

#### Información del Plan Docente

2016/17
201 - Escuela Politécnica Superior
277 - Degree in Environmental Sciences
6.0
3
First Four-month period
Compulsory

- 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 course is theoretical and practical. The learning process that is designed for this subject is based on immersion student in environmental pollution, so that allows to acquire the habits and skills necessary for planning and development of a strategy to control water pollution from a technical point of view.

# 5.2.Learning activities



The program that is offered in order to achieve the expected results includes the following activities ...

Theory classes: 30 hours The course is organized into two thematic blocks: B1. Introduction to quality and water pollution. B2. Water treatment technologies.

Practical sesions of laboratory and Integral Practical Work: 20 hours SEMINARS (5 hours) VISITS TO WATER TREATMENT FACILITIES (5 hours) NO STUDENT CLASSROOM WORK (86 hours)

### 5.3.Program

#### THEORY

In class theory (30 hours)

#### **B1. INTRODUCTION TO THE QUALITY AND POLLUTION OF WATER**

1. General concepts about the quality and pollution of water.

2. Water pollutants. Types of pollutants. Origin and effects of the pollutants. Main polluting sectors.

3. Characterizing the pollution present in sewage and natural water. Physicochemical parameters and biological indicators.

4. Preventative measures applicable for pollution control. Best techniques available (Mejores técnicas disponibles (MTDs))

- 5. Evolution of pollutants in the receiving environment
- 6. Basic legislation regarding water. Quality standards.

#### **B2.- WATER TREATMENT TECHNOLOGY**

- 1. General concept about water treatment technologies. Classification of treatments.
- 2. Water treatment installations: treatment, purification, regeneration.
- 3. Homogeneization chambers

4. Techniques for the elimination of thick solids, sedimentable solids and fats. Roughing down and removal of sand and grease.



5. Techniques for the elimination of suspended or colloidal. Matter. Coagulaton, flocculation, decanting, flotation and filtration.

6. Techniques for eliminating biodegradable matter. Biological treatments, dispersed phase and fixed phase.

7. Techniques for the elimination of non-biodegradable matter. Eliminating dangerous substances: neutralization, adsorption, oxidation, reduction, stripping.

8. Water treatment for water with resin and membrane process: Osmosis, Nanofiltration, Ultrafiltration, Microfiltration, Electrodailysis.

9. Disinfection treatments: chlorination, ozonization, UV light.

10. Low-cost technologies.

#### CONTENT OF PRACTICAL SESSIONS

Practical lab sessions and simulations

- P1. Characterizacion of waste and treated waters through indicator parameters.
- P2. Drinking water production (with natural water).
- P3. Assessment of the organic contamination of domestic wastewater: determination of the COD, BOD and TOC.
- P4. Monitoring of Practical Integral Work
- P5. Waste treatment in a chrome industry: elimination of chrome using coagulation/flocculation.
- P6. Elimination of contaminants in water using advanced oxidation processes
- P7: Presentation of the Comprehensive Practical Project.

### 5.4. Planning and scheduling

Schedule sessions and presentation of works

Activity	2	3	4	5	6	7	8	9	10	11
/ Week										



Classr activit	oom y										
Theo	<b>'y</b> 2	2	2		2	2	1	2	2	2	2
Lab			3		3		3		3		3
sessi	ons										
Simu	lation					2					
sessi	ons										
Semi	nars							2		3	
Visits											
Evalu	ation										
Non											
classro	om										
activit	У										
Indivi	d∉al	4	3	5	3	3	3	3	3	2	2
WORK											
Colle work	ctive			2	1	2	1	2	1	1	1
ΤΟΤΑ	L6	6	8	7	9	9	8	9	9	8	8
	•	•	•	•	•		•	•	•	•	•

Activity//2/Vee	k13	14	15	16	17	18	19	20	21	Total
Classroom										59
activity										
Theory	2	2			2					25
Lab										15
sessions										
Simulation	3									5
sessions										
Seminars										5
Visits 5										5
Evaluación						4				4
Non										91
classroom										
activity										
Individual	2	9	9	9	8	4				77
work										
Collective	2									14
work										
TOTAL7	9	11	9	9	10	8				150

# 5.5.Bibliography and recomended resources

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