Chemistry in Industry

Code: 42426
ECTS Credits: 15

2025/2026

Degree	Type	Year
Industrial Chemistry and Introduction to Chemical Research	OT	0

Contact

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Teachers

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Sergio Ponsa Salas
Jofre Ferrer-Dalmau Falgueras
(External) Amadeo Triviño
(External) Claudio Roscini
(External) David del Moral
(External) Francesc Cabré
(External) Jesús Santamaria
(External) Joan Guasch
(External) Josep Gimeno
(External) Marius Valls
(External) Miquel Osset
(External) Montserrat Closa
(External) Romina Marín

Teaching groups languages

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

Prerequisites

No previous requirements needed.

Objectives and Contextualisation

The student will acquire the knowledge of the main important aspects that are at play in a General Chemistry Industry.That will involve the main topics related to *the creation and expansion of a Chemical Company, the description of a selection of the main types of chemical activities that are currently developed in the world of the industrial chemistry, and some complementary issues that, although they are not directly related to the chemical aspects of the production process itself, are needed to efficiently run a chemical facility. The level of Knowledge obtained will range, depending on the particular topics, from a general introduction to a medium level of details and complexities.*

Competences

- Correctly apply new information capture and organisation technologies to solve problems in professional activity.
- Correctly evaluate the risks and environmental and socio-economic impact associated to special chemical substances.
- Define specialised concepts, principles, theories and facts in the different areas of Chemistry.
- Design processes that imply the treatment or elimination of dangerous chemical products.
- Evaluate responsibility in the management of information and knowledge in the field of Industrial Chemistry and Chemical Research.
- 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.
- Innovate in the spaces and environments of the field of work, showing initiative and an entrepreneurial spirit.
- 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
- Propose alternatives for the solving of complex chemical problems in different chemical specialities.
- 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. Correctly apply new information capture and organisation technologies to solve problems in professional activity.
2. Describe and analyse monographic themes of chemical products of major industrial relevance.
3. Describe the different types of sustainable energy and its applications
4. Evaluate responsibility in the management of information and knowledge in the field of Industrial Chemistry and Chemical Research.
5. Evaluate risks related with industrial products.

6. Evaluate the human, economic, legal and ethical dimension of professional practice, as well as the environmental implications of one's work.
7. Explain waste treatment procedures.
8. Identify technological applications based on biological systems and living organisms for the creation and modification of products or processes.
9. Innovate in the spaces and environments of the field of work, showing initiative and an entrepreneurial spirit.
10. Manage projects, evaluate production costs and demonstrate entrepreneurial activity.
11. 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
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

Chemistry in Industry

The creation and expansion of a Chemical Company

Entrepreneurship

Prof.: Jofre Ferrer Dalmau. jofre.ferrerdalmau@bioeclosion.com. Evaluation: Exam.

1. Introduction. From Research to Innovation

2. The entrepreneurial cycle: Innovation and creativity, risk, initiative, confidence and control.

3. Diagnosis: Culture, training and financing.

4. The tool box: Opportunity window, feasibility analysis, and business plan.

5. Funding: From "FFF" to "business angels" and "venture capital".

6. Managing and growing the venture.

Practical exercise: Each student will have to propose a business idea and assess its feasibility using the tools provided in the course.

Project Management

Prof.: David del Moral. daviddelmoralca@gmail.com. Evaluation: Group Homework.

Overview of project management concepts:

1. Project initiation.

2. Setting objectives.

3. Planning.

4. The human factor.

5. Project execution and evaluation.

Skills and technical tools of the Project Manager:

1. Specification of appropriate objectives for the project.

2. Techniques of management by objectives.

3. Roles and responsibilities of the Project Manager.

4. Preparation of Project Plan and development.

5. Evaluation and implementation.

Selected topics on Chemical Industry activities

Bulk