Universitat Autònoma de Barcelona

2023/2024

Characterization of Materials

Code: 102513
ECTS Credits: 6

Degree	Type	Year	Semester
2502444 Chemistry	OT	4	1

Contact

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Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Teachers

Luis Escriche Martinez

Ramón Yáñez López

Ignacio Ramon Mata Martínez

Prerequisites

It is recommended to have completed and passed Spectroscopy and Materials Science. It is necessary to have knowledge of symmetry.

Objectives and Contextualisation

Characterization of all types of materials at any stage of their production and transformation. In addition, be able to use conventional and some advanced techniques, as well as interpret the information obtained from sophisticated and novel techniques.

Competences

- Adapt to new situations.
- Apply knowledge of chemistry to problem solving of a quantitative or qualitative nature in familiar and professional fields.
- Be ethically committed.
- Communicate orally and in writing in one's own language.

- Evaluate the health risks and environmental and socioeconomic impact associated to chemical substances and the chemistry industry.
- Learn autonomously.
- Manage the organisation and planning of tasks.
- Manage, analyse and synthesise information.
- Obtain information, including by digital means.
- Propose creative ideas and solutions.
- Reason in a critical manner
- Recognise and analyse chemical problems and propose suitable answers or studies to resolve them.
- Resolve problems and make decisions.
- Show an understanding of the basic concepts, principles, theories and facts of the different areas of chemistry.
- Show initiative and an enterprising spirit.
- Show motivation for quality.
- Show sensitivity for environmental issues.
- Use IT to treat and present information.
- Use the English language properly in the field of chemistry.
- Work in a team and show concern for interpersonal relations at work.

Learning Outcomes

1. Adapt to new situations.
2. Analyse and extract information on the composition and structure of material from results obtained using spectroscopic, microscopic and thermal techniques.
3. Be ethically committed.
4. Communicate orally and in writing in one's own language.
5. Compare the microscopic techniques for the characterisation of nanomaterial.
6. Describe the physical principles that govern interactions between X-ray radiation and matter, as well as X-ray diffraction techniques in single crystal and powder form.
7. Distinguish the different microscopic and spectroscopic surface analysis techniques.
8. Identify the basic principles of spectroscopic electron-spin resonance and nuclear magnetic resonance techniques of solids.
9. Identify the health risks associated to the use of radiation and electromagnetic fields in the different techniques for characterising materials.
10. Interpret the results obtained by thermal techniques for the characterisation of materials.
11. Justify the spectroscopic response of materials using their structural characteristics.
12. Learn autonomously.
13. Manage the organisation and planning of tasks.
14. Manage, analyse and synthesise information.
15. Obtain information, including by digital means.
16. Propose creative ideas and solutions.
17. Read, analyse and extract information from texts in the English language on the different areas of the field of material chemistry.
18. Reason in a critical manner
19. Recognise basic English terms in the crystallographic and structural fields, as well as those associated to spectroscopic and microscopic techniques and to the databases used in the characterisation of materials.
20. Resolve problems and make decisions.
21. Show initiative and an enterprising spirit.
22. Show motivation for quality.
23. Show sensitivity for environmental issues.
24. Use IT to treat and present information.
25. Use spectroscopic, crystalline structure, powder diffraction and other databases related bibliographic data.
26. Work in a team and show concern for interpersonal relations at work.

Content

1. Simetría Infinita

2. Difracción de Rayos X

3. Técnicas de Difracción de Rayos X

4. Microscopía Óptica, Electrónica y de Proximidad

5. Técnicas de Análisis Térmica

6. Espectroscopías de Dispersión y de Absorción

Methodology

Methodology:

The student will perform three types of activities: directed, autonomous and supervised.

1.- Directed activities:

Theoretical classes.

Probleme classes: The knowledge acquired in the lectures and autonomous student activities, mainly through study, are applied to the resolution of problems and exercises related to the contents of the subject.

2.- Autonomous activities: With these activities, the student alone, or in a group, must achieve the competences of the subject. These activities include studying, solving problems, writing work, reading texts and searching for bibliography.

3.- Supervised activities: The student can request the tutor of the subject tutorials of support to be able to assimilate the exposed matter in the classes of theory and / or problems, and for the resolution of works of pursuit.

The teachers will dedicate approximately 15 minutes of a class to allow the students to answer the questions of evaluation of the teaching performance and evaluation of the subject or module.

