320073 - GTR - Waste Management and Treatment

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 713 - EQ - Department of Chemical Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN TEXTILE TECHNOLOGY AND DESIGN ENGINEERING (Syllabus 2009).
      (Teaching unit Optional)
      BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ECTS credits: 6
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: Mª Dolores Alvarez del Castillo

Teaching methodology
The course is divided into four types of sessions:
- Theoretical sessions and application of content. In these sessions, the professor will explain the theoretical basis of the material, concepts, and methods and illustrate them with appropriate examples to facilitate understanding.
- Lab sessions.
- Individual work. Students will spend time outside the classroom to understand the theoretical content.
- Work in pairs. Students will spend time outside the classroom to working in pairs to prepare the working laboratory sessions as directed by the teacher.

Learning objectives of the subject
The objectives of the course are to enable students to:
- Identify the different types of waste and the hierarchy of waste management.
- Identify and apply properly the key technologies for the treatment and recovery of waste.
- Identify the various stakeholders in the regulatory and legal aspects related to waste management.
- Correctly managing various waste that can be generated as a result of the production activity of company, using the current regulations.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 45h</th>
<th>30.00%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
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<tr>
<td></td>
<td>Hours small group: 15h</td>
<td>10.00%</td>
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<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study: 90h</td>
<td>60.00%</td>
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### Content

#### Topic 1. Introduction to waste

**Description:**
- Definition of waste
- Types of waste
- Generation of waste by type
- Administrative competences in the field of waste management.
- The waste hierarchy management.

**Learning time:** 2h 30m
- Theory classes: 1h
- Self study: 1h 30m

#### Topic 2. Municipal waste. Generation, collection of structure

**Description:**
- Generation and composition of municipal waste
- Management of municipal waste. Collection and transportation operations, planning microroutes, economy collection, transfer plants.

**Learning time:** 7h 30m
- Theory classes: 3h
- Self study: 4h 30m

#### Topic 3. Municipal waste. Biological treatment

**Description:**
- TMB Plants. Equipment and performance of separation treatments associated with different material flows.
- Composting plants.
- Biological basis of the process. Parameters to control.
- Inputs, transactions carried out in the plant and outputs.
- Performances
- Methanization plants
- Biological basis of the process. Parameters to control. Composition of biogas.
- Inputs, transactions carried out in the plant and outputs.
- Performances

**Related activities:**
- OFMSW Anaerobic digestion. Obtaining methane.

**Description:**
- Theory classes: 9h
- Laboratory classes: 3h
- Self study: 18h
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## Topic 4. Waste disposal

**Learning time:** 25h
- Theory classes: 6h
- Laboratory classes: 4h
- Self study: 15h

**Description:**
- Type of landfills (Class I, II, and III).
- Waterproofing, Exploitation Control, sealed. Elements of restoration.
- Reactions that take place in a landfill. Evolution processes in a landfill.
- Composition and treatment of leachate.
- Study of various leachate treatment technologies

**Related activities:**

## Topic 5. Heat treatment systems for waste

**Learning time:** 25h
- Theory classes: 10h
- Self study: 15h

**Description:**
- The municipal waste as fuel. PCI, Humidity...
- CDR. Preparation of the residue for direct use, pyrolysis and gasification.

## Topic 6. Industrial Waste. Generation, structure and types

**Learning time:** 20h
- Theory classes: 4h
- Laboratory classes: 4h
- Self study: 12h

**Description:**
- Composition and industrial waste generation.
- Type of industrial waste (ES, NE). Characterization of the waste classification. Dam Festival. Leaching tests, analysis on the leaching residue
**Topic 7. Industrial waste management.**

**Learning time:** 40h  
Theory classes: 12h  
Laboratory classes: 4h  
Self study: 24h

**Description:**
- Responsibilities. Control Documentation for the traceability and waste DAR, FA, FS., FSI, JRR, FD, FSAA  
- Exchange of products.  
- Regeneration of mineral oils  
- Stabilization of a residue

**Related activities:**
Obtaining biodiesel from used vegetable oil.

**Qualification system**
- 1st Exam: 35%  
- 2nd Exam: 35%  
- Delivering activities: 10%  
- Lab: 20%

**Regulations for carrying out activities**
Attendance at laboratory sessions is mandatory. The unsatisfactory results of the First exam will redirected through a written test that will be held in the same day as the second exam. All the students enrolled in the course can access to this second-chance. The second-chance exam results will have a score between 0 and 10, and the score obtained will replace the initial score of the exam 1, as long as the score is higher.
Bibliography

Basic:


Others resources: