Universidad Zaragoza

Academic Year/course: 2024/25

66223 - Nanostructured Materials

Syllabus Information

Academic year: 2024/25
Subject: 66223 - Nanostructured Materials
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 531 - Master's in Chemical Engineering
ECTS: 3.0
Year:
Semester: Second semester
Subject type: Optional
Module:

1. General information

The main objective is that the student knows how to distinguish between the different families of nanostructured materials and recognize their fundamental members, as well as their most relevant properties. Also, to know their properties and the place they occupy in the innovation sequence in order to be able to make a decision on their possible use in an existing application or in a new process to be defined and/or exploited.

2. Learning results

The student, in order to pass this subject, must demonstrate the following results...

- To know how to distinguish between the different families of nanostructured materials and recognize their fundamental members, as well as their most relevant properties.
- To develop the ability to relate the structural properties of materials with their possible applications in the field of Chemical Engineering.
- To design appropriate synthesis and characterization procedures for the most representative materials.
- To design the synthesis of a nanomaterial and analyse its properties using advanced characterization techniques. To analyse the chemical composition, texture and physical properties as a basis for materials applications.
- To apply what has been learned about structured materials to the search for solutions related to product engineering.

3. Syllabus

The foreseen syllabus for this subject is the following:

BLOCK 1.- INTRODUCTION

1. Nanostructured materials.

BLOCK 2.- POROSE SOLIDS

2. Amorphous materials: Silica-based.
3. Crystalline materials: Zeolites, MOF and COF.

BLOCK 3.- CARBONACEOUS MATERIALS

4. Activated carbons and graphitic materials.
5. Carbon nanotubes, graphene and fullerenes.

BLOCK 4.- NANOPARTICLES AND COMPOUNDS

6. Nanostructured materials. Procedures for production
7. Composites and nanocomposites.
8. Nanotoxicity.

4. Academic activities

- Master classes (15 h)

-Problem solving and case studies (10 h). In these classes, the teacher and the student, with the teacher´s supervision, will solve problems.

-Practical work sessions (3 h) in which the student will synthesize a nanomaterial in the laboratory and characterize its different properties. The practical session requires the knowledge acquired in the different topics of the subject as well as the previous knowledge already acquired by the student. These sessions will require a deliverable to be corrected and evaluated by the teacher.

-Special practices (2 h) corresponding to a crystallographic modelling session.

Individual study (24 hours). The student is advised to study continuously throughout the semester.

Both the mentioned practical sessions and the individual presentations will require of 11 additional hours to conclude a deliverable (a solved exercise, the presentation. etc.) for each of the thematic blocks.

Personalized teacher-student tutoring (7 h).

Assessment (3 h). There will be individual presentations by the students on topics proposed by the teacher related to the content blocks, with a duration of up to 15 minutes.

5. Assessment system

The student must demonstrate achievement of the intended learning results through the following assessment activities:

Option 1:

Assessment is continuous and includes:

1. Oral presentations (**P**).
2. Solving practical cases and writing of academic assignments. These will be converted into deliverables, in principle, one per block, less than the one for which the oral presentation is made. Apart from the content and expected result, the reasoning and formal aspects, as well as the presentation will be valued (**E**).
3. Direct observation on the active participation in classes and result of the follow up tests (**O**). The grade of the subject will be calculated as follows:

Grade = 0.3-***P*** + 0,6-***E*** **+** *0,*1**-*O***

Option 2:

Global test. Those students who do not wish to follow the evaluation according to option 1, may choose to sit for the exam call (100% of the final grade). This option is available in both calls.

6. Sustainable Development Goals

7 - Affordable and Clean Energy
9 - Industry, Innovation and Infrastructure
12 - Responsible Production and Consumption