Universidad Zaragoza

Academic Year/course: 2023/24

29718 - Materials Technology

Syllabus Information

Academic year: 2023/24
Subject: 29718 - Materials Technology
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 330 - Complementos de formación Máster/Doctorado
434 - Bachelor's Degree in Mechanical Engineering
ECTS: 6.0
Year: 434 - Bachelor's Degree in Mechanical Engineering: 2
330 - Complementos de formación Máster/Doctorado: XX

Semester: Second semester
Subject type: 434 - Compulsory
330 - ENG/Complementos de Formación
Module:

1. General information

The objective of the subject is to understand the importance of the forming and manufacturing processes of parts and components in obtaining different internal structures in the materials (microstructure, internal defects, inclusions), which conditions their properties and their behavior in service . It discusses how the design of the forming processes allows the material to achieve the necessary properties to achieve the minimum performance to satisfy the operational conditions. Techniques for inspecting the condition of materials in service are described and for monitoring their damage or degree of deterioration. Finally, basic aspects of the Surface Engineering of interest for Mechanical Engineeringare described.

Sustainable Development Goals, SDGs, of Agenda 2030

(https://www.un.org/sustainabledevelopment/es/): Goal 12: Target 12.5

2. Learning results

1.- Understand the relationship between processing and the final structure obtained from the materials, and its influence on the mechanical properties and their behavior in service.

2.- Know the most appropriate processing technologies for different materials and the levels of waste generation associated with each of them.

3.- Know the different mechanisms of deterioration of materials in service and in-service inspection techniques.

4.- Know the basic methods of Surface Engineering and the latest trends of interest for Mechanical Engineering.

3. Syllabus

1.- Metal forming processes: solidification and molding, plastic deformation, powder metallurgy.

2.- Polymer forming processes.

3.- Forming processes of polymer matrix composite materials.

4.- Ceramic and glass forming processes: traditional ceramics, advanced ceramics, glass.

5.- Fusion joining technologies: metallurgy of metal welding.

6.- Surface technologies: surface treatments, coatings.

7.- Behavior in service: oxidation and corrosion of metals.

8.- In-service behavior: brittle fracture of ceramics, thermofluence, fatigue-thermofluence interaction, fatigue-thermofluence interaction.

9.- In-service failure analysis: non-destructive testing, methodology.

4. Academic activities

* Full group lectures (27 hours)

* Classes of exercises and problems in a split group (11 hours). After each session of problems an example will be proposed to be handed in.

* Practical sessions (12 hours). These sessions are highly recommended. In these lectures, the topics presented in the lectures are discussed in depth at.

* Tutored work (10 hours). It will be carried out in groups of three people and a poster will be elaborated and presented in a final joint session.

* Personal work (85 hours) necessary for the study of the theory, realization of problems, elaboration of assignments and practice reports.

Assessment 5 hours.

5. Assessment system

Preferably, a progressive assessment with the following blocks is proposed:

Block 1: Laboratory practices (20% of the final grade).

It consists of two parts: questionnaires on what was done in the session, maximum 10% of the final grade, and the pracice reports, which are assigned 10% of the final grade. Qualification computable if and only if the following conditions are met: i) To have answered all the individual questionnaires at the end of each session; ii) To have submitted the reports corresponding to all the sessions.

Block 2: Elaboration and presentation of a poster, related to a topic of the subject*(10% of the final grade).*

Block 3: Problems proposed and delivered throughout the term *(5% of the final grade,* proportional to the number of problems delivered with a minimum of content*.*

Block 4: Partial exam *(15% of the final grade).* The structure will be the same as in the global exam. The need to achieve the same minimum scores for each part of the examwill also apply in this case.

Block 5: Comprehensive exam (50% of the final grade). It consists of three parts: A first part associated with basic contents of the subject, a second part type test and a third part of theoretical/practical questions.

It will be necessary to obtain a minimum score of 25% of the maximum grade in each of its parts, except in the part of basic contents of the subject where it will be necessary to reach a minimum of 50% of the maximum grade.

If a minimum score (40% of the maximum grade) is not reached in any of the blocks 2, 3 or 4, the weight of the overall exam in the final grade will be increased in the same percentage as the corresponding block.

Alternatively, the student has the possibility of passing the subject by means of the **global assessment** in the official exams. It will consist of two parts, a comprehensive exam (80% of the final grade) and a practice exam (20% of the final grade).

The practical exam will consist of two parts: a written exam and a practical exam at Laboratory. It will take place after the comprehensive assessment has been completed. In order to speed up the management of the personalized practical exam, students who wish to sit the exam must notify the exam at least a couple of days before the date of the official exam.

In both the progressive and the global assessment, in any block of the evaluation it will be necessary to obtain a minimum score of 40% of the maximum in order to be able to average.