentarias / Miguel Ángel Sogorb Sánchez, Eugenio Vilanova Gisbert Madrid : Díaz de Santos, 2004
- Dean, John R.. Extraction methods for environmental analysis/ John R. Dean. . - Reprint. Chichester [etc.]: John Wiley & Sons, 1998.