29742 - Advanced Industrial Materials

Información del Plan Docente

Academic Year	2018/19
Subject	29742 - Advanced Industrial Materials
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.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

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

4.Methodology, learning tasks, syllabus and resources

4.1.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.

4.2.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

4.3.Syllabus

1. METALLIC AND NON METALLIC MATERIALS.

Advanced steels and cast irons. Alloys for low and high temperature applications: Superalloys and ODS alloys. Shape memory alloys. Glassy metals. Metallic foams. Metal matrix composites. Properties and applications. Polymer matrix composites. Ceramic matrix composites.

2. WELDS AND ADHESIVE JOINTS.

Welding processes. Friction and Friction Stir welding. Microstructure of the welded zone in ferrous and non-ferrous alloys. Weldability. Cracking in welds: causes and remedies. Mechanical and non-destructive tests on metallurgical welds. Adhesives and adhesion mechanisms. Surfaces preparation. Joint design and strength. Joining wood, metals, plastics, composite structures and rubber. Applications.

3. MODIFICATION OF SURFACES AND COATINGS.

Classification. Classic surface treatments. New surface treatments. PVD (physical vapour deposition). CVD (chemical vapour deposition). Ion implantation. Thermal projection. The laser applied to surface treatments.

4. ANALYSIS OF FAILURES IN SERVICE.

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Analysis methodology on damage and failure mechanisms: Brittle and
ductile fracture, fatigue, creep, wear, corrosion, etc. Investigation and identification techniques: non-destructive tests, metallography, scanning electron microscopy, destructive tests. The technical report.

4.4.Course planning and calendar

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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 Ingenieria y Arquitectura " (EINA) website: https://eina.unizar.es/

4.5.Bibliography and recommended resources