

COURSE: ADVANCED-MATERIALS SYNTHESIS LABORATORY

SUBJECT: Characterization of materials 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: 8

Languages: Spanish, Catalan, English

DESCRIPTION

BRIEF DESCRIPTION AND JUSTIFICATION

The Advanced-Materials Synthesis Laboratory course develops at a practical level the contents taught in the theoretical subjects. The experimental work will serve as a basis to review contents of synthesis of materials and their characterization. The objective of the laboratory is to confront the students with the typical problems of experimental work and allow them to provide solutions from the knowledge that they have learnt in the theoretical subjects

COMPETENCES

- E11 – Ability to design, plan and perform experiments to synthesize specific materials, as well as to interpret the results obtained in the experiments performed to determine the structure of these materials
- CG2 - The ability to perform a responsible practice of the profession.
- CB9 - To communicate conclusions and the reasons that sustain them, to specialized and non-specialized audiences in a clear and unambiguous way
- CB10 – To understand the need for life-long learning in a self-directed or autonomous way.
- T1 - Ability to communicate in English and to use English as a working language

PREREQUISITES*

The corresponding to access master studies

CONTENTS

1. Synthesis of Materials
 - a. Synthesis of Ceramic materials
 - b. Synthesis of polymeric materials
 - c. Synthesis of metallic materials
2. Characterization
 - a. Metallographic preparation

* 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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- b. Mechanical characterization (universal testing machine, Vickers hardness, Rockwell hardness, microhardness ...)
- c. Physical-Chemical Characterization (IR, thermal analysis, Diffraction RX, BET, ...)
- d. Microscopy (SEM, M. óptica, AFM) Powder Characterization

METHODOLOGY

LEARNING ACTIVITIES *

Learning Activities	ECTS credits	Competences
Lectures	0.37	E11, CG2
Seminars	0.19	E11, CB9, CB10, CG2, T1
Practical & Lab Work	6.93	E11, CB9, CB10, CG2, T1
Presentations	0.37	E11, CG2, CB9, T1
Assessment Tasks (Exams, Continuous Assessment...)	0.15	E11, CB9
TOTAL	8	

TEACHING METHODOLOGY

Students work in groups of 4-5 people with a leader that varies in each practice.

The laboratory practices are based on the synthesis of a material (either metallic, ceramic or polymeric) and its subsequent characterization. A synthesis is proposed from one or several scientific papers and the students must, based on the characterization of the products obtained individually, draw group conclusions.

Pre-laboratory work includes a presentation in which the students review key terms for the development of the practice, as well as the description of the methods and materials that will be necessary for this. The students decide the test conditions and the characterization they perform.

All the steps taken and the results should be reflected in the laboratory journal that will be reviewed regularly.

Once the experimental part is finished, each of the students must write a short report on the individual results obtained. The leader of the practice must analyze the results obtained to present the group results in the form of a scientific article in English.

ASSESSMENT

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ASSESSMENT METHODS *

Assessment methods	Weight	competences
Lab Work	50%	E1, E2, CB6, CB7, CB8
Reports and Presentations	20%	E1, E2, CG2, CB9
Follow-up activities	25%	E1, E2, CG2
Participation	5%	CG2

LEARNING OUTCOMES

- The student must demonstrate his ability to design, plan and perform experiments to synthesize concrete materials. (E11)
- The student must demonstrate his ability to interpret the results obtained in the experiments carried out to determine the structure of materials obtained. (E11)
- The student must demonstrate their ability to communicate effectively both orally and in writing. (CB9, T1).
- The student must be able to develop learning skills and recognize the need for ongoing training for proper professional development. (CB10)

QUALIFICATION

The evaluation of the course will consider all the aspects that appear in the evaluation table with their corresponding weight. The main weight of the grade lies in the experimental work that includes the reports of the practices carried out (50%). The papers and presentations include the presentations prior to the practice that take place in class and the article about the practice (10% + 20%, respectively). Follow-up activities include the laboratory diary and the practice planning (15%). Participation (5%) includes attitude, assistance and initiative shown by the student in the laboratory.

ASSESSMENT OF THE COMPETENCES

For the evaluation of the E11 competence, the participation grade, the papers and presentations and the follow-up activities will be used as an indicator.

For the evaluation of CG2 competence, the participation grade will be used as an indicator

The T1 competence will be evaluated from the reports and presentations grade.

The competencies CB9 and CB10 will be evaluated from the follow-up activities and laboratory work

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BIBLIOGRAPHY (Recommended and accessible to students.)

- Scientific papers

DOCUMENT HISTORY

PREVIOUS CHANGES

September 14, 2016, Ana Ramos

September 4 2014 Ana Ramos, Dr. Carles Colominas

CURRENT REVISION

February 26, 2019, Ana Ramos