

## 25226 - Management, treatment and recovery of waste

### Información del Plan Docente

<b>Academic Year</b>	2016/17
<b>Academic center</b>	201 - Escuela Politécnica Superior
<b>Degree</b>	277 - Degree in Environmental Sciences
<b>ECTS</b>	6.0
<b>Course</b>	3
<b>Period</b>	Second Four-month period
<b>Subject Type</b>	Compulsory
<b>Module</b>	---

### **1.Basic info**

#### **1.1.Recommendations to take this course**

#### **1.2.Activities and key dates for the course**

### **2.Initiation**

#### **2.1.Learning outcomes that define the subject**

#### **2.2.Introduction**

### **3.Context and competences**

#### **3.1.Goals**

#### **3.2.Context and meaning of the subject in the degree**

#### **3.3.Competences**

#### **3.4.Importance of learning outcomes**

### **4.Evaluation**

### **5.Activities and resources**

#### **5.1.General methodological presentation**

The learning process that is designed for this subject is based on the following:

The teaching methodology used in the subject will be based on the model of lecture to address the basic theoretical concepts of the subject, trying to encourage student participation through short questions. On the other hand, they will be resolved in the classroom and in the computer room various problems and practical cases that allow students relate the theoretical concepts and see their application. These case studies are complemented by visits to treatment facilities and waste disposal.

Two sessions of theory and problems of two hours a week will be taught and then work practically, two hours a week,

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knowledge treated in the theoretical sessions. The theoretical sessions will be based on a model of lecture, encouraging student participation through short questions. In the kinds of problems students participate in resolving them in class. The practical sessions will be twofold: development throughout the course of a collaborative groupware three to four students under the supervision of the teacher, and be exposed to conclude public to other colleagues; and self-study by students in cases, projects, plans or management programs real waste, both the scope of the various authorities involved in its management, and the business environment, further supplemented by visits to various facilities waste treatment.

For problem solving and case studies they will be used frequently tools.

### 5.2.Learning activities

The program that the student is offered to help achieve the expected results includes the following activities:

Theory and problems sessions where the teacher develops the contents of the subject. Part of the lectures are devoted to solving problems posed by the teacher with the direct participation of students ([see program theory](#)).

Realization, presentation and defense of a collaborative group that covers most of the contents of the subject and who is elected by the student at the beginning of the course. Their progress is monitored by the teacher.

Seminars (5 sessions) focused on solving problems and study and case studies by students with teacher's guide ([see internship program](#)).

Laboratory practice (4 sessions) guided by the teacher and focused on experiments related to the subject of the subject ([see internship program](#)).

Visits to facilities management and waste treatment.

### 5.3.Program

Theory Program

#### BLOCK 0. INTRODUCTION

General concepts of waste pollution

Municipal Solid Waste. Definitions.

#### BLOCK 1. REGULATIONS

Legislation on waste. Legal Terms and definitions.

European directives.

basic state regulations

Regulations implementing the CAA of Aragon

Planning and waste management.

#### BLOCK 2. URBAN WASTE

Management and treatment of non-hazardous waste. Urban waste

Characterization, classification and properties

Generation and statistics

Collection and transportation systems and management models. Recycling

Treatment systems: incineration and landfills

Integrated waste management

#### BLOCK 3. INDUSTRIAL WASTE AND HAZARDOUS WASTE

Management and treatment of non-hazardous waste. Industrial waste

Treatment of Residual Organic Matter

Dangerous residues

Production and management of hazardous waste.

Physico-chemical treatment

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Incineration and landfill

Internship Program

seminars

S1. Waste characterization.

S2. Design of a waste collection plan: Part I.

S3. Design of a waste collection plan: Part II.

S4. Waste incineration.

S5. Estimation of gas production in a landfill.

Laboratory

L1. Design and control of a process of aerobic composting of municipal solid waste. Part I: preparation of compost.

L2. Stabilization and solidification of hazardous waste: part I.

L3. Stabilization and solidification of hazardous waste: part II.

L4. Design and control of a process of aerobic composting of municipal solid waste: Part II: Analysis of compost.

### 5.4.Planning and scheduling

#### Schedule sessions and presentation of works

It is estimated that the student must devote to this subject a total of 150 hours or so, which should encompass both classroom activities and non-attendance, according to the following breakdown:

The sessions will be conducted according to the established schedule of classes and School Board is public on the website of the Polytechnic School of Huesca.

The dates of the visits are set at the beginning of the course. The calendar of classroom sessions is as follows:

Type activity / week	1	2	3	4	5	6	7	8	9	10	11
Classroom activity											
<b>Theory</b>	2	2	2	2	2	2	2	2	2		2
<b>Seminars</b>			2		2	2			2		
<b>Laboratory practices</b>	2						2	2			
<b>Visits</b>						5					
<b>Evaluation</b>									1		
No classroom activity											
<b>Individual work</b>	4	3	3	4	3	1	6	6	3	3	4
<b>Team work</b>			2		2		2		2		
<b>TOTAL</b>	<b>6</b>	<b>8</b>	<b>9</b>	<b>6</b>	<b>9</b>	<b>10</b>	<b>12</b>	<b>10</b>	<b>10</b>	<b>3</b>	<b>6</b>

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Type activity / week	12	13	14	15	16	17	18	19	20	Total
Classroom activity										64
<b>Theory</b>	2	2	2	2	2					<b>30</b>
<b>Seminars</b>		2								<b>10</b>
<b>Laboratory practices</b>			2							<b>8</b>
<b>Visits</b>			5							<b>10</b>
<b>Evaluation</b>					1			4		<b>6</b>
No classroom activity										86
<b>Individual work</b>	4	4	4	4	4	6	8	4		<b>76</b>
<b>Team work</b>	2									<b>10</b>
<b>TOTAL</b>	<b>7</b>	<b>6</b>	<b>13</b>	<b>8</b>	<b>7</b>	<b>7</b>	<b>7</b>	<b>8</b>		<b>150</b>

### 5.5. Bibliography and recommended resources

- BB Tchobanoglous, George. Integral management of solid waste / George Tchobanoglous, Hilary Theisen, Samuel Vigil ; translation and technical review Juan Ignacio Tejero Monzón, José Luis Gil Díaz, Marcel Szanto Narea . [1a. ed. in spanish, reimpr.] Madrid [etc.] : McGraw-Hill, D.L.1996
- BB Environmental pollution: a view from the chemical / Carmen Orozco Barrenetxea ... [et al.] . Madrid [etc.] : Thomson, D. L. 2002
- BB GIRA :plan integrated waste management in Aragón : [2009-2015]. [Zaragoza] : Observatorio de Medio Ambiente de Aragón : Dirección General de Calidad Ambiental y Cambio Climático, Gobierno de Aragón, D.L. 2009
- BB Hazardous waste: characterization, treatment and management / editores, J.J. Rodríguez Jiménez y A. Irabien Gullías ; J. Aguado Alonso ... [et al.] . Madrid : Síntesis, D.L 1999