Environmental Technology

Code: 106049
ECTS Credits: 6

2024/2025

Degree	Type	Year
2500897 Chemical Engineering	OB	3

Contact

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Teachers

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Teaching groups languages

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

Prerequisites

Basic knowledge on material and energy balances and reaction stoichiometry.

Objectives and Contextualisation

he general objective of this subject is to introduce students to the environmental problems, their management and the technical and methodological solutions to minimize them. With this objective, different methodologies to prevent and reduce the generation of the environmental impacts caused by the human activities and the main technologies of treatment of waters, emissions and waste will be studied.

At the end of the course the student must be able to:

Explain the concept of environmental pollution and its impact on the environment,

Explain and use basic methodologies of environmental prevention,

Recognize and describe the main pollutants and the analytical parameters used to measure them, as well as their effects on the environment,

Interpret a residual water analysis and propose a logical combination of treatment operations to purify and / or reuse it,

Physic-chemical processes design for water treatment,diseñar procesos físico-químicos para el tratamiento de aguas,

Analyse criteria for the selection and design of activated sludge systems

Interpret an analytic of an emission into the atmosphere and propose a logical combination of treatment operations todebug it,

Describe the operation, characteristics and scientific bases of treatment operations and facilities for water treatment, water purification, waste treatment and emissons treatment.

Competences

- Communication
- Develop personal work habits.
- Show an understanding of the role of chemical engineering in the prevention and resolution of environmental and energy problems, in accordance with the principles of sustainable development.
- Understand and apply the basic principles on which chemical engineering is founded, and more precisely: balances of matter, energy and thermodynamic momentum, phase equilibrium and kinetic chemical equilibrium of the physical processes of matter, energy and momentum transfer, and kinetics of chemical reactions

Learning Outcomes

1. Analyse the meaning of environmental parameters.
2. Apply chemical engineering to the prevention of environmental and energy problems in accordance with the principles of sustainable development and applied to the different production processes of the main inorganic and organic products in the different sectors of industrial chemistry.
3. Apply environmental and technological risk the evaluation procedures.
4. Apply matter and energy balance to typical continuous and discontinuous environmental engineering systems.
5. Communicate efficiently, orally and in writing, knowledge, results and skills, both professionally and to non-expert audiences.
6. Identify and enunciate environmental problems.
7. Work autonomously.

Content

THEME 1.- Introduction

Concept of pollution and pollutant. Cycles of matter and pollution. The role of the Chemical Engineer in sustainable development. Hierarchy in waste management. Social control of pollution and environmental legal framework.

THEME 2.- Environmental management systems

Legal framework, authorisation, licensing and environmental communication. Best available techniques. Waste management hierarchy. Registration of atmospheric emissions. Industrial ecology, industrial metabolism. Green engineering. Life cycle analysis.

THEME 3.- Introduction to wastewater treatment.

Characterisation of wastewater: physicochemical and biological parameters. Introduction to wastewater treatment, generation, quality and management. Potabilisation and purification.

THEME 4.- Pre-treatments and physico-chemical treatments.

Separation processes of coarse solids, sedimentation (equipment and design criteria), flotation, filtration. Chemical treatments: chemical precipitation, coagulation, flocculation, adsorption, reverse osmosis, disinfection.

THEME 5.- Fundamentals of biological wastewater treatment processes.

Removal of organic matter and nitrogen. Introduction and design of the activated sludge process. Modifications of the conventional process. Suspended biomass and immobilised biomass processes. Introduction to anaerobic digestion of wastewater.

THEME 6.- Solid waste treatment.

Industrial waste and urban waste. Quality parameters and legislation. Anaerobic digestion and composting. Pre- and post-treatment in the treatment of urban waste.

THEME 7.- Treatment of atmospheric emissions.

