66240 - Alternative technologies for industrial wastewater treatment

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	531 - Master's in Chemical Engineering
ECTS	3.0
Year	
Semester	Half-yearly
Subject Type	Optional
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

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

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as

- Lectures, where the teacher explains the theoretical bases that make up the course and solves some model problems
- Problems and cases sessions are the effective complement to lectures, and they allow to check the comprehension

of matter.
- Guided projects.

Students are expected to participate actively in the class throughout the semester.

5.2.Learning tasks

The course includes the following learning tasks:

- Lectures (17 hours). In them the explanation of theoretical contents will be held (see Syllabus).
- Practice sessions (7 hours). Problems and case studies related to the theoretical aspects presented in the lectures.
- Simulation practice sessions (4 hours). Sessions using commercial programs to simulate processes: Reverse osmosis (ROSA) and ion exchange (CADIX).
- Special sessions (2 hours). Visit an industrial effluent treatment plant.
- Individual assignment (10 hours). These hours will be used to prepare a case study, as well as its presentation and follow-up discussion. It should be done individually (or group in the situation that the number of students is high).
- Autonomous work (32 hours). Study to prepare assignments, problems and cases, as well as the different proposed evaluation tests.
- Assessment (3 hours). Case study presentations and weekly test (continuous assessment system) or final global exam (not continuous assessment system).

5.3.Syllabus

The course will address the following topics:

SECTION 1. INDUSTRIAL WASTEWATERS

- Topic 1. Problems of industrial wastewater. Differences with urban wastewater
- Topic 2. Specific contaminants from industrial wastewater
- Topic 3. Industrial effluents produced in different sectors
- Topic 4. Depuration technologies of specific industrial pollutants

SECTION 2. TREATMENT WITH MEMBRANE PROCESSES

- Topic 5. Reverse osmosis and nanofiltration
- Topic 6. Microfiltration and ultrafiltration

SECTION 3. TREATMENT BY MEANS ELECTROCHEMICAL PROCESSES

- Topic 7. Electroplating
- Topic 8. Electrodialysis
- Topic 9. Electrohydrolysis
- Topic 10. Electrocoagulation and electroflotation

SECTION 4. TREATMENT BY ADSORPTION MEANS

- Topic 11. Adsorption with new materials
- Topic 12. Ion exchange

SECTION 5. CHEMICAL TREATMENT

- Topic 13. Advanced oxidation (Fenton, ozone, photocatalysis,...)
- Topic 14. Wet oxidation
- Topic 15. Supercritical water oxidation
- Topic 16. Hydrodechlorination

SECTION 6. OTHER TECHNOLOGIES

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- Topic 17. Supercritical fluid extraction
- Topic 18. Stripping
- Topic 19. Dissolved air flotation (DAF)
- Topic 20. Biacumulation

Simulation practice sessions

- Design of an ion exchange resin column using software CADIX (2 hours)
- Design of a reverse osmosis membrane system using software ROSA (2 hours)

5.4.Course planning and calendar

There will be two simulation practice sessions. Depending on the required depth we will work with 1 or 2 software applications.

In addition, a wastewater treatment plant of companies will be visited. Companies will be selected at the beginning of the course depending on their availability.

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the EINA website.

5.5.Bibliography and recommended resources

BB	Eckenfelder, William Wesley. Industrial water pollution control / W. Wesley Eckenfelder, Jr . - 3rd ed. Boston [etc.] : McGrawHill, cop. 2000
BB	Tratamientos avanzados de aguas residuales industriales / editor José Aguado Alonso Madrid . Universidad Rey Juan Carlos, Servicio de Publicaciones : Dykinson, D.L. 2012
BC	Arundel, John. Tratamientos de aguas negras y efluentes industriales / John Arundel ; traducido por Vicente San José González Zaragoza : Acribia, D.L. 2002
BC	Nemerow, Nelson Leonard. Tratamiento de vertidos industriales y peligrosos / Nelson Leonard Nemerow, Avijit Dasgupta Madrid : Diaz de Santos, D.L. 1998