

## 29938 - Technologies for Treatment of Polluted Waters and Gases

### Syllabus Information

**Academic Year:** 2020/21

**Subject:** 29938 - Technologies for Treatment of Polluted Waters and Gases

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura

**Degree:** 435 - Bachelor's Degree in Chemical Engineering

**ECTS:** 6.0

**Year:** 4

**Semester:** Second semester

**Subject Type:** Optional

**Module:** ---

### 1.General information

#### 1.1.Aims of the course

#### 1.2.Context and importance of this course in the degree

#### 1.3.Recommendations to take this course

### 2.Learning goals

#### 2.1.Competences

#### 2.2.Learning goals

#### 2.3.Importance of learning goals

### 3.Assessment (1st and 2nd call)

#### 3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

### 4.Methodology, learning tasks, syllabus and resources

#### 4.1.Methodological overview

The course includes both theory and practice. The methodological approach design for this course is based on the immersion of the student in the topic of environmental pollution, so he/she can gain the knowledge and skills necessary in order to face projects and, in general, any work activities, including environmental considerations in both management and technical tasks.

The class and laboratory materials available for the students can be found on the subject website (Moodle platform): <http://moodle2.unizar.es/add/>

The programmed activities are detailed below.

#### 4.2.Learning tasks

The course includes the following learning tasks:

1. Theory lectures (TP1): 30 hours
2. Exercises and case studies sessions (TP2): 15 hours. Exercises and case studies will be done in order to complement theoretical sessions.
3. Laboratory sessions (TP3): 10 hours.
4. Visits to facilities related to water and air treatment and quality control (TP4): 5 hours.
5. Tutored case studies (TP6): 30 hours. Guidance, monitoring and evaluation of guided work.

6. Evaluation (TP8): 6 hours.
7. Study (TP7): 54 hours.
8. Tutorials.

### 4.3.Syllabus

#### Theory and practical cases sessions.

##### Module 1: WATER TREATMENT TECHNOLOGIES (B1)

###### 1.1. Water Quality and Pollution

Legislation. Resources: availability, composition, use and pollution.

###### 1.2. Water Supply Treatments

Softening, demineralization, ultra purification and disinfection processes; drinking water treatment and desalination.

###### 1.3. Wastewater Treatments

Urban and industrial wastewater: characteristics and environmental effects. Flow and load regulation. Wastewater treatment and reclamation[U1] processes for effluent reuse.

##### Bloque 2: AIR POLLUTION CONTROL (B2)

###### 2.1. Atmosphere and air quality.

The atmosphere. Air quality. Deepening on aspects relevant to the main air pollutants. Global warming.

###### 2.2. Air Pollutant Control.

NO<sub>x</sub> control strategies, SO<sub>2</sub> minimization, CO<sub>2</sub> capture and storage, pollutant minimization in mobile sources.

#### Laboratory sessions:

**CPL1. DRINKING WATER PRODUCTION FROM NATURAL HYDROLOGICAL RESOURCES**

**CPL2. OPERATIONAL CONTROL OF ACTIVATED SLUDGE PLANT**

**CPL3. ZARAGOZA HEAT ISLAND**

**CPL4. ATMOSPHERIC POLLUTION EVALUATION IN EINA SURROUNDINGS**

### 4.4.Course planning and calendar

WEEK	Theory and Exercises TP1 and TP2			Laboratory TP3	Visits TP4	TP6 delivery	Exam TP8
1	Course Presentation	B1	B1				
2	B1	B1	B1				
3	B1	B1	B1			TGB1_1	
4	B1	B1	B1	CPL1		TGB1_2	
5	B1	B1	B1		VISIT	TGB1_3	
6	B1	B1	B1	CPL2		TGB1_4	
7	B1	B1	B1				
8	B1	B2	B2				B1 Exam
9	B2	B2	B2	CPL3			
10	B2	B2	B2		VISIT		
11	B2	B2	B2	CPL4		TGB2_1	
12	B2	B2	B2			TGB2_2	
13	B2	B2	B2			TGB2_3	

14	B2	B2	B2			TGB2_4	
15	B2	B2	B2				B2 Exam

#### 4.5. Bibliography and recommended resources

[http://biblos.unizar.es/br/br\\_citas.php?codigo=29938&year=2019](http://biblos.unizar.es/br/br_citas.php?codigo=29938&year=2019)