

Degree	Type	Year
2501915 Environmental Sciences	OT	4

## Contact

Name: Jose Peral Perez

Email: jose.peral@uab.cat

## Teaching groups languages

You can view this information at the [end](#) of this document.

## Prerequisites

Knowledge about general Chemistry.

## Objectives and Contextualisation

1. Assimilate the most important changes that the world of chemistry is experiencing in recent years to minimize its environmental impacts and achieve more sustainable modern societies. Green Chemistry.
2. Take a tour of the most notable cases of the replacement of non-renewable, toxic, and dangerous materials with more sustainable alternatives.
3. Recognize the role of chemistry in the development of renewable energies.
4. Mention some particular topics of improvement in chemical processes and materials that have a decisive impact on sustainability on the planet.

## Competences

- Adequately convey information verbally, written and graphic, including the use of new communication and information technologies.
- Analyze and use information critically.
- Demonstrate adequate knowledge and use the most relevant environmental tools and concepts of biology, geology, chemistry, physics and chemical engineering.
- Demonstrate initiative and adapt to new situations and problems.
- Develop analysis and synthesis strategies regarding the environmental implications of industrial processes and urban management
- Information from texts written in foreign languages.
- Learn and apply in practice the knowledge acquired and to solve problems.
- Quickly apply the knowledge and skills in the various fields involved in environmental issues, providing innovative proposals.

- Teaming developing personal values regarding social skills and teamwork.
- Work autonomously

## Learning Outcomes

1. Adequately convey information verbally, written and graphic, including the use of new communication and information technologies.
2. Analyze and use information critically.
3. Analyze, evaluate, design and operate systems or processes, equipment and facilities associated with environmental engineering in accordance with certain requirements, standards and specifications under the principles of sustainable development.
4. Apply relevant knowledge of basic sciences to enable compression, the description and the solution of typical problems of environmental engineering.
5. Apply the basic principles on which is based environmental engineering and, more specifically, mass and energy balances.
6. Apply the scientific method to systems in which chemical, physical or biological both macroscopic and microscopic scale transformations occur.
7. Demonstrate initiative and adapt to new situations and problems.
8. Design and implement waste management plans and waste water.
9. Identify the processes most appropriate to apply chemical engineering to environmental surroundings and to value them properly and originally.
10. Information from texts written in foreign languages.
11. Learn and apply in practice the knowledge acquired and to solve problems.
12. Objectively compare and select different technical alternatives of an industrial process with parameters of environmental sustainability.
13. Teaming developing personal values regarding social skills and teamwork.
14. Work autonomously

## Content

### 1. Main concepts of Sustainable Chemistry

- 1.1. Pollution Risk Assessment
- 1.2. Green Chemistry
- 1.3. Life Cycle Assessment of Chemical Processes
- 1.4. Assessment of Distribution of Pollutants into the Environment: Fugacity Model

### 2. Materials Replacement

- 2.1. Biomass for new materials
- 2.2. Sustainable Polymer Synthesis
- 2.3. Biodiesels
- 2.4. Ionic Liquids
- 2.5. Deep Eutectic Solvents
- 2.6. Water as Chemical Solvent
- 2.7. CFCs Substitution
- 2.8. Graphene
- 2.9. Metal Organic Frameworks
- 2.10. Sustainable metals and alloys

### 3. Energy Replacement

- 3.1. Chemistry and Renewable Energies: Solar Cells and Wind Mills.
- 3.2. Batteries for Energy Storage.
- 3.3. Hydrogen.
- 3.4. Fuel Cells.

### 4. Other Important Topics

- 4.1. CO<sub>2</sub> Capture.
- 4.2. Ammonia Production.

4.3.Desalination.

4.4.Desulfuration.

4.5.Photocatalysis for the Cleaning of Urban Atmospheres, Hydrogen Production and Removal of CO<sub>2</sub>.

4.6.Plastic Enzyme Degradation.

## Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Solving of numerical problems and mathematical models about the distribution of pollutants in the environment	10	0.4	1, 2, 6, 7, 8, 10, 11, 12, 13, 14
Theoretical classes: Master classes on the topics of the syllabus	38	1.52	2, 6, 7, 10, 12, 13, 14
Type: Autonomous			
Collaborative learning	30	1.2	1, 2, 6, 7, 10, 11, 12, 13
Self-contained learning of the student	56	2.24	1, 2, 6, 7, 10, 11, 12, 13, 14

Theoretical classes: Master classes on the topics of the syllabus.

Problem classes: Resolution of case studies corresponding to the subject. Discuss with the students about the solution strategies and their execution.

Seminars: Meetings of small groups of students with the teacher to clarify doubts, one hour per subject.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

## Assessment

### Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Homeworks	10%	10	0.4	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Two written tests with a theoretical and practical part	90%	6	0.24	1, 2, 6, 11, 12, 14

Continuous assesment:

1st Partial: 45% of the final mark

2nd Partial: 45% of the final mark

1st Work assignment: 5% of the final mark

2nd Work assignment: 5% of the final mark

The retrieve exam: 90% of the mark. The remaining 10% will be the grade for the assignments (that can no be retrieved). The retrieve exam will be 100% of the subject (there will be no retrieve exams of the partials).

The partial exams will have a part of test-type questions, and another of questions in which you will have to develop a reasoning.

A minimum final grade of 5.0 is required to pass.

Non-participation in any of the activities will be assessed with a zero.

If neither of the two written tests is taken, the final grade will be "Not assessable".

To be able to attend the retrieve exam, the student must have previously been assessed for continuous assessment activities that are equivalent to 2/3 of the final grade.

Unique assessment:

Students who have accepted the single assessment modality will have to take a final test which will consist of a theory exam where they will have to answer a series of short questions and develop a couple of topics. When you have finished, you will hand in the internship reports.

The student's grade will be the weighted average of the previous activities, where the theory exam will account for 80% of the grade, and each of the practice reports 10% (1st and 2nd work assignments).

If the final grade does not reach 5, the student has another opportunity to pass the subject through the remedial exam that will be held on the date set by the degree coordinator. In this test you can recover 80% of the grade corresponding to the theory. The practice part is not refundable.

## Bibliography

Basically, information collected on the web will be used.

## Software

## Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	1	Catalan	second semester	morning-mixed
(TE) Theory	1	Catalan	second semester	morning-mixed