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.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures	42	1.68	2, 5, 6, 7, 14, 9, 8, 10, 11, 17, 15, 18, 19, 20, 25
Type: Supervised			
Tutorials	5	0.2	1, 2, 5, 4, 21, 22, 6, 7, 13, 14, 9, 8, 10, 11, 17, 3, 23, 15, 16, 18, 19, 20, 26, 25, 24
Type: Autonomous			

Problem resolution	16	0.64	1, 2, 12, 5, 7, 13, 14, 8, 10, 11, 15, 18, 20, 26, 25
Search of bibliography	7	0.28	1, 21, 13, 14, 8, 10, 15, 16, 18, 20, 26, 24
Study	60.75	2.43	1, 2, 12, 5, 21, 22, 6, 7, 13, 14, 9, 8, 10, 11, 17, 3, 23, 15, 16, 18, 19, 20, 26, 25, 24
Writing of works	10.25	0.41	1, 2, 12, 5, 4, 21, 22, 6, 7, 13, 14, 9, 8, 10, 11, 17, 3, 23, 15, 16, 18, 19, 20, 26, 25, 24

Assessment

Assessment of the course:

The subject will be assessed on a continuous basis and will consist of the following assessment activities:

Theoretical part

It represents 70% of the final grade. The student can choose between two ways of assessing this part:

1) Continuous assessment which will be carried out by means of two partial tests, and.

2) The final assessment which will consist of a final test.

Continuous assessment:

First partial: The contents covered in the first part of the course will be assessed (35% of the final mark).

Second partial exam: The contents covered in the second part of the course will be assessed (35% of the final mark).

If these tests are passed with an average mark equal to or higher than 5 (provided that the mark of one of the mid-term exams is not lower than 4), it will not be necessary to take the final assessment test.

If the average is lower than 5 or any of the marks of the mid-term exams is lower than 4, the student will have to take the final exam to pass the course.

Final exam:

Students who have not passed the subject in the continuous assessment will take a final exam which will cover the theoretical contents of the subject and will have a weight of 70% of the overall grade. The final exam will consist of two parts and students may sit one or both, depending on the marks obtained in the partial exams.

In order to take part in the final exam, students must have been previously assessed in a set of activities whose weight is equivalent to at least two thirds of the total mark for the subject.

In order to pass the course, the final mark must be higher than 5 (and the marks of none of the mid-term exams must be lower than 4). Final mark = mark for the mid-term exams (70%) + mark for evidence (30%).

Students who wish to improve the mark obtained in the continuous assessment may opt for the final exam but will not qualify for the matriculation mark.The final assessment will be carried out using the best mark.

Evidence / Seminars:

Will account for 30% of the final mark. Students will have to solve and/or present individually or in groups problems related to the contents of the subject that will be delivered in class.

Single Assessment

Students who have opted for the single assessment mode must take a final exam consisting of an examination of the entire subject syllabus to be taken on the day on which the students of the continuos assessment take the exam of the second partial + the delivery of the evidences (exercises/works and video of the assigned presentation).

The grade will be = Exam mark (70%) + Evidence mark (30%).

If the final grade does not reach 5, the student has another opportunity to pass the subject by means of the recovery exam to be held on the date set by the coordination of the degree. This student's exam mark will replace the old one to obtain the grade.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Evidences	30	1	0.04	1, 2, 12, 5, 4, 21, 22, 6, 7, 13, 14, 9, 8, 10, 11, 17, 3, 23, 15, 16, 18, 19, 20, 26, 24
Final test	70	4	0.16	1, 2, 12, 5, 4, 21, 22, 6, 7, 13, 14, 9, 8, 10, 11, 17, 3, 23, 16, 18, 19, 20, 25
First partial	35	2	0.08	1, 2, 12, 5, 4, 21, 22, 6, 7, 13, 14, 9, 8, 10, 11, 17, 3, 23, 16, 18, 19, 20, 25
Second Partial	35	2	0.08	1, 2, 12, 5, 4, 21, 22, 6, 7, 13, 14, 9, 8, 10, 11, 17, 3, 23, 16, 18, 19, 20, 25

Bibliography

Ferraris, G., Gilli, G., Zanotti, G., Catti, M., Artioli, G., Viterbo, D.,Giacovazzo, C. and Monaco, H.L. *Fundamentals of Crystallography*. IUCR Texts on Crystallography. Oxford Science Publications, 2002

Leng, Yang. *MATERIALS CHARACTERIZATION: Introduction to Microscopic and Spectroscopic Methods* WILEY, 2008

Software

In case the teaching is not on-site: Teams

Required software: Office or similar.