25863 - Industrial Processes and Advanced Materials

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	271 - Bachelor's Degree in Industrial Design and Product Development Engineering
ECTS	6.0
Year	
Semester	Second Four-month period
Subject Type	Optional
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

4.1.Assessment tasks (description of tasks, marking system and assessment criteria)

5.Methodology, learning tasks, syllabus and resources

5.1.Methodological overview

The proposed methodology searches for promoting the constant work of the student
The lectures for the complete group will deal with theoretical and practical objectives, complemented trough practical and laboratory sessions. These sessions are made in small groups to promote teamwork.
Another important aspect to be developed is student decision making. For this aim, several works are proposed along the semester.

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Evaluation will be centered on the basic aspects of material behavior and the relationship material-processing-structure-application.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials.

Further information regarding the course will be provided on the first day of class.

5.2.Learning tasks

The course includes 6 ECTS organized according to:

* Lectures: 37 hours
* Laboratory sessions: 12 hours
* Problem solving tasks and Problem-based learning: 30 hours
* Individual work : 65 hours
* Examination: 6 hours

5.3.Syllabus

The course will address the following topics:

Theory sessions

1. ANALYSIS OF FAILURE IN SERVICE. Analysis methodology on damage and failure mechanisms. Investigation and identification techniques: non-destructive tests, metallography, electron microscopy, destructive tests. The technical report.
2. METALLIC MATERIALS. Metal alloys for low and high temperature applications: Superalloys and ODS alloys. Shape Memory Alloys. Glassy metals. Metallic foams. Metal Matrix Composites. Properties and applications.
3. MATERIALS FOR THE FUTURE. Nanostructured materials. Nanomaterials. Carbon nanotubes. Production of carbon nanotubes. New products based on nanostructured materials. Nano-scale microscopes.
4. JOINTS AND ADHESIVES. Fusion welding. Diffusion welding. Friction and Friction Stir welding. Microstructure of the welded zone in ferrous and non-ferrous alloys. Mechanic test and non-destructive test on metallurgic welding. Joint formation. Design and strength. Surfaces preparation. Joining wood, metals, plastics, composite structures and rubber-metal. Applications.
5. MODIFICATION OF SURFACES AND COATINGS. Classification. Classic surface treatments. New surface treatments. PVD (physical vapour deposition). CVD (chemical vapour deposition). Ionic implantation. Thermal projection. The laser applied to surface treatments.
6. MATERIALS RECYCLING. Waste recovery: recycling. Definition and classification of waste. RSU collection and treatment (urban solid waste). Identification procedures, classification, separation and recovery. Recycling of specific products: containers for beverages, electronic scrap, used tires, etc. Analysis of life cycle. Ecodesign.

5.4.Course planning and calendar

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

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Lectures	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Solving tasks and problem				x	x	x	x	x	x	x	x	x	x		
Laboratory sessions							x								x
Examination															
Individual work	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

For further details concerning the timetable, classroom and further information regarding this course please refer to the "Escuela de Ingenieria y Arquitectura " (EINA) website: https://eina.unizar.es/

5.5.Bibliography and recommended resources

Michael F Ashby. David R H Jones "Engineering Materials 1: An Introduction to their Properties and Applications". Butterworth-Heinemann

Michael F Ashby. David R H Jones "Engineering Materials 2: An Introduction to Microstructures, Processing and Design". Butterworth-Heinemann

Michael Ashby, Hugh Shercliff and David Cebon "Materials, Engineering, Science, Processing and Design". Butterworth-Heinemann

Michael F. Ashby "Materials Selection in Mechanical Design". Elsevier

J.A. Puértolas, R. Ríos, M. Castro, J.M. Casals (eds.). *Tecnología de Materiales*. Ed. Síntesis, 2009.

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J.A. Puértolas, R. Ríos, M. Castro, J.M. Casals (eds.). *Tecnología de Superficies en Materiales*. Ed. Síntesis, 2010.

F. Liesa y L. Bilurbina*. Adhesivos Industriales*. Ed. Marcombo.

K-E Easterling. *Materiales del futuro*.

C. Janot et B. Ilschner. *Matériaux Émergents*. Ed. Presses Polytechniques et Universitaires Romandes, 2001.

M. A. Borrell, M. D. Salvador. *Materiales de carbono, del grafito al grafeno.* Ed. REverté

J. A. Martín-Gago, C Briones, E. Casero, P. A. Serena. El nanomundo en tus manos. Ed. Crítica

K-E Easterling. *Introduction to the Physical Metallurgy of Welding*. Ed. Butterworths-Heinemann, 1983.

S. Kou. *Welding Metallurgy.* Ed. Wiley, 2003.

J. Rieradevall, J. Vinyes. *Ecodiseño y Ecoproductos*. Ed. Rubes, 1999.

H.F. Lund. *Manual McGraw-Hill de Reciclaje*. Ed. McGraw-Hill, 1997.

S. Kalpakjian. *Manufactura. Ingeniería y Tecnología*. Ed. Pearson Educación, 2008.

M. Groover. *Fundamentos de Manufactura Moderna*. Ed.Prentice-Hall, 1997.

J.G. Bralla. *Handbook of Product Design for Manufacturing*. Ed. Mc Graw-Hill, 1986.

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