Microscopies Laboratory and Materials Characterisation

Code: 106834
ECTS Credits: 6

2025/2026

Degree	Type	Year
Nanoscience and Nanotechnology	OB	3

Contact

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Teachers

Gemma Garcia Alonso

Teaching groups languages

You can view this information at the end of this document.

Prerequisites

NONE

Objectives and Contextualisation

- 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

1. CM25 (Competence) Propose optimal synthesis, fabrication and characterisation methods based on the desired properties and functionalities of nano-systems.
2. CM27 (Competence) Work in teams to develop practical cases in the field of nanotechnology and assess their social, economic and environmental impact.
3. KM46 (Knowledge) Describe the principles of atomic and molecular manipulation.
4. SM37 (Skill) Synthesise and characterise nanomaterials, as well as simple micro and nano-systems.

5. SM40 (Skill) Use digital tools and documentary sources to obtain, analyse and present information from a critical perspective in the field of nanotechnology.

Content

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

Activities and Methodology

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

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

Continous Assessment Activities

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

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

- Theoretical exam: a written multiple-choice test will be administered, with a weight of 25% of the final grade.
- Mandatory online self-learning test, 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 tests 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.

Bibliography

Bibliografia (llibres virtuals disponible a la biblioteca)

A User's Guide to Vacuum Technology

First published:20 June 2003

Print ISBN:9780471270522 |Online ISBN:9780471467168 |DOI:10.1002/0471467162

Materials Characterization: Introduction to Microscopic and Spectroscopic Methods, Second Edition

First published:2 August 2013

Print ISBN:9783527334636 |Online ISBN:9783527670772 |DOI:10.1002/9783527670772

Software

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

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PLAB) Practical laboratories	1	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	2	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	3	Catalan	second semester	morning-mixed
(TE) Theory	1	Catalan	second semester	afternoon