Chemistry for Specific Materials of Interest to Industry and Research

Code: 42428
ECTS Credits: 6

2024/2025

Degree	Type	Year
4313385 Industrial Chemistry and Introduction to Chemical Research	OB	0

Contact

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Teachers

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Teaching groups languages

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

Prerequisites

Teaching, including teaching materials handed over to students, will be in English, hence good communication skills in English are necessary.

The course assumes that the student has a solid chemical background (that typically shown by graduate students in Chemistry).

Objectives and Contextualisation

This focus of this subject is the study of the chemical properties of specific materials that are currently of interest for either research or Industry. The couse will cover selected examples of molecular, supramolecular, nanostructured and bulk materials, their corresponding applications in different fields and relevant techniques for their characterization.

Competences

- Apply materials and biomolecules to innovative fields of chemical industry and research.
- Correctly apply new information capture and organisation technologies to solve problems in professional activity.
- Define specialised concepts, principles, theories and facts in the different areas of Chemistry.
- Evaluate the human, economic, legal and ethical dimension of professional practice, as well as the environmental implications of one's work.
- Foster innovation and entrepreneurship in chemical industry and research.
- Identify information in the scientific literature using the appropriate channels and integrating said information to approach and contextualise a research issue.
- Innovate in chemical synthesis and analysis methods related with different areas of Chemistry.
- Possess and understand knowledge that provides a basis or opportunity for originality in the development and/or application of ideas, often in a research context
- Student should possess an ability to learn that enables them to continue studying in a manner which is largely self-supervised or independent
- Students should know how to communicate their conclusions, knowledge and final reasoning that they hold in front of specialist and non-specialist audiences clearly and unambiguously
- Use scientific terminology in the English language to defend experimental results in the context of the chemistry profession.

Learning Outcomes

1. Analyse biomaterials and apply them.
2. Correctly apply new information capture and organisation technologies to solve problems in professional activity.
3. Define the properties of specific materials.
4. Describe the properties of liquid interphases and their applications.
5. Encourage innovation in the field of materials and their applications.
6. Evaluate the human, economic, legal and ethical dimension of professional practice, as well as the environmental implications of one's work.
7. Identify information in the scientific literature using the appropriate channels and integrating said information to approach and contextualise a research issue.
8. Innovate in the synthesis and analysis methods of specific materials.
9. Interpret the properties of gels and identify their applications.
10. Possess and understand knowledge that provides a basis or opportunity for originality in the development and/or application of ideas, often in a research context
11. Propose advanced applications for supra-molecular materials and nanomaterials.
12. Student should possess an ability to learn that enables them to continue studying in a manner which is largely self-supervised or independent
13. Students should know how to communicate their conclusions, knowledge and final reasoning that they hold in front of specialist and non-specialist audiences clearly and unambiguously
14. Use scientific terminology in the English language to defend experimental results in the context of the chemistry profession.

Content

- Solids, Supramolecular materials, nanomaterials, biomaterials and liquid interphases. Molecular recognition: cationic or anionic species. Neutral molecules. Self-assembly. Molecular devices and molecular machines. Liquid interphases: Langmuir-Blodgett films, micelles, vesicles. Jordi Hernando (8 h).

- Metal-Organic Frameworks: from molecules and metal ions to crystals and superstructures. Jorge Albalad (4 h).

- Metal nanoparticles, quantum dots, nanotubes, graphenes, fullerenes, liquid crystals. Mª José Esplandiu (7 h).

- Materials for Sustainable Energy: sustainable energy, solar fuels, water splitting, hydrogen, CO_2 reduction. Xavier Sala (4 h).

- Advanced materials characterization using synchrotron radiation light. Roberto Boada (6 h)

- Materials and microfabrication technologies for miniaturized systems. Mar Puyol (6 h)

- Nanoparticles and applications in catalysis. Roser Pleixats, (3 h)

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Theory Lectures	38	1.52	1, 3, 4, 7, 5, 8, 9, 11
Type: Autonomous			
Personal Work and Study	92	3.68	2, 7, 14

Theory Lectures

The lecturer will explain the syllabus to the classroom using blackboard and multimedia material, which will be made available to the students in the "Campus Virtual" in Moodle environment. These expositive sessions will conform most of the theory lecturing of the syllabus.

Personal Study

Personal work by the student is a very important, almost indispensible aspect of the students' attitude towards passing the topic. Besides the most obvious areas (like readying and studying notes and books, preparing exercises, etc.) specific, well delimited areas of the theory syllabus will be left to the students to work out by themselves. In these cases, personal consultation hours will be made available to help coalescing the knowledge gained by the students.

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
Oral Presentations	32%	7	0.28	2, 13, 14, 6
Turned-In Exercises	6%	1	0.04	2, 7, 5, 11, 13, 12, 10, 14, 6

Written Exams	62%	12	0.48	1, 3, 4, 8, 9, 11, 14

- Every professor decides the number and typology of evaluation activities: oral presentations, written exams, delivery of discussed articles, tests.

- The final mark of the module will be the sum of the marks of every professor multiplied by the percentage of his classes in the total teaching of the module.

- To pass a module, it is mandatory a mark over 3.5 in a 75% of all the activities in order to average with other marks of the professor and/or the module.

- There will be a period in January to repeat written exams with marks under 5. In the case of exams under 3.5, it will be mandatory to the student. In the case of exams between 3.5 and 5 it would be optional.

- The marks of other evaluations activities (i. e. oral presentations) will average with the rest of the marks of the professor/module independently of the value. There will be not option of repeating these evaluation activities.

- If a student participates in less than 1/3 of the evaluation activities, he/she will be graded as "No evaluable".

VERY IMPORTANT: Partial or total plagiarising will immediately result in a FAIL (0) for the plagiarised exercise (first-year students) or the WHOLE subject (second-, third- and fourth-year students). PLAGIARISING consists of copying text from unacknowledged sources -whether this is part of a sentence or a whole text - with the intention of passing it off as the student's own production. It includes cutting and pasting from internet sources, presented unmodified in the student's own text. Plagiarising is a SERIOUS OFFENCE. Students must respect authors' intellectual property, always identifying the sources they may use; they must also be responsible for the originality and authenticity of their own texts.

In the event of a student committing any irregularity that may lead to a significant variation in the grade awarded to an assessment activity, the student will be given a zero for this activity, regardless of any disciplinary process that may take place. In the event of several irregularities in assessment activities of the same subject, the student will be given a zeroas the final grade for this subject.

Bibliography

Every lecturer will provide the students with a list of appropriate references (scientific papers, books, links, etc...) for each part of the syllabus.

Software

No specific software is employed in this module.

Language list

Name	Group	Language	Semester	Turn
(TEm) Theory (master)	1	English	first semester	morning-mixed