

## Course guide

### 2500227 - GEA0227 - Solid Waste

**Last modified:** 01/10/2023

**Unit in charge:** Barcelona School of Civil Engineering  
**Teaching unit:** 745 - DEAB - Department of Agri-Food Engineering and Biotechnology.

**Degree:** BACHELOR'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2020). (Compulsory subject).

**Academic year:** 2023    **ECTS Credits:** 6.0    **Languages:** Spanish

#### LECTURER

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**Coordinating lecturer:** INGRID MASALO LLORA, LUIS ALBERTO SEGUI AMORTEGUI

**Others:** INGRID MASALO LLORA, LUIS ALBERTO SEGUI AMORTEGUI

#### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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##### Specific:

- 14451. Apply the fundamental concepts of statistics and randomness of physical, social and economic phenomena, as well as uncertainty and decision-making techniques.
- 14457. Identify the fundamentals of structure theory, sustainable procedures for construction and dismantling of buildings and civil works; and describe the technology bases of the materials used in construction.
- 14460. Design and project treatment systems for purification and purification of water resources, and establish the basis for the management of waste generated, describe and assess desalination and reuse processes.
- 14461. Analyze, design, simulate and optimize processes and systems with environmental relevance, both natural and artificial, and their resolution techniques, as well as recognize techniques for analysis and evaluation of climate change.
- 14462. Design and project processes for the treatment of contaminated soils and aquifers.
- 14463. Prepare, implement, coordinate and evaluate urban and industrial solid waste management plans and resource recovery.
- 14464. Apply measures to prevent and control air quality, quantify noise pollution and its corrective measures and quantify odor emissions and corrective measures.

##### Generical:

- 14440. Identify, formulate and solve problems related to environmental engineering.
- 14441. Apply the functions of consulting, analysis, design, calculation, project, construction, maintenance, conservation and exploitation of any action in the territory in the field of environmental engineering.
- 14442. To use in any action in the territory proven methods and accredited technologies, in order to achieve the greatest efficiency respect for the environment and the protection of the safety and health of workers and users.
- 14443. Apply the necessary legislation during the professional practice of environmental engineering.
- 14444. Apply business management techniques and labor legislation.

## TEACHING METHODOLOGY

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The subject consists of 3 hours a week of face-to-face classes in a classroom (large group).

3 hours are devoted to theoretical classes in a large group, in which the teacher exposes the basic concepts and materials of the subject, presents examples and performs exercises.

The rest of the weekly hours are dedicated to practical classes where the concepts acquired in the theoretical classes will be developed and applied. Among the activities to be carried out:

- Classes of problems and questions in the classroom.
- Sessions for discussion and resolution of problems and exercises previously worked on by the students.
- Oral presentations.
- Visits to RSU and industrial facilities.

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

## LEARNING OBJECTIVES OF THE SUBJECT

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Currently most of human activities produce waste, in this subject we will study how they are generated, treated and managed. Special attention will be given to the residues coming from construction, urban solid residues and those derived from the agri-food activity. Also the design of landfills and waste containment systems as well as treatments for organic waste such as composting or anaerobic digestion. It will delve into the aspects of waste minimization and recovery that are key to heading towards a circular economy where the generation of waste must be zero.

1. Understand how urban and industrial solid waste is generated and its characteristics, prevention, collection, treatment and deposit.
2. Know the main characteristics of the waste generated in the construction sector and its management and treatment. Recovery concept of resources.
3. Know the tools for the design of landfills and waste containment systems.

Solid waste. Subject that will study how urban and industrial solid waste is generated. Special mention will have the waste from the construction and design of landfills and waste containment systems. The concept of resource recovery will be introduced.

## STUDY LOAD

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Type	Hours	Percentage
Self study	90,0	60.00
Hours large group	40,0	26.67
Hours small group	20,0	13.33

**Total learning time:** 150 h

## CONTENTS

### WASTE CHARACTERIZATION AND CLASSIFICATION

**Description:**

Circular economy concept.  
Solid waste generating activities.  
Characterization of contamination by solid waste.  
Legislation relating to solid waste.  
Practice on characterization and classification of waste

**Specific objectives:**

introduce the concept of Circular Economy  
Know the applicable legislation on waste

**Full-or-part-time:** 33h 36m

Theory classes: 10h  
Laboratory classes: 4h  
Self study : 19h 36m

### WASTE TREATMENT PROCESSES

**Description:**

Waste pre-treatment processes  
Physical treatment processes.  
Chemical treatment processes.  
Biological treatment processes.  
Waste incineration.  
Solidification/inerting technologies.  
Waste deposition.  
Analysis and selection of process alternatives  
Practice on waste treatment processes

**Specific objectives:**

Analyze industrial waste treatment processes.

