UAB
Universitat Autònoma de Barcelona

Waste Treatment

Code: 106065
ECTS Credits: 3

2024/2025

Degree	Type	Year
2500897 Chemical Engineering	OT	4

Contact

Name: Raquel Barrena Gomez
Email: raquel.barrena@uab.cat

Teachers

Maria Teresa Gea Leiva

Teaching groups languages

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

Prerequisites

It is recommended that the course Enginyeria del Medi Ambient has been passed.

Objectives and Contextualisation

This subject corresponds to the continuation of the Environmental Technology subject focused on solid organic waste, with a focus on the design and study of facilities with special emphasis on biological treatments (composting, anaerobic digestion, etc.), study of real installations and practical cases.

Knowledge to acquire:

- General knowledge of the different types of solid waste and their associated problems
- List the hierarchy of waste treatment options in order
- Ability to interpret the properties associated with solid waste, especially its biodegradability and ways to measure it.
- Interpret the scientific foundations on which the biological processes of valorization of organic waste from composting and anaerobic digestion are based, and design of facilities
- Know and compare different thermal treatment processes for waste.
- Learn about renewable energy sources that are obtained from waste.
- Know the role of waste in the circular economy and the current trends in its valorisation

Competences

- Communication
- Develop personal work habits.
- Develop thinking 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 and evaluate processes in observance of sustainability criteria.
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 environmental management systems and tools.
5. Apply matter and energy balance to typical continuous and discontinuous environmental engineering systems.
6. Communicate efficiently, orally and in writing, knowledge, results and skills, both professionally and to non-expert audiences.
7. Develop scientific thinking.
8. Enumerate and describe the social factors involved in environmental solutions.
9. Identify the applicable environmental legislation on a local, regional and global scale.
10. Work autonomously.

Content

Topic 1. Types and characteristics of organic waste
Topic 2. Biological treatments of waste
Topic 3. Thermochemical treatments of waste
Topic 4. Studies real installations including gas treatment.
Topic 5. Zero-waste strategy in biorefineries. Innovation in the waste sector

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Classroom practices	5	0.2	2, 4, 5, 6, 7
Theory class	20	0.8	2, 4, 5, 9, 10
Type: Autonomous			
Independent work	21	0.84	1, 2, 5, 6, 7, 9, 10
Personal study	25	1	4, 5, 6, 7, 10

In person sessions will be distributed between theory classes and problem classes.

- Theory classes: in these sessions, theoretical knowledge is applied to solving problems and/or practical cases raised by the teaching staff as collected in each teaching unit.
- Classroom practices: will be carried out in coordination with the theory classes. They will include the performance of assessable activities and the development of case studies that will be worked on throughout the semester. The teaching staff will mark the results to be presented and achieved each week. In these classes, the case study method is applied, in which the student must solve illustrative exercises in which he must apply the concepts developed in the theoretical part.
- Case studies and design: proposal, analysis and selection of alternatives for the management of urban waste produced in a municipality and county. Pre-design of the necessary facilities. Matter and energy balances. Throughout the subject, work will be done on the study of waste management in a municipality and district. The first part will consist of individual work on waste flows generated in a municipality and its management. In a second stage, the analysis will be raised to county level. This work will constitute the group work (3-4 students) that will have to be presented orally at the end of the semester. The formation of groups and work topics will be proposed and established by the teaching team.
- The option of a visit to an industrial facility will be considered.

During classes, they will be presented with different evaluable activities based on practical cases and the exchange of partial information with the students, the collective analysis of this information and the consequent debate.

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
Assessment activities in classroom	30%	0	0	1, 2, 5, 6, 7, 8, 9
Case studies and design	30%	2	0.08	1, 2, 3, 4, 5, 6, 7, 8, 10
Examen	40%	2	0.08	1, 2, 4, 5, 6

Scheduled evaluation process and activities

The subject consists of the following assessment activities:

- Exam (40%): There will be an exam at the end of the subject that will be worth 40% of the overall grade. This exam will consist of a theory part combined with some small exercises. It will be an examination of short questions and interpretation of cases where the students will have to reason the solutions provided or answers.
- Case studies and desing (30%)
- Evaluable activities done in class (30%). This part of the note is not refundable.

Non-participation in any of the assessment activities will be assessed with a zero. In order to pass the subject, through continuous assessment, a minimum grade of 5 in the exam and a minimum grade of 5 in the subject's overall average will be required. In the case of not passing this grade, the student may take a make-up exam.

Programming of evaluation activities

At the beginning of the subject, the groups will be formed to do the work and the evaluation activities will be scheduled to be done during class time.

The exams will be held according to the schedule set in the Degree exam calendar.

Recovery process

The recovery process is exclusively for those students who have not passed the subject based on the continuous assessment.

- The exam and case study activity will be recoverable.
- The calculation of the final grade, in the recovery process, will be done in the same way as in the continuous assessment and with the same minimum grade criteria.
- Evaluable activities done in the classroom are not recoverable.

Qualification review procedure

For each assessment activity, a review place, date and time will be indicated in which students can review the activity with the teaching staff. In this context, claims can be madeabout the grade of the activity, which will be evaluated by the teaching staff responsible for the subject. If the student does not attend this review, this activity will not be reviewed later.

Qualifications

Honors registrations (MH). Awarding an honors matriculation qualification is the decision of the teaching staff responsible for the subject. UAB regulations indicate that MH can only be granted to students who have obtained a final grade equal to or higher than 9.00. Up to 5% of MH of the total number of enrolled students can be awarded.

Students will be considered non-evaluable (NA) if they have not taken the theory exam or the make-up exam.

Irregularities: copying and plagiarism

Without prejudice to other disciplinary measures that are deemed appropriate, irregularities committed by students that may lead to a change in the grade of an assessment act will be graded with a zero. Therefore, copying, plagiarism, deception, allowing copying, etc. in any of the assessment activities will involve failing it with a zero.

Evaluation of repeat students

Students who repeat the subject will not be assessed differently from other students.

Unique Assessment

It is not contemplated

Bibliography

- Gestión de residuos tóxicos. Tratamiento, eliminación y recuperación de suelos. Michael D. Lagrega, Phillip L. Buckingham, Jeffrey C. Evans. Editorial Mc Graw-Hill. 1996.
- Gestión integral de residuos sólidos. George Tchobanoglous, Hilary Theisen, Samuel A. Vigil. Editorial Mc Graw-Hill. 1994.
- The Practical Handbook of Compost Engineering. R. T. Haug. Editorial CRC Press. 1993. (Disponible document electrònic:https://ebookcentral.proquest.com/lib/uab/detail.action?docID=5389526)
- Handbook of Solid Waste Management and Waste Minimization Technologies. Cheremisinoff, Nicholas P. 200. Disponible en línia

- Agència de Residus de Catalunya, www.arc.cat
- Agència Europea del Medi Ambient, https://www.eea.europa.eu/

Software

No specific software required

Language list

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