

Course guide

240EM111 - 240EM111 - Structure, Properties and Processing of Metals and Alloys

Last modified: 26/06/2025

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

Degree: Academic year: 2025 **ECTS Credits:** 4.5
Languages: Spanish

LECTURER

Coordinating lecturer: JESSICA CALVO MUÑOZ

Others:

PRIOR SKILLS

Basic knowledge on Physical Metallurgy

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CEMCEM-02. (ENG) Dissenyar i desenvolupar productes, processos, sistemes i serveis, així com l'optimització d'altres ja desenvolupats, atenent a la selecció de materials per a aplicacions específiques

Transversal:

06 URI N2. EFFECTIVE USE OF INFORMATION RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

TEACHING METHODOLOGY

Subject in process of extinction. There is no teaching, the students that enroll it do so only with the right to an exam.

LEARNING OBJECTIVES OF THE SUBJECT

The objective of this subject is to provide students a general knowledge regarding metallic alloys of industrial interest. Common ferrous and non-ferrous alloys will be described and the relationship between their mechanical properties, heat treatments and processes will be explained, based on the structural changes that they promote. Each one of these aspects will be detailed for each of the metallic materials family.

At the end of the course, the student must be able to:

- classify the main families of metallic materials and their alloys and compare their mechanical and physical properties
- describe the hardening mechanisms active for each material and how to control them to promote a certain structure to achieve certain given properties



STUDY LOAD

Type	Hours	Percentage
Hours small group	13,5	12.00
Self study	72,0	64.00
Hours large group	27,0	24.00

Total learning time: 112.5 h

CONTENTS

Introduction

Description:

Classification of metals and their alloys. Description of the main characteristics of each family of metals

Full-or-part-time: 1h

Theory classes: 1h

Ferrous alloys

Description:

Fe-C phase diagram and phase transformations in steels. TTT and CCT diagrams. Heat treatments. Construction steels. Sheet steels. Tool steels. Stainless steels. Cast iron.

Related activities:

Heat treatments lab

Full-or-part-time: 22h

Theory classes: 20h

Guided activities: 2h

Copper and its alloys

Description:

Pure copper. Brasses, alloys and applications. Bronzes, alloys and applications. Other copper alloys.

Full-or-part-time: 6h

Theory classes: 6h

Light alloys

Description:

Wrought aluminium alloys, heat-treatable and non-heat-treatable. Cast aluminium alloys. Alpha-titanium alloys and their applications. Alpha+beta titanium alloys and their applications. Beta titanium alloys and their applications. Main cast and wrought magnesium alloys. Applications of magnesium alloys.

Full-or-part-time: 12h

Theory classes: 12h



Other families

Description:

Superalloys. Refractory metals. Precious metals. Metallic glasses. Intermetallics. Metallic foams. Etc...

Full-or-part-time: 4h

Theory classes: 4h

GRADING SYSTEM

Subject in process of extinction. There is only one final test that corresponds to 100% of the final grade of the subject.

BIBLIOGRAPHY

Basic:

- Polmear, I. J. Light Alloys : from traditional alloys to nanocrystals [on line]. 4th ed. Amsterdam [etc.]: Elsevier, cop. 2006 [Consultation: 02/03/2015]. Available on: <http://www.sciencedirect.com/science/book/9780750663717>. ISBN 0750663715.
- Avner, Sidney H. Introducción a la metalurgia física. 2ª ed. México ; Madrid [etc.]: McGraw Hill, cop. 1979. ISBN 9686046011.
- Bhadeshia, H. K. D. H; Honeycombe, R. W. K. Steels : microstructure and properties [on line]. 3rd ed. Amsterdam [etc.]: Elsevier, cop. 2006 [Consultation: 02/03/2015]. Available on: <http://www.sciencedirect.com/science/book/9780750680844>. ISBN 9780750680844.
- Callister, William D. Introducción a la ciencia e ingeniería de los materiales [on line]. 2a ed. México, D.F.: Limusa Wiley, cop. 2009 [Consultation: 24/11/2021]. Available on: <https://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=2616389>. ISBN 9786075000251.