

29742 - Advanced Industrial Materials

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	434 - Bachelor's Degree in Mechanical Engineering
ECTS	6.0
Year	4
Semester	Second semester
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 through practical and laboratory sessions. These sessions are made in small groups to promote teamwork.

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Another important aspect to be developed is student decision making. For this aim, several works are proposed along the semester.

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

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	
Solving tasks and Problem		x	x	x						x	x	x	x		
Laboratory sessions		x	x	x	x	x	x	x	x	x	x	x	x		
Examination							x								x
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 Ingeniería y Arquitectura " (EINA) website: <https://eina.unizar.es/>

5.5.Bibliography and recommended resources

[BB: Basic Bibliography / BC: Additional Bibliography]

- [BB] Ashby, Michael F.. Engineering Materials. [Vol.] 1, An introduction to their properties and applications / by Michael F. Ashby and David R. H. Jones . - 2nd ed., [6th] repr. Oxford [etc.] : Butterworth Heinemann, 2002
- [BB] Ashby, Michael F.. Engineering Materials. [Vol.] 2, An introduction to Microstructures, Processing and Design / by Michael F. Ashby and David R. H. Jones . - 2nd ed., [3rd] repr. Oxford [etc.] : Butterworth Heinemann, 2001
- [BB] Tecnología de materiales / José Antonio Puértolas Ráfales , Ricardo Ríos Jordana, Miguel Castro Corella, José Manuel Casals Bustos (eds.) ; [Luis Alberto Angurel Lambán, Miguel Artigas Álava, Javier Castany Valeri, Isabel Clavería, Jesús Cuartero Salafranca, Juan Carlos Díez Moñux, Jesús Fuentelsanz Gallego, Luis Gracia Villa, Antonio Miravete de Marco, José Ignacio Peña Torre, Javier Rubín Llera, Anselmo Vilellas Malo ... (et al.)] Madrid : Síntesis, D.L. 2009
- [BB] Tecnología de superficies en materiales / José Antonio Puértolas Ráfales, Ricardo Ríos Jordana, Miguel Castro Corella, José Manuel Casals Bustos (eds.) ; [José Ignacio Arnaudás Pontaque, Ricardo Ibarra García, Francisco Villuendas Yuste ... (et al.)] Madrid : Síntesis, D.L. 2010
- [BC] Alting, Leo. Procesos para ingeniería de manufactura / Leo Alting México, D.F. : Alfaomega, cop. 1990
- [BC] Borrell Tomás, M^a Amparo. Materiales de carbono : del grafito al grafeno / M^a Amparo Borrell Tomás, M^a Dolores Salvador Moya Barcelona : Reverté ; [Valencia] : Editorial Universitat Politècnica de València, D.L. 2015
- [BC] Bralla, James.. Manual de diseño de producto para manufactura [recurso electrónico] : guía práctica para producción a bajo costo / James Bralla. . México : McGraw-Hill Interamericana, 1993.
- [BC] Easterling, K. E.. Introduction to the Physical Metallurgy of Welding / Kenneth Easterling . - 1st ed. London : Butterworths, 1983
- [BC] Easterling, K. E.. Materiales del futuro / Ken Easterling ; traducido por Javier Fernández . - [3^a ed.] Londres : The Institute of Materials, cop. 1997
- [BC] Groover, Mikell P.. Fundamentos de manufactura moderna : Materiales, procesos y sistemas / Mikell P. Groover . - 1a ed. México : Prentice-Hall Hispanoamericana, cop. 1997
- [BC] Kalpakjian, Serope. Manufactura, ingeniería y tecnología. Vol. 1, Tecnología de materiales / Serope Kalpakjian, Steven R. Schmid ; traducción Jesús Elmer Murrieta Murrieta ; revisión técnica Ulises Figueroa López, Francisco Sandoval Palafo. 7^a ed. Naucalpan de Juárez (México) : Pearson Educación, 2014
- [BC] Kalpakjian, Serope. Manufactura, ingeniería y tecnología. Vol. 2, Procesos de manufactura / Serope Kalpakjian, Steven R. Schmid ; traducción Javier Enríquez Brito ; revisión técnica Ulises Figueroa López, Francisco

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Sandoval Palafox, Jorge Eduardo Aguirre Aguilar . - 7ª ed. Naucalpan de Juárez (México) : Pearson Educación, 2014

- [BC] kou, Sindo. Welding Metallurgy / S. Kou . Ed. Wiley, 2003
- [BC] Liesa Mestres, Francisco. Adhesivos industriales / Francisco Liesa y Luis Bilurbina Barcelona : Marcombo Boixareu, D.L. 1990
- [BC] Lund, Herbert F.. Manual McGraw-Hill de reciclaje / Herbert F. Lund ; traducción y revisión técnica, Juan Ignacio Tejero Monzón ... [et al.] . - [1a. ed. en español] Madrid [etc.] : McGraw-Hill, D.L. 1996
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URL list:

- Matweb Material Property Data [<http://www.matweb.com/search/MaterialGroupSearch.aspx>]