

27218 - Materials Science

Syllabus Information

Academic year: 2023/24

Subject: 27218 - Materials Science

Faculty / School: 100 - Facultad de Ciencias

Degree: 452 - Degree in Chemistry

ECTS: 7.0

Year: 4

Semester: Annual

Subject type: Compulsory

Module:

1. General information

The subject and its expected results respond to the following approaches and objectives:

- The student recognizes the main types of materials, their properties and applications.
- The student knows how to relate the chemical structure of a material and the methods of preparation, processing and transformation with the properties and applications of the materials..

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the Agenda 2030 of the United Nations (<https://www.un.org/sustainabledevelopment/es/>):

- Goal 7: Affordable and non-polluting energy
- Goal 9: Industry, Innovation and Infrastructure
- Goal 12: Responsible Production and Consumption

2. Learning results

The use of materials in any type of company requires, on the part of the future Chemistry graduate, a minimum knowledge of their structure, preparation and properties. Research or innovation in new materials in sectors such as energy, biomedicine, electronics, nanotechnology, etc. requires chemists capable of combining their knowledge of chemistry with their knowledge of materials science, as well as the ability to work in interdisciplinary environments.

Upon completion of the subject, the student will be able to:

- Apply the chemical knowledge acquired to argue and solve problems related to materials.
- Establish a logical relationship between the chemical structure, preparation and properties of a material.
- Predict and critically discern the most suitable material for basic applications and its main properties
- Understand the basics of materials processing and use, as well as their potential environmental impact and recycling.
- Establish an integral vision of Materials Science and its relationship with other disciplines, social and industrial implications, as well as to understand new contributions in advanced materials.
- Elaborate, present and defend basic material science papers.

The learning results are:

- Describe the chemical nature and origin, basic properties and most important transformation methods of the main types of materials.
- Properly relate the type of material, its preparation and possible processing, depending on the application and required property
- Critically evaluate the choice of materials in different technologies, according to properties and application conditions.
- Search, manage, organize and present information on materials-related topics.

3. Syllabus

1. Definition and classification of materials.
2. Metallic materials: mechanical properties
3. Metallic materials: alloys.
4. Ceramic materials and glass.
5. Polymeric materials. Structure and properties of polymers.
6. Polymeric materials: processing and applications of polymers.
7. Composite materials.
8. Electrical and electronic materials.

9. Magnetic materials.
10. Optical Materials.
11. Biomaterials.
12. New materials (seminars/discussions)
13. Environmental Aspects in Materials Science (seminars/discussions).
14. Materials characterization techniques (seminars/discussions).

4. Academic activities

Methodology:

- Theory classes with resolution of practical cases (5 ECTS).
- Supervised work with elaboration of seminars/debates (2 ECTS).
- Tutorials to solve doubts and follow up on assignments.

Activities:

- Activities related to the acquisition of basic knowledge of materials science: theoretical aspects, resolution of questions and practical cases: in classroom in a single group.
- Supervised work and elaboration of seminars and/or debates:

Proposals for small group work on bibliographic research in case studies and current topics related to Materials Science. Follow-up tutorials.

Preparation of reports.

Oral presentation and discussion/debate of the papers.

5. Assessment system

1. Continuous evaluation

- A supervised project on Materials Science, which will be submitted in written form and will be presented and defended in the form of a seminar/debate in front of classmates and teachers. They will be scheduled in the second semester, according to a presentation schedule to be announced in advance. It will be graded with an S grade (from 0 to 10). This grade will be saved for the second call.
- Performance of two theoretical-practical tests during the academic year (prior to the global evaluation period).

The first one will take place in the January exam period (grade T1), in which the topics taught in the first semester will be evaluated, and the second one at the end of the academic year (grade T2), in which the topics taught in the second semester will be evaluated. Each of these exams will be graded from 0 to 10. A grade $T = (0.6 \cdot T1 + 0.4 \cdot T2)$ will be obtained from these exams.

The grade of the subject for continuous evaluation will be:

GRADE Continuous Assessment = $0.2 \cdot S + 0.8 \cdot T$

In order to pass the subject, the S grade must be equal to or higher than 5, and the T grade must be equal to or higher than 4. Otherwise, the subject will be considered failed (with a quantitative grade equal to the lowest of the S or T values).

2. Overall test

Those students who have not passed the continuous evaluation or who wish to improve their grade may take a global test in the first call (May-June) which will consist of:

- Presentation of a paper and its defence, which is not necessary for those who have passed this part in the continuous evaluation (grade S higher than 5)
- Theoretical-practical test of the whole subject (TG grade).

The grade for this global test will be:

GRADE Global Test = $0.2 \cdot S + 0.8 \cdot TG$

In order to pass the subject, the S grade must be equal to or higher than 5, and the TG grade must be equal to or higher than 4. Otherwise, the subject will be considered failed (with a quantitative grade equal to the lowest of the S or T values).

Those students who sit for an exam in order to achieve a higher grade will obtain the best of the grades of the continuous evaluation or global test

The overall test of the second call will consist of the same sections and will be graded in the same way as in the first call.