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

Last modified: 14/06/2019

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

Degree: MASTER'S DEGREE IN MATERIALS SCIENCE AND ENGINEERING (Syllabus 2014). (Optional subject).
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Academic year: 2019 **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 INFORMATI0N 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 explaned, based on the structural changes that they promote. Each one of these aspects will be detailed for each fo 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 achive certain given properties

STUDY LOAD

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

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. Bronces, 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. Refractary 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:
- Avner, Sidney H. Introducción a la metalurgia física. 2ª ed. México ; Madrid [etc.]: McGraw Hill, cop. 1979. ISBN 9686046011.
- Polmear, I. J. Light Alloys : from traditional alloys to nanocystals [on line]. 4th ed. Amsterdam [etc.]: Elsevier, cop. 2006 [Consultation: 02/03/2015]. Available on: http://www.sciencedirect.com/science/book/9780750663717. ISBN 0750663715.
- 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. 2a ed. México, D.F.: Limusa Wiley, cop. 2009. ISBN 9786075000251.