Course guide  
2500227 - GEA0227 - Solid Waste

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: 2022  
ECTS Credits: 6.0  
Languages: Spanish

LECTURER

Coordinating lecturer: INGRID MASALO LLORA, LUIS ALBERTO SEGUI AMORTEGUI

Others: INGRID MASALO LLORA, LUIS ALBERTO SEGUI AMORTEGUI

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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.

General:
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

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

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>40,0</td>
<td>26.67</td>
</tr>
<tr>
<td>Self study</td>
<td>84,0</td>
<td>56.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>20,0</td>
<td>13.33</td>
</tr>
</tbody>
</table>

Total learning time: 150 h
## 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

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## 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

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## 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

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**GRADING SYSTEM**

The global evaluation of the subject will be made from the following partial evaluations:

N1: written test to be taken in the middle of the semester. 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: evaluation of the practice sessions (attendance, problem solving and raising doubts).

Nend: 0.3N1+0.3N2+0.4N3

Regarding the conditions of the evaluation of practical sessions, it will be the following:

Work on "Specific waste treatment technologies" (10%)  
Work on "Circular Economy" (10%)  
Exhibition and defense of the works (10%, 5% in each work).

In this case, peer assessment will be applied in order to provide students with other important skills for their professional future, such as submitting their work to the criticism of others, enduring -and learning from- their judgments and, at the same time, having responsibility over the work of others, having to judge its quality.

Evaluation of guided visits to industrial facilities (5%)

Attendance at the scheduled visits and the correct completion of the reports of the visits made represent 5% of the final grade for the subject.

Attendance and participation in class activities will account for 5% of the final grade.
BIBLIOGRAPHY

Basic: