Sustainable Chemical Processes

Code: 106776
ECTS Credits: 6

2025/2026

Degree	Type	Year
Environmental Sciences	OP	4

Contact

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

General knowledge of Chemistry.

Objectives and Contextualisation

1. To assimilate the most important changes that the world of chemistry is experiencing in recent years in order to minimize its environmental impacts and achieve more sustainable modern societies. Green Chemistry.

2. To take a tour of the most notable cases of replacement of non-renewable, toxic, and dangerous materials with more sustainable alternatives.

3. To recognize the role of chemistry in the development of renewable energies.

4. To mention some particular issues of improvement in chemical processes and materials that have a decisive impact on sustainability on the planet.

Learning Outcomes

1. CM37 (Competence) Present proposals for the prevention and mitigation of the impact on the physical environment of natural or anthropogenic action, including that based on green chemistry.
2. CM39 (Competence) Transmit general scientific information associated with an environmental problem to a general audience appropriately.
3. KM47 (Knowledge) Recognise the way in which human activity has an impact on the function of physical vectors (water, soil, oceans, atmosphere) in the natural environment.
4. SM46 (Skill) Characterise the main processes of natural environments (marine, soil, atmosphere), including aspects of physics, chemistry, geology, biology and their interaction.

Content

1. Basic Concepts on Sustainable Chemistry

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

2. Replacement of Materials

2.1. New Materials from Biomass.
2.2. Sustainable Synthesis of Polymers.
2.3. Biodiesels.
2.4. Ionic Liquids.
2.5. Solvents with Deep Eutectic Point.
2.6. Water as a Solvent.
2.7. Replacement of CFCs.
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 Windmills.
3.2. Energy Storage in Batteries.
3.3. Hydrogen.
3.4. Fuel Cells.

4. Other Important Topics

4.1.CO2 Capture.
4.2.Ammonia Production.
4.3.Desalination.
4.4.Desulfurization.
4.5.Photocatalysis for Urban Atmosphere Cleaning, Hydrogen Production and CO2 Removal.
4.6.Enzymatic Degradation of Plastics.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Resolution of numerical problems and mathematical modeling on the distribution of pollutants in the environment.	10	0.4	CM37, CM39, KM47, CM37
Theoretical classes: Master classes on the concepts of the syllabus	38	1.52	CM37, CM39, KM47, CM37
Type: Autonomous			
Collaborative learning	30	1.2	CM37, CM39, KM47, SM46, CM37
Student autonomous learning	56	2.24	CM37, CM39, KM47, SM46,

Theoretical classes: Lectures on the concepts of the syllabus.
Problem classes: Resolution of numerical problems and mathematical modeling on the distribution of pollutants in the environment.

Note: 15 minutes of a class will be reserved, within the calendar established by the center/degree, for the completion by students of the surveys to evaluate the performance of the teaching staff and to evaluate the subject/module.

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	CM37, CM39, KM47, SM46
Two written tests with theoretical and practical parts	90%	6	0.24	CM37, CM39, KM47

Continuous assessment:

1st Partial: 45% of the final grade

2nd Partial: 45% of the final grade

1st Assignment: 5% of the final grade

2nd Assignment: 5% of the final grade

Re-sit Exam: 90% of the grade. The remaining 10% will be the grade for the assignments. The re-sit will be for partials.

The partial exams will have a part of multiple-choice 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".

In order to attend the re-sit, the student must have previously been assessed in continuous assessment activities equivalent to 1/2 of the final grade.

Single assessment:

Students who have opted for the single assessment method must take a final test that will consist of a theory exam where they must answer a series of short questions and develop a couple of topics. When finished, they will submit the practice 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 papers).

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 coordination. In this test, 70% of the grade corresponding to the theory can be recovered. The practice part is not recoverable.

Bibliography

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Software

No especial software is needed

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

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