



Course guide

240045 - 240045 - Materials

Last modified: 14/06/2023

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 702 - CEM - Department of Materials Science and Engineering.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 4.5 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Candau, Nicolás (Q1)
García Torres, José Manuel (Q2)

Others: Alcala Cabrelles, Jorge
Calero Martinez, José Antonio
Candau, Nicolás
Fernandez Aguado, Enrique
García Torres, José Manuel

TEACHING METHODOLOGY

Lectures on theory, problem solving and laboratory experimentation.

LEARNING OBJECTIVES OF THE SUBJECT

Understand the relationship that exists between the properties of a material (metal, ceramic and/or polymer) and its microstructure, by microstructure we mean all those microstructural characteristics that can be measured at different possible geometric scales of measurement (i.e. R0, R1, R2 and/or R3), from the atomic scale to the macroscale.

STUDY LOAD

Type	Hours	Percentage
Hours large group	40,5	36.00
Hours small group	4,5	4.00
Self study	67,5	60.00

Total learning time: 112.5 h



CONTENTS

Introduction to the Science and Engineering of Materials

Description:

Chapters 1, 2, 3, 4, 5, 6, 7, 9, 11, 14 and 16 of the reference book (William D. Callister, Materials Science and Engineering: An introduction, 7th Edition (English) and/or later (There is a Spanish version.) The syllabus covers basic aspects of atomic bonding, crystal structures, defects in crystal structures, diffusive processes, phase diagrams, mechanical properties, deformation mechanisms, and hardening mechanisms, with a focus on metallic alloys. Likewise, some basic aspects of structure and properties of polymeric materials (basically chapter 14) and composite materials (chapter 16) are covered.

Full-or-part-time: 36h

Theory classes: 36h

Problem resolution

Description:

Solving basic problems related to the course syllabus (crystalline structure, diffusive processes, phase diagrams, elastic and plastic behavior, cold working and annealing, properties of polymers).

Full-or-part-time: 4h 30m

Practical classes: 4h 30m

Laboratory practices

Description:

Prácticas de Laboratorio: Se realizarán tres sesiones de prácticas de 90 minutos cada una en el laboratorio (1. Choque térmico en materiales cerámicos; 2. Ensayo de tracción mecánica; 3. Observación metalográfica)

Full-or-part-time: 4h 30m

Laboratory classes: 4h 30m

GRADING SYSTEM

1. - A partial exam (EP) at mid semester with a duration of 1 hour.
2. - A final exam (EF) at the end of the semester, with a duration of 2.5h. The final exam will consist of a theory part (EFT) and a problem part (EFP). The total content of the subject will be evaluated.
- 3.- A final laboratory exam (EAP) with a duration of 30min. It will take place the same day than the final exam.

All the evaluations are in a scale of 10.

The final mark (NF) will be calculated from the following expression:

$$NF = \text{máx} \{(0.25 EP + 0.25 EFT + 0.40 EFP + 0.10 EAP); (0.40 EFT + 0.50 EFP + 0.10 EAP)\}$$

REPEATING STUDENTS:

For repeating students, having carried out and evaluated the practical sessions in previous semesters, they are given as an alternative option for calculating the final grade for the subject:

$$NF = \text{máx} \{(0.25 EP + 0.30 EFT + 0.45 EFP); (0.45 EFT + 0.55 EFP)\}$$

They are exempt from attending the practical sessions, fulfilling the report and taking the practical exam.

In case the student does not want this alternative, his evaluation system will be that of the student who enrolls for the first time, with all that this implies.

The re-evaluation exam will consist of a single exam of the entire subject (Theory (ERT), Problems (ERP) and Laboratory (ERL). The final mark will be:

$$NF (\text{alumne no repetidor}) = 0.10 ERL + 0.4 ERT + 0.50 ERP$$

$$NF (\text{alumne repetidor}) = 0.45 ERT + 0.55 ERP$$

BIBLIOGRAPHY

Basic:

- Callister, William D; Rethwisch, David G. Materials science and engineering . 9th ed. S I version. Hoboken, New Jersey [etc.] : John Wiley & Sons, cop. 2015. ISBN 9781118319222.
- Askeland, Donald R; Wright, Wendelin J. Essentials of materials science and engineering . Fourth edition, SI. ©2019. ISBN 9781337629157.

Complementary:

- Callister, William D; Rethwisch, David G. Materials science and engineering . 9th ed. S I version. Hoboken, New Jersey [etc.] : John Wiley & Sons, cop. 2015. ISBN 9781118319222.
- Askeland, Donald R. Ciencia e ingeniería de los materiales . Madrid : International Thomson Editores, cop. 2001. ISBN 8497320166.
- Callister, William D. Introducción a la ciencia e ingeniería de los materiales . 2a ed. México D. F. : Limusa Wiley, cop. 2009. ISBN 9786075000251.

RESOURCES

Other resources:

All those resources that the coordinator and/or the professors involved in teaching enable on the ATENEA virtual campus for a better understanding and/or follow-up of the subject.