25807 - Materials

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	558 - Bachelor's Degree in Industrial Design and Product Development Engineering 271 - Bachelor's Degree in Industrial Design and Product Development Engineering
ECTS	6.0
Course	---
Period	Indeterminate
Subject Type	Compulsory
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

CB01. Students have demonstrated knowledge and understanding in a field of study that is part of the general secondary education curricular, and is typically at a level which, although it is supported by advanced textbooks, includes some aspects that involve knowledge of the forefront of their field of study.

CB02. Students can apply their knowledge to their work or vocation in a professional manner and have competences typically demonstrated through devising and defending arguments and solving problems within their field of study.

CB03. Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include an important reflection on social, scientific or ethical issues.

CB04. Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.

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CB05. Students have developed those skills needed to undertake further studies with a high degree of autonomy.

GC01. Able to acquire basic knowledge of the profession of industrial design, to combine that generalist knowledge and expertise with those who generate innovative and competitive proposals.

GC02. Ability to analyze and assess social and environmental impact of technical solutions, acting with ethics, professional responsibility and social commitment.

GC03. Ability to design and develop design projects in aspects related to the nature of products and services, their relevance to the market, usage environments and user, and based on their manufacture, the selection of materials and processes most appropriate in each case considering relevant aspects such as quality and product improvement.

GC05. Capacity to collect, manage, analyze and synthesize information from various sources for the development of design projects and product development. Capacity to use this documentation to obtain conclusions aimed at solving problems and making decisions with initiative, creativity and critical thinking, in order to generate new product concepts, new ideas and solutions.

GC06. Ability to generate the necessary documentation for the proper transmission of ideas through graphics, reports and technical documents, models and prototypes, oral presentations in Spanish and other languages.

GC07. Ability to use and master techniques, skills, tools and techniques and communication and others specific of design engineering needed for design practice.

GC08. Ability to learn continuously, to develop autonomous learning strategies and to work in multidisciplinary groups with motivation and determination to achieve goals.

GC09. Knowing the industries, organizations, regulations and procedures and other elements to be considered in industrial design projects.

SC07. Knowledge of the fundamentals of science, technology and materials chemistry. Understanding the relationship of microstructure, synthesis or processing, the material properties and behavior in service to develop product concepts in aspects of the most suitable materials in each case.

CB: Basic Competences. GC: General Competences. SC: Specific Competences.

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

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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.

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

5.2.Learning activities

- Lectures: 42 hours
- Laboratory sessions: 14 hours
- Problem solving tasks and Problem-based learning: 30 hours
- Individual work : 59 hours
- Examination: 5 hours

5.3.Program

0. Introduction: Materials Science and Engineering

1. Mechanical properties of materials. Materials quality control

1.a. Destructive inspections and tests.

1.b. Metalography

2. The Structure of Crystalline Solids

2.a. Fundamental theoretical concepts

2.b. Imperfections in Solids and Diffusion processes

3.. Strengthening Mechanisms

4. Metallic alloys

4.a. Iron-Carbon Alloys

4.b. Different types of steel. Thermal treatments

4.c. Light metallic alloys Al, Mg y Ti

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4.d. Heavy metallic alloys. Cu and copper alloys

5. Ceramic materials

5.a. Properties, applications and processing of ceramics

5.b. Different types of ceramic materials

6. Polymeric materials

6.a. Different types, applications, and properties of polymers

6.b. Processing of polymers

7. Composite materials.

8. Corrosion of Materials

8.a. Study of corrosion processes.

8.b. Study of corrosion protection systems

Laboratory sessions:

1. Tensile strength tests on metals

2. Brinell, Vickers and Rockwell hardness tests

3. . Hardness tests on polymer materials

4. Deformation and recrystallization of copper

5. Metalography test

6. Thermal treatment of steel

7. Charpy impact test

8. Tensile strength tests on plastics

9. Thermal shock test on glasses

10. Tensile strength tests on composites

5.4.Planning and scheduling

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

5.5.Bibliography and recomended resources

Basic bibliography:

- William D. Callister "Introducción a la Ciencia e Ingeniería de los Materiales". Ed. Reverté
- M. Ashby and K. Johnson "Materials and Design: The Art and Science of Material Selection in Product Design". Elsevier
- Smith, William F. "Fundamentos de la Ciencia e Ingeniería de Materiales". De. McGraw-Hill.
- Coca / Rosique. Ciencia de Materiales. Ed. Pirámide
- 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 F. Ashby "Materials Selection in Mechanical Design". Elsevier
- Donald R. Askeland "La Ciencia e Ingeniería de los Materiales" Ed. Grupo Editorial Iberoamérica.
- James F. Shackelford "Introducción a la Ciencia de Materiales para Ingenieros". Ed. Prentice may

Specific bibliography:

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- Michael Ashby, Hugh Shercliff and David Cebon "Materials, Engineering, Science, Processing and Design". Butterworth-Heinemann
- Avner. Introducción a la Metalurgia Física. Ed. McGraw-Hill.
- J. Apraiz Barreiro. Tratamientos Térmicos de los Aceros. Ed. Dossat
- Hellerich / Harsch / Haenle. Guía de materiales plásticos. Propiedades, ensayos, parámetros. Ed. Hanser
- M. A. Ramos Carpio "Ingeniería de los materiales plásticos" . Ed. Diaz de Santos
- Eduardo A. Mari "Los materiales cerámicos". Ed. Librería y Editorial Alsina
- Antonio Miravete "Materiales Compuestos I y II". Ed INO Reproducciones S.A.
- Hull, Derek. "Materiales compuestos". Cambridge University Press. Edición española: Editorial Reverte, S.A..
- Enrique Otero "Corrosión y degradación de materiales". Ed Sintesis
- NAVARRO LIZANDRA, José Luis. Maquetas, modelos y moldes: materiales y técnicas para dar forma a las ideas. Ed. Editorial: Publi. Univ. Jaime I