

COURSE: CHARACTERIZATION OF THE MECHANICAL BEHAVIOUR AND OTHER PROPERTIES

SUBJECT: Materials characterization and experimentation

MODULE: Specific knowledge module

PROGRAM: Master's degree in Materials Science and Engineering

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GENERAL CHARACTERISTICS*

Type: Basic formation, Compulsory, Optional

Master Thesis, External practices

Duration: Semester

Semester / s: 1

Number of ECTS credits: 4

Languages: Spanish, Catalan

DESCRIPTION

BRIEF DESCRIPTION AND JUSTIFICATION

The aim of the course is that the students acquire knowledge of the most important mechanical, optical and electrical properties of solids, as well as laboratory techniques for obtaining their related parameters. It is intended that the student acquires a broad knowledge of the physics of the tests to be able to carry out the presented experiments with complete control, as well as being available to create derivations or new characterization approaches.

COMPETENCES

- E9 - Have knowledge of the most common techniques of mechanical, surface, electrical and optical characterization, as well as their limitations, for the characterization of ceramics, metals, polymers and composite materials.
- E10 – Ability to select the most appropriate characterization technique of the mechanical, surface, electrical and optical properties of materials, as well as to interpret an analytical procedure and to characterize it by defining suitable parameters.
- CG2 - The ability to perform a responsible practice of the profession.
- CB6 - To have and understand the required knowledge that provides the basis or opportunity to be innovative in the development and/or application of ideas, often in a research context.
- CB7 - To apply their knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study

PREREQUISITES*

The corresponding to access master studies

CONTENTS

0. Introduction to the subject

* These features should not be modified without the approval of the bodies responsible for academic higher-level structures (field, module and / or system).

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1. Characterization of the mechanical behavior
2. Characterization of the surfaces
3. Characterization of the optical properties
4. Characterization of the electrical properties

METHODOLOGY

LEARNING ACTIVITIES *

Learning Activities	ECTS credits	Competences
Lectures	1,15	E9, E10, CG2, CB6, CB7
Seminars	0,07	E9, E10, CG2, CB6, CB7
Case and Problem-Solving Sessions	0,15	E9, E10, CG2
Personal study	2,33	E9, E10, CG2
Presentations	0,15	E9, E10, CG2
Assessment Tasks (Exams, Continuous Assessment...)	0,15	E9, E10, CG2
TOTAL	4	

TEACHING METHODOLOGY

The teaching methodology is carried out through lectures, where the most relevant parameters of the study are obtained based on test regulations. The student must complete the problem solving training individually, from the dossier of statements of several cases, and the availability of hours of consultation with the teacher. It is completed with the preparation of presentations, and search for research articles. In this way, knowledge and practice are acquired in a participatory manner in each of these parts.

ASSESSMENT

ASSESSMENT METHODS *

Assessment methods	Weight	Competences
Final exam / Midterm Exams	65%	E9, E10, CB6, CB7
Reports and Presentations	28%	E9, E10, CG2
Follow-up activities	2%	E9, E10, CG2
Participation	5%	CG2

LEARNING OUTCOMES

- The student must know the most common spectroscopic, diffraction, microscopy and surface techniques for the characterization of ceramics, metals, polymers and composite materials, as well as their limitations. (E7)

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- The student must know the most common techniques for the mechanical, superficial, electrical and optical characterization of ceramics, metals, polymers and composite materials, as well as their limitations. (E9)
- The student must be able to select the most appropriate analysis technique in the mechanical, superficial, electrical and optical characterization of concrete materials and to relate the structure and properties of the materials with the results obtained. (E10)
- The student must demonstrate sufficient knowledge and ability to interpret an analytical procedure and characterize it by defining the appropriate parameters. (E10)
- The student must demonstrate knowledge of the repercussions derived from the misuse of the characterization techniques and their results. (CG2)

QUALIFICATION

The final grade of the subject will be calculated, in base 10, in the following way, taking into account each one of the activities (Final Exam and Midterm Exams 65%, Follow-up activities 2%, Reports and Presentations 28% and Participation 5%):

$$Grade = 0,65 \cdot A + AC \cdot 0,02 + PRS \cdot 0,28 + PRT \cdot 0,05$$

<i>Grade</i>	Final grade of the course
<i>A:</i>	Final Exam and Midterm Exams
<i>AC:</i>	Follow-up activities grade
<i>PRS:</i>	Reports and Presentations grade
<i>PRT:</i>	Participation grade

The final exam and mid-term exams grade is calculated according to the best grade of both following options:

Option 1: Final Exam grade, *EF*.

$$A1 = EF$$

Option 2: Weighted average grade between the final exam *EF* and the average of the two midterm exams

$$C = \frac{C1 + C2}{2};$$

$$A2 = 0,65 \cdot EF + 0,35 \cdot C$$

<i>C_i:</i>	Mid-term exams grade
<i>C:</i>	Average grade of the midterm exams

To average by formula, the test grade *A* (option *A1* or *A2*) must be equal to or greater than 4.

The continuous activities note *AC* will be calculated as the average of the proposed activities.

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It is compulsory to submit a high degree of attendance (approximately 75%) to pass the subject. An attendance lower than the indicated one, without cause, implies the direct fail of schooling of the present c.

ASSESSMENT OF THE COMPETENCES

For the evaluation of E9 and E10 competences it will be used as an indicator the final exam, and presentations of work and monitoring activities.

For the assessment of competence CG2 it will be used as an indicator the participation, reports and presentations and follow-up activities marks.

For the assessment of CB6, CB7 competences will be used as an indicator the final exam.

BIBLIOGRAPHY

- KYRIAKOS KOMVOPOULOS, "Mechanical Testing of Engineering Materials", Academic Publishing. San Diego, CA, 2010
- ROYLANCE, D. "Mechanical properties of materials". Ed. Massachusetts Institute of Technology, 2008
- TABOR, D. "The hardness of Metals," Clarendon Press. Oxford, 1951
- "Concise Enciclopedia of Materials Characterization". Editors: R.W. Cahn FRS & E. Lifshin. Pergamon Pres, 1993
- Normativas UNE-ISO / ASTM

DOCUMENT HISTORY

PREVIOUS CHANGES

September 14, 2016, Dr. Josep Maria Puigoriol

July 2015, Dr. Josep Maria Puigoriol

September 2014, Dr. Josep Maria Puigoriol

CURRENT REVISION

February 26, 2019, Dr. Josep Maria Puigoriol