Course guide
340662 - MATD - Design Materials

Last modified: 03/04/2024

Unit in charge: Vilanova i la Geltrú School of Engineering
Teaching unit: 702 - CEM - Department of Materials Science and Engineering.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2009). (Optional subject).

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Maite Baile Puig

Others: Maite Baile Puig

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. D10. Knowledge of beginning of science and material technology to select materials and its processes as well as its repercussion into design, redesign development of products.

Transversal:
2. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

TEACHING METHODOLOGY

In the theory classes the basic concepts of the subject will be introduced and the basic techniques for the resolution of exercises and laboratory practices will be explained. There will be group presentations of proposed topics and they will be discussed based on the contributions of the students. Oral communication will be worked through the presentation of the works and the resolution in public of the proposed problems.
In the practical classes, the knowledge acquired to carry out the proposed laboratory practices will be applied and the results obtained will be interpreted and discussed. The competence of teamwork and use of information resources will be developed.
In non-contact activities, the teacher supervises the student's work by analyzing his / her evolution through the evaluation acts and the directed activities.
The scheduled activities are subject to the availability of spaces and material.

LEARNING OBJECTIVES OF THE SUBJECT

Relating microstructure, processing and properties of materials.
Select materials based on their physical, chemical, thermal and mechanical properties.

STUDY LOAD

Type	Hours	Percentage
Hours small group	15,0	10.00
Hours large group	45,0	30.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

(ENG) -

Description:
Material selection methods

2. STEELS AND CAST IRONS

Description:
Fe-C alloys
Heat treatments
Superficial treatments
Practical examples

3. Other metallic materials

Description:
Aluminium and alloys
Magnesium and alloys
Titanium and alloys
Cooper and alloys
Practical examples

4. Polimeric materials

Description:
Types of polymers. Thermomechanical properties of polymers. Natural polymers.
Practical examples and case studies.

5. Ceramics and Composites

Description:
Ceramics and glass. Mechanical properties of ceramics and glass
Composite materials.
Practical examples

Specific objectives:
Ceramics and glass. Mechanical properties of ceramics and glass
Composite materials.
Practical examples

6. Smart materials and functional materials

Description:
Shape memory materials
Chromoactive materials
Photoactive materials
Electroactive materials
Biomaterials
Construction materials
Materials for additive manufacturing
Practical examples

GRADING SYSTEM

The assessment of the subject will be done according to the following indicators:
T, Theory: average partial examination 1, PT1, and content test, PT2.
P, resolved exercises and moodle questionnaires: average of the different exercises done.
L, Practices of Laboratory: Average of the different practices
W, Work and exhibition
F, Final exam.
The global rating will be obtained:

1. It will be necessary to pass the subject, according to this scale, to have participated, at least, in 75% of the presentations made in the classroom and to have carried out the evaluations of the same
Final grade= 0,3PT1+0,3PT2+0,1P+0,2L + 0,1W
2. For students who fail scale 1 or who have not assisted/evaluated peers in 75% of submissions
Final grade = 0,6F+0,1P+0,2L+0,1W

The laboratory practices, the tests carried out via Campus Digital and the activities carried out in the classroom during the regular period of classes (problems and / or presentations of work) will not be re-evaluated.

The completion and presentation of the corresponding reports of at least 75% of the laboratory practices will be a necessary condition for the approval of the subject. It will also be a necessary condition to have participated in, at least, 75% of the presentations made in the classroom and to have made the evaluations of them.

EXAMINATION RULES.

All planned activities, except activity 4 (moodle test), are face-to-face and have a part of autonomous learning. Practical laboratory activities have a laboratory face-to-face part and a part of autonomous learning. Before and during practical exercise and laboratory classes, students will discuss in small groups the proposed practice. The evaluation of your task will influence the evaluation. In laboratory working sessions, the teacher will guide students in the application of theoretical concepts for the resolution of experimental tests, working at all times critical reasoning. Activities are proposed for students to solve in the laboratory and outside the laboratory, in order to promote the contact and use of the basic tools necessary for the conduct of the tests. Students, autonomously, have to work on the material provided by the teacher in order to assimilate and fix concepts. The teaching staff will provide a study and activity monitoring plan (Athena).
The conditions for carrying out individual written exams will be announced in each case with sufficient time.

BIBLIOGRAPHY

Basic:
- Askeland, Donald R. .; Wright, Wendelin J. ciencia e ingeniería de materiales. 7a ed. México D.F: Cengage Learning, 2021. ISBN 9786075260624.
- Callister, William D;Rethwisch, David G. Ciencia e ingeniería de materiales. 2a ed. Barcelona [etc.]: Reverté, 2016. ISBN 9788429172515.
- Smith, William F.; Hashemi, Javad. Fundamentos de la ciencia e ingenieria de los materiales [on line]. 7a ed. Ciudad de México: McGraw-Hill, 2023 [Consultation: 19/02/2025]. Available on: https://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=18989. ISBN 9781456294878.
- Ashby, M. F.; Jones, David R. H. Materiales para ingeniería, vol. 1, introducción a las propiedades, las aplicaciones y el diseño [on line]. Barcelona: Reverté, 2008-2009 [Consultation: 14/02/2024]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=5635457. ISBN 9788429172553.
- Addington, Michelle; Schodek, Daniel L. Smart materials and technologies : for the architecture and design professions. Amsterdam: Architectural Press, 2005. ISBN 9780750662253.
- Mangonon, Pat L. Ciencia de materiales : selección y diseño. México [etc.]: Prentice Hall, 2001. ISBN 9702600278.
- Ashby, M. F; Jones, David R. H. Materiales para ingeniería, vol. 2, introducción a la microestructura, el procesamiento y el diseño [on line]. Barcelona [etc.]: Reverté, 2008-2009 [Consultation: 02/06/2020]. Available on: http://www.ingebook.com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=7725. ISBN 9788429172577.

Complementary:
- Ashby, M. F.; Johnson, Kara. Materials and design : the art and science of material selection in product design [on line]. 2nd ed. Amsterdam [etc.]: Elsevier Butterworth Heinemann, 2010 [Consultation: 20/02/2024]. Available on: https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9781856174978/materials-and-design. ISBN 9781856174978.
- ASM handbook. Vol. 20, Materials selection and design. Materials Park, Ohio: ASM International, 1997. ISBN 0871703866.

RESOURCES

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