

Academic Year/course: 2022/23

66240 - Alternative technologies for industrial wastewater treatment

Syllabus Information

Academic Year: 2022/23

Subject: 66240 - Alternative technologies for industrial wastewater treatment

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 531 - Master's in Chemical Engineering

ECTS: 3.0

Year:

Semester: First semester

Subject Type: Optional

Module:

1. General information

2. Learning goals

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. 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.

4.2. 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 (WAVE) to simulate processes: Reverse osmosis and ion exchange.
- 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).

4.3. 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 and Electrohydrolysis
- Topic 9. Electrooxidation
- Topic 10. Electrocoagulation and electroflotation

SECTION 4. TREATMENT BY ADSORPTION MEANS

- Topic 11. Adsorption with active carbon
- Topic 12. Adsorption with new materials
- Topic 13. Ion exchange

SECTION 5. CHEMICAL TREATMENT

- Topic 14. Advanced oxidation (Fenton, ozone, photocatalysis,?)
- Topic 15. Wet oxidation
- Topic 16. Supercritical water oxidation
- Topic 17. Hydrodechlorination

Simulation practice sessions

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

4.4. Course planning and calendar

It is a 3 ECTS course, it means 75 hours of student work, distributed as indicated in section 4.2.

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.

4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=66240>