Types and origin of atmospheric pollutants. Particles and gases. Emission and immission. Particle elimination operations: sedimentationchambers, cyclones, bag filters, washing towers, electrostatic precipitators. Gaseous pollutant removal operations: absorption, adsorption, incineration and biofiltration.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Problem classes	15	0.6	1, 2, 3, 4, 6
Technical visits	5	0.2	2, 6
Theory classes	30	1.2	1, 2, 3, 4
Type: Autonomous			
Group work	14	0.56	5
Problem resolution and study	74	2.96	1, 2, 3, 4, 6, 7

The following teaching tools will be used throughout the course:

- Theoretical lectures and cases resolution: The student acquires their own knowledge of the subject attending theoretical lectures and cases resolution, complementing them with the individual study of the topics explained. Apart from theory classes, there will also be sessions of case studies and problems resolution.
- Technical visits (if the budget allows): They will be an additional tool for reviewing and consolidating the work done in theoretical classes.
- Autonomous and collaborative study and resolution of cases: These are autonomous activities that will serve the student to consolidate the knowledge acquired in the theoretical activities and develop the corresponding competences. The contents of this material will be evaluated in the examinations of the subject.
- Group homework: Students will carry out a group homework on topics that the teacher will propose. The works will be part of the subject.

Schedule of attention to the students

The attention will be held after class or during a scheduled time between the student and the teacher.

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
First Partial exam	45%	3	0.12	1, 2, 3, 6, 7
Group work	15%	0	0	2, 3, 5
Recovery Test	85%	6	0.24	1, 3, 6, 7
Second Partial exam	40%	3	0.12	1, 2, 3, 4, 6

A) Continuous evaluation

The evaluation of the subject will be based on four evaluation activities. These activities will consist of two partial exams, a group homework and classroom activities.

- The first partial exam will include the themes 1, 2, 3 and 4, will be done in class period. This partial will contribute 45% in the final mark of the subject.
- The second partial exam will include the themes 5, 6 and 7 and the date will be fixed in the calendar of exams of the degree. In this partial exam may include content already evaluated in the previous partial. This partial exam will contribute 40% in the final mark of the subject.
- Group work: A group work will be carried out, with a weight of 15% on the final mark of the subject. The topics of the works will be proposed by the professor and will form part of the agenda to be evaluated in the partial exams.

The content that will be evaluated in the 1st and 2nd partial exams will correspond both to the content explained in class and in the material corresponding to the work done by all the groups, which will be posted in the Moodle Classroom.

B) Recovery test:

The student can apply for recovery whenever he/she has submitted to a set of activitiesthat represent at least two thirds of the total mark of the subject. Of these, students who have an average of all the activities of the subject with a score equal or higher than 3.5 out of 10 may be presented to the recovery.

The recovery test will be divided into two parts. One corresponding to themes 1,2, 3 and 4 and the other to themes 5, 6 and 7. In both cases the material prepared in group works will be included. The date of this test will be fixed in the calendar of exams of the degree.

The final mark of the subject will be calculated in the same way as in the continuous evaluation.

C) Procedure for the revision of the qualifications:

For each assessment activity, a place, date and time of revision will be indicated in which the student will be able to review the activity with the teacher. In this context, claims can be made about the activity note, which will be evaluated by the teachers responsible for the subject. If the student does not submit to this review, this activity will not be reviewed later.

D) Qualifications:

The MH qualification is a decision of the lecturers responsible for the subject. The regulations of the UAB indicate that MH can only be awarded to students who have obtained a final grade of 9.00 or more. It can be granted up to 5% of MH of the total students enrolled.

A student will be considered non-evaluable (NA) if it has not been presented in a set of activities whose weight equals to a minimum of two thirds of the total grade of the subject.

E) Irregularities by the student, copy and plagiarism:

without prejudice to other disciplinary measures considered appropriate, the irregularities committed by the student that can lead to a variation in the rating of an evaluation act will be qualified with a zero. Therefore,copying, plagiarizing, cheating, copying, etc.in anyof the assessment activities it will imply suspending it with a zero. Assessment activities qualified in this way and by this procedure will not be recoverable. If it is necessary to pass any of these assessment activities to pass the subject, this subject will be suspended directly, without opportunity toretake it in the samecourse.

F) Group work

The topic of the work can be chosen from a list proposed by the teacher.

The works will be posted in the Moodle Classroom and will be part of the evaluation of the subject.

Bibliography

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Software

none

Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	211	Catalan	second semester	morning-mixed
(PAUL) Classroom practices	212	Catalan	second semester	morning-mixed
(SEM) Seminars	211	Catalan	second semester	morning-mixed
(SEM) Seminars	212	Catalan	second semester	morning-mixed
(TE) Theory	21	Catalan	second semester	morning-mixed