**Full-or-part-time:** 67h 12m

Theory classes: 18h  
Laboratory classes: 10h  
Self study : 39h 12m

### ALTERNATIVE WASTE MANAGEMENT TECHNOLOGIES TO PROMOTE THE CIRCULAR ECONOMY

**Description:**

Technological alternatives: clean production  
Technological alternatives: minimization  
Practice on alternative waste management technologies to promote the circular economy

**Specific objectives:**

Perform synthesis, analysis and evaluation of alternatives for minimization and recovery of waste.

**Full-or-part-time:** 21h 36m

Theory classes: 6h  
Laboratory classes: 3h  
Self study : 12h 36m



## APPLICATION OF CIRCULAR ECONOMY STRATEGIES for the REDUCTION OF WASTE GENERATION

### Description:

Circular economy strategies

Practical cases of circular economy in the urban and industrial field

Practice on the application of circular economy strategies to reduce waste generation

### Specific objectives:

Apply Circular Economy Strategies to reduce waste generation.

### Full-or-part-time: 21h 36m

Theory classes: 6h

Laboratory classes: 3h

Self study : 12h 36m

## GRADING SYSTEM

The overall evaluation of the course will be based on the following partial evaluations:

N1: written test to be held in the middle of the four-month period. It will include all the contents taught in the theory and practical sessions up to the date of the exam.

N2: written test to be taken at the end of the course. It will include the contents taught in the theory and practical sessions of the second half of the course.

N3: continuous assessment which includes various activities, as well as the practical sessions (attendance, problem solving and raising doubts).

The weighting of the final mark is given by:

$$N_{\text{final}} = 0,3N1 + 0,3N2 + 0,4N3$$

The continuous assessment, which corresponds to 40% (N3), is distributed as follows:

Work on "Characterisation of waste and specific waste treatment technologies" (10 %).

Work and exhibition on "Circular economy" (10 % paper and 5 % exhibition).

Evaluation of the guided visits to industrial facilities (10 % attendance and report of the visit).

Attendance and participation in class will account for 5 %.

### Re-evaluation (RE)

Qualification criteria and admission to the re-evaluation (RE):

Students failed at the ordinary assessment who have regularly sat the assessment tests of the failed subject will have the option to take a re-evaluation test in the period set in the academic calendar.

Students who have already passed the subject may not sit the re-evaluation test of the subject, nor may students who have not presented themselves or who have not handed in all of the continuous assessment activities.

The re-evaluation (RE) will consist of a single exam covering the entire course content. The maximum mark for the re-evaluation will be five (5.0).

Failure of a student to attend the re-evaluation test, held within the fixed period, will not entitle him/her to take another test at a later date. Extraordinary evaluations will be carried out for those students who, due to accredited force majeure, have not been able to take any of the continuous assessment tests. These tests must be authorised by the corresponding Head of Studies, at the request of the teacher responsible for the subject, and will be held within the corresponding teaching period.



## EXAMINATION RULES.

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If any of the continuous assessment activities are not carried out in the scheduled period, it will be considered a zero score. The exams will be done individually, with multiple choice questions (which can be theoretical or applied) as well as short-answer open questions and finally exercises on problems solved in class.

## BIBLIOGRAPHY

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### Basic:

- Tchobanoglous, G.; Theisen, H.; Vigil, S. Gestión integral de residuos sólidos. Madrid: McGraw-Hill, 1994. ISBN 8448118308.
- Elias i Castells, X. Tratamiento y valorización energética de residuos. Madrid: Díaz de Santos, 2005. ISBN 8479786949.
- GENCAT. Impulso a la economía verde y a la economía circular una estratègia del govern de la generalitat de catalunya [on line]. 2015 [Consultation: 25/10/2023]. Available on: [https://mediambient.gencat.cat/ca/05\\_ambits\\_dactuacio/empresa\\_i\\_produccio\\_sostenible/economia\\_verda/impuls\\_economia\\_verda/index.html](https://mediambient.gencat.cat/ca/05_ambits_dactuacio/empresa_i_produccio_sostenible/economia_verda/impuls_economia_verda/index.html).
- Ministerio para la Transición Ecológica y el Reto Demográfico. Estrategia Española de Economía Circular. España Circular 2030 [on line]. Madrid: MITECO, 2021 [Consultation: 21/02/2023]. Available on: [https://www.miteco.gob.es/es/calidad-y-evaluacion-ambiental/temas/economia-circular/espanacircular2030\\_def1\\_tcm30-509532\\_mod\\_tcm30-509532.pdf](https://www.miteco.gob.es/es/calidad-y-evaluacion-ambiental/temas/economia-circular/espanacircular2030_def1_tcm30-509532_mod_tcm30-509532.pdf).