UAB
Universitat Autònoma de Barcelona

Industry and Research in Chemistry: Specialized Topics in Theory and Practice

Code: 42424
Credits: 9

2026/2027

Degree programme	Type	Course
Industrial Chemistry and Introduction to Chemical Research	OB	1

Contact lecturer

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Group languages

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

Prerequisites

none

Objectives

Industrial Chemistry and Introduction to Chemical Research is a mandatory module of the Masters Program in Industrial Chemistry and Introduction to Chemical Research. The objective of this course is to acquiere new knowledge and abilities in fields related to Industrial Chemistry and Chemical Research: Regulations, Patents, Experimental design, Job searching, Introduction to computational chemistry, NMR , Introduction to photochemistry, Resource optimization and environmental assessment of chemical processes, Risk and safety in chemical facilities, and Laboratory instrumental techniques and chemical analysis (including mass spectrometry, chromatography, microscopy, XRD, ICP and laboratory advanced techniques).

Learning outcomes

1. Students should be able to integrate knowledge and face the complexity of making judgements from information which, being incomplete or limited, include reflections on the social and ethical responsibilities linked to the application of their knowledge and judgements
2. 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
3. Describe quality and patent regulations.
4. Design chemical experiments.
5. Know the environmental risks associated to special substances and chemical processes.
6. Evaluate risks and security in chemical facilities and laboratories.
7. Design chemical processes that respect the environment.
8. Apply advanced analytical and instrumental techniques in a chemistry laboratory.
9. Characterise materials and biomolecules.
10. Compare microscopy and spectroscopy techniques for applications of differing natures.
11. Identify information in the scientific literature using the appropriate channels and integrating said information to approach and contextualise a research issue.
12. Use scientific terminology in the English language to defend experimental results in the context of the chemistry profession.
13. Correctly apply new information capture and organisation technologies to solve problems in professional activity.
14. Evaluate the human, economic, legal and ethical dimension of professional practice, as well as the environmental implications of one's work.

Contents

M1: Industry and Research in Chemistry: Specialized Topics in Theory and Practice

- Regulations.

- Patents.

- Experimental design.

- Job searching.

- Introduction to computational chemistry.

- NMR (theory + problem resolution + introductory practical course)

- Introduction to photochemistry.

- Resource optimization and environmental assessment of chemical processes.

- Risk and safety in chemical facilities.

- Laboratory instrumental techniques and chemical analysis.

Mass spectrometry, chromatography
Microscopy
XRD
ICP
Laboratory advanced techniques

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Individual work	146	5.84	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
Lectures	43	1.72	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
Laboratory Practice	16	0.64	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14

Lectures / Individual work:
The student acquires the knowledge of the course by attending the lectures and complementing them with the individual work. The lectures may include problem solving (theoretically based or practical exercises) and seminars.

Laboratory work
Laboratory practices will be held to achieve specific and relevant competencies.

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
Theoretical - practical tests	40%	10	0.4	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14

Reports	40%	6	0.24	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
Presentations	20%	4	0.16	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14

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Assessment

- 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.

VERY IMPORTANT: Partial or total plagiarising will immediately result in a FAIL (0) for the plagiarised exercise and the WHOLE subject. 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 zero as the final grade for this subject.

One single final assessment: Students who have opted for the "One single final assessment" modality will have to take a final test consisting of an exam covering the entire theoretical content and problem-solving exercises of the subject. This test will be held on the period as the regular assessment students take the examinations. The student's final grade will be calculated as follows: Subject Grade = (Final Test Grade * 0.85 + Laboratory Grade * 0.15). If the final grade does not reach 5, the student has another opportunity to pass the subject through a recovery exam, which will take place on a date set by the degree program coordination. In this recovery test, it will be possible to recover 85% of the grade corresponding to the theoretical part. The practical component is not recoverable. It is mandatory to pass the laboratory (minimum grade of 5.0).

For this course, the use of Artificial Intelligence (AI) technologies is permitted exclusively for support tasks such as bibliographic or information search, text correction, or translation. The student must clearly identify which parts of the assessed tasks have been generated using this technology, specify the tools used, and include a critical reflection on how these have influenced the process and final outcome of the activity. This provision does not apply to exams or in-class assessments, where the use of AI is strictly prohibited. Lack of transparency in the use of AI in assessed activities will be considered academic dishonesty and may result in a partial or full grade penalty for the activities, or more severe sanctions in serious cases.

The commission of any irregularity in an assessment activity (academic fraud, plagiarism, or improper use of AI, unless such use is expressly authorized in the course syllabus), which may lead to a significant change in the grade, will result in that activity being graded as 0. If the course syllabus specifies that obtaining a minimum grade in that assessment activity is a mandatory requirement to pass the course, or if multiple irregularities occur in the assessment activities of the same course, the final grade for that course will be 0. In addition, disciplinary proceedings may be initiated against any student who commits any of these irregularities.

Bibliography

Patents

http://www.ub.edu/centredepatents/es/
http://www.oepm.es/es/propiedad_industrial/index.html
http://www.epo.org/law-practice.html
http://e-courses.epo.org/wbts/htgaep_en/index.html

Experimental design

Richard G. Brereton, "Applied Chemometrics for Scientists", 2007, chapter 2, Wiley Chichester.
Rolf Carlson & Johan E. Carlson, "Design and optimization in organic synthesis", 2005, Series Data Handling in Science and Technology Vol. 24, Elsevier Amsterdam.
Gareth A. Lewis; Didier Mathieu & Roger Phan-Tan-Luu, "Pharmaceutical experimental design", 1999, Marcel Dekker NY.

Introduction to computational chemistry

C. J. Cramer, \"Essentials of Computational Chemistry: Theories and Models\", 2004, Wiley, 2nd edition.
F. Jensen, \"Introduction to Computational Chemistry\", 2007, Wiley, 2nd edition.
E. G. Lewars, \"Computational Chemistry: Introduction to the Theory and Applications of Molecular and Quantum Mechanics\", 2011, Springer, 2nd edition.
D. C. Young, \"Computational Chemistry: A Practical Guide for Applying Techniques to Real-World Problems\", 2001, Wiley.

Introduction to Photochemistry

Angelo Albini, "Photochemistry: Past, Present and Future", 2016, Springer-Verlag, Berlin Heidelberg.

Resource optimization and environmental assessment of chemical processes

Xavier Domènech, \"Química Verde\", 2005, Editorial Rubes, ISBN 9788449701818.
Risk Assessment and Sustainable Chemistry: http://www.epa.gov/nrmrl/std/index.html
Life Cycle Assessment: http://www.epa.gov/nrmrl/std/lca/resources.html
Donald Mackay, \"Multimedia Environmental Models\", 2001, Lewis Publishers, ISBN 1-56670-542-8.

Risk and safety in chemical facilities

D.J. Knight, \"EU Regulation of Chemicals: REACH\", 2005, Rapra Review ReportN. 181, RapraTechnology Limited, Shawbury UK.

Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency.

Laboratory instrumental techniques and chemical analysis

Thomas T. Tidwel, \"Wilhelm Schlenk: The Man Behind the Flask\", Angew. Chem. Int. ed. 2001, 40, 331-337.

Duward F. Shriver, M. A. Drezdzon, \"The Manipulation of Air-Sensitive Compounds\", 1986, J. Wiley and Sons: New York.

Software

ChemBioDraw

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
(TEm) Theory (master)	1	English	first semester	morning-mixed