

Degree programme	Type	Course
Nanoscience and Nanotechnology	OB	3

Contact lecturer

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Teaching staff

Galien Grosjean

Group languages

You can consult this information at the [end](#) of the document.

Prerequisites

NONE

Objectives

- Acquire practical knowledge of the most relevant techniques for materials and surface characterization, while reinforcing the theoretical knowledge acquired in previous courses.
- Develop practical skills in the use of equipment and specific software for structural, surface, and morphological characterization.
- Foster critical thinking and analytical skills through the writing of technical laboratory reports.

Learning outcomes

- CM25 (Propose optimal synthesis, fabrication and characterisation methods based on the desired properties and functionalities of nano-systems.) Propose optimal synthesis, fabrication and characterisation methods based on the desired properties and functionalities of nano-systems.
- CM27 (Work in teams to develop practical cases in the field of nanotechnology and assess their social, economic and environmental impact.) Work in teams to develop practical cases in the field of nanotechnology and assess their social, economic and environmental impact.
- KM46 (Describe the principles of atomic and molecular manipulation.) Describe the principles of atomic

and molecular manipulation.

- SM37 (Synthesise and characterise nanomaterials, as well as simple micro and nano-systems.)
Synthesise and characterise nanomaterials, as well as simple micro and nano-systems.
- SM40 (Use digital tools and documentary sources to obtain, analyse and present information from a critical perspective in the field of nanotechnology.) Use digital tools and documentary sources to obtain, analyse and present information from a critical perspective in the field of nanotechnology.

Contents

I. Mandatory Theoretical-Practical Preparation Sessions

- Session 1. Introduction to the course. Introduction to Materials Characterization. Activity: *"How to write a lab report."*
- Session 2. Diffraction and electron microscopies techniques. Description of the related practical sessions.
- Session 3. Surface engineering. Description of the related practical sessions.
- Session 4. Scanning probe microscopies techniques. Description of the related practical sessions.

II. Mandatory Laboratory Practical Sessions

- Diffraction Practicals (XRD and ED)
- AFM Practical
- STM Practical
- Surface Treatment Practical
- Surface Tension Practical
- Electron Microscopy Practical

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Bibliography research	5	0.2	CM27, SM40
Problem solving	10	0.4	CM27, SM40
Theory lectures	12	0.48	CM25, CM27, KM46, SM40
Practice report redaction	28	1.12	CM25, CM27, KM46, SM40
Laboratory sessions	48	1.92	CM25, CM27, KM46, SM37, SM40
tutorized learning	2	0.08	SM40
Practice guides lectures	22	0.88	SM40
Individual and autonomous Study	20	0.8	KM46, SM37, SM40

Theoretical sessions (review of concepts acquired in previous courses, introduction of new concepts, and description of the teaching laboratory equipment with special emphasis on the differences compared to research equipment).

Theoretical-practical sessions involving demonstrative exercises, reading of the lab manual, discussion of key tasks, and expected results.

Practical laboratory sessions focused on equipment handling and solving practical problems.

Self-learning through the writing of lab reports.

Students will find in the Moodle platform of the course the lecture notes in PDF format, group distribution, calendar, and lab manuals. To make the most of the practical sessions, students must review -before each lab- the corresponding theory, the lab manual, and any complementary materials (articles, videos, etc.).

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Exam	25	3	0.12	CM25, KM46
Practical test	25	0	0	CM25, KM46
Laboratory sessions reports	50	0	0	CM25, CM27, KM46, SM37, SM40

The competencies of this course will be assessed through different methods, each with a certain weight in the final grade.

- Theoretical exam: a written test will be administered, with a weight of 25% of the final grade.
- Mandatory self-learning activity, designed to prepare for the corresponding practical session. Failure to complete it on time will result in a penalty of 0.5 points out of 10 in the grade of the corresponding practical activity.
- Practical exam: an individual practical test will be conducted to assess the knowledge acquired from the

- different laboratory sessions, with a weight of 25% of the final grade.
- Group submission of laboratory reports, which will count for 50% of the final grade.

To pass the course, students must:

- Complete all evidence from the mandatory theoretical-practical sessions.
- Complete all mandatory laboratory sessions.
- Complete the self-learning activities prior to the practical sessions.
- Obtain a minimum score of 3.5 out of 10 in the theoretical exam.
- Achieve an overall final grade equal to or higher than 5 out of 10.

Those who do not achieve 3.5 in the theoretical exam or do not reach an overall grade of 5, but have completed all mandatory activities, will be allowed to take a resit exam for the theoretical part.

This subject does not consider the possibility of evaluation in the modality of "unique evaluation".

In this subject, the use of Artificial Intelligence (AI) technologies is permitted as an integral part of the coursework development, provided that the final result reflects a significant contribution by the student in terms of personal analysis and reflection. The student must clearly identify which parts have been generated using this technology, specify the tools employed, and include a critical reflection on how these have influenced the process and the final outcome of the activity. A lack of transparency in the use of AI will be considered a breach of academic honesty and may result in a grade penalty for the activity, or more severe sanctions in serious cases.

Committing any irregularity during an assessment activity (academic fraud, plagiarism, or misuse of AI, unless such use is expressly authorized in the teaching guide) that could lead to a significant variation in the grade will result in that specific activity being graded as a 0. If the teaching guide stipulates that passing the subject requires a minimum grade in that specific assessment activity, or if multiple irregularities occur across different assessment activities within the same subject, the final grade for the subject will be 0. Aside from this, disciplinary proceedings may be initiated against any student who commits any of these irregularities.

Bibliography

Bibliografia (llibres virtuals disponible a la biblioteca)

Leng, Y. (2013). Materials characterization : introduction to microscopic and spectroscopic methods. (2nd ed.) John Wiley

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Software

Data analysis software (Matlab, Excel, or equivalent). Proprietary software for each experimental device (provided in the laboratory).

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	1	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	1	Catalan	second semester	morning-mixed
(PLABs) Suport a les pràctiques de laboratori	1	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	2	Catalan	second semester	morning-mixed
(PLABs) Suport a les pràctiques de laboratori	2	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	3	Catalan	second semester	morning-mixed
(PLABs) Suport a les pràctiques de laboratori	3	Catalan	second semester	morning-mixed