Universidad Zaragoza

Academic Year/course: 2023/24

25210 - Foundations of environmental engineering

Syllabus Information

Academic year: 2023/24
Subject: 25210 - Foundations of environmental engineering
Faculty / School: 201 - Escuela Politécnica Superior
Degree: 571 - Degree in Environmental Sciences
ECTS: 6.0
Year: 3
Semester: First Four-month period
Subject type: Compulsory
Module:

1. General information

The general objective of this subject is to lay the scientific-technical engineering foundations needed to address the technologies for the treatment and control of environmental pollution. In this sense, it aims to bring together the basic knowledge concerning the basic operations and fundamental processes used in engineering for the treatment of environmental pollution, with special emphasis on the approach and resolution of material and energy balances , and their application to systems for the purification of pollutants in the environment.

This objective is aligned with the Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (https://www.un.org/sustainabledevelopment/es/), specifically, the learning activities foreseen in this subject will contribute to the achievement of Objectives 6.3, 7.2, 9.4 and 13.3

2. Learning results

In order to pass this subject, the students shall demonstrate they has acquired the following results:

RA1. To specify the most relevant environmental problems, summarize the origin, causes and effects of pollution on different environments and identify which substances pollute the most and what are the concentration limits allowed by current legislation.

RA2. To interpret purification flow diagrams, identifying the Basic Operations of Environmental Engineering, for the control and regulation of environmental pollution.

RA3. To interpret and handle tables, diagrams and software (EES) with databases of thermodynamic properties of substances.

RA4. To identify and order the necessary information in a problem of matter and energy balances with and without reaction, to formulate the necessary system of independent equations and solve it.

RA5. To solve questions or problems related to the determination of pollution parameters and, likewise, to produce and interpret quality indexes of different media.

RA6. To solve questions or problems related to the selection and calculation of design parameters of equipment for physical, chemical and biological purification processes.

RA7. To prepare reports of the laboratory practices carried out (group) making appropriate use of ICT (word processor , spreadsheet, bibliographic searches on the Internet).

Learning results 1 to 6 are aligned with the SDGs, in particular 6.3 and 9.4, and secondarily with 7.2 and 13.3

3. Syllabus

Program Theory

Module I. Concept of Environmental Engineering

Topic 1: Introduction to Environmental Engineering

Module II: Balances of matter and energy

Topic 2: Material balances

Topic 3: Energy balances

Module III: Environmental quality indexes

Topic 4: Quality indexes

Module IV: Physical purification processes

Topic 5: Physical gas cleaning processes

Topic 6: Physical processes of liquid purification I

Topic 7: Physical processes of liquid purification II

Module V: Chemical and biological purification processes

Topic 8: Chemical purification processes

Topic 9: Biological purification processes

Laboratory Practical Program

Module II: Balances of matter and energy

Practice 1.- Heat Exchangers

Practice 2.- Adsorption

Module IV: Physical purification processes

Practice 3.- Filtration

Practice 4.- Sedimentation

Module V: Chemical and biological purification processes

Practice 5.- Water decalcification by ion exchange resins.

Kinetics of oxidation of organic matter with H O in the presence of UV light.

4. Academic activities

A1. Master class: Study of the material taught in theory classes.

A2. Problem solving and case studies: Resolution of the problems of each topic, both those solved by the teacher in the classroom, as well as those proposed to be solved by the student.

A3. Laboratory Practices: 5 face-to-face sessions of 2 hours.

A4. Autonomous work of the student: An estimated 1.5 to 2 hours of study time for each hour of face-to-face classes. This includes the time dedicated to the resolution of individual and/or group tasks

A5. Tutoring. They may be face-to-face or virtual.

A6. Evaluation tests: face-to-face examination of about 4 hours of duration.

5. Assessment system

Continuous evaluation: It will include 3 tests:

1 Theory exam and problems

It will consist of two parts: theory and problems. Only minimum grades of 3 will be compensated. The grade of the test will be weighted: theory (40%) and problems (60%) and cannot be lower than 4. This grade will account for 60% of the final grade.

2 Tasks and works

Several tasks will be delivered. The grade obtained, which cannot be less than 3, will represent 20% of the overall grade.

Students who have not completed or passed this activity will be required to take an exam related to the assignments and a minimum grade of 4 will be required.

3 Laboratory practical exam

If the student has completed all the practices, they will take a written test in which the reports of the reports can be consulted. The grade obtained, which cannot be less than 3, will represent 20% of the final grade.

Global assessment:

Global written test that includes theory and problems and that will constitute 80% of the final grade. A minimum grade of 4 is necessary to compensate . Students who take this test and have not previously completed the laboratory practices , will be summoned to take the practice exam and must perform some of the practices included in the program and answer a questionnaire. The student will only be able to consult the scripts of the practices, this test will represent 20% of the grade and a minimum grade of 3 will be necessary to compensate.

The success rate of the subject in the last three academic years was 40.74%, 51.35% and 75.00%.