

66232 - Alternative Technologies for Industrial Wastewater Purification

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	531 - Master's in Chemical Engineering
ECTS	3.0
Course	2
Period	First semester
Subject Type	Optional
Module	---

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 will take place at various levels: master classes, problem solving (cases), tutored projects, with increasing level of student participation. Theoretical bases that make up the subject and solution of some model problems will be developed in theory classes. Problems and cases classes are the effective complement to master classes, and it allows checking the comprehension of matter. At the same time these classes will contribute to develop in the student a more applied point of view. Finally the mentored work will complement all of the above.

5.2. Learning activities

66232 - Alternative Technologies for Industrial Wastewater Purification

- Master classes (16 h class). In them the exhibition of theoretical content of the various subjects proposed will be held (see Planning).
- Problem solving and case studies classes (6 h class). Problems related to the theoretical part in master classes will be resolved, with previous work undertaken by students.
- Simulation practice sessions (4 h. class). Practices using commercial programs to simulate processes: Reverse osmosis (ROSA) and ion exchange (CADIX).
- Special practices (4 h), corresponding to visits to industrial effluent treatment plants.
- Individual mentored work or study (non-presential 44 h). These hours will be used in the preparation of deliverables (work and reports of the various practices). These deliverables should be preferably performed on an individual (or group in the event that the number of students is high). In case that it elects not to do reports, student should be examined and 44 working hours correspond to hours of personal study.
- Evaluation (1 h). To present the case study (continuous assessment) or to carry out a global exam.

5.3.Program

The program planned for the course is as follows:

PART 1.- INDUSTRIAL WASTEWATERS

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

PART 2.- TREATMENT WITH MEMBRANE PROCESSES

5. Reverse osmosis and nanofiltration
6. Microfiltration and ultrafiltration

PART 3.- TREATMENT BY MEANS ELECTROCHEMICAL PROCESSES

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

PART 4.- TREATMENT BY MEANS ADSORPTION

11. Adsorption with new materials
12. Ion exchange

PART 5.- CHEMICAL TREATMENT

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

PART 6.- OTHER TECHNOLOGIES

66232 - Alternative Technologies for Industrial Wastewater Purification

17. Supercritical fluid extraction
18. Stripping
19. Dissolved air flotation (DAF)

Practice program

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

5.4.Planning and scheduling

Resolution problems and master classes are held according to the schedule established by the EINA, in addition each teacher shall inform their hours of tutoring.

There will be two practical sessions of simulation of two hours each. Depending on the required depth will work with 1 or 2 software applications. Schedule will be fixed at the beginning of course.

In addition, two wastewater treatment plants of companies in the province will be visiting. Companies will be selected at the beginning of the course depending on their availability.

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 : Díaz de Santos, D.L. 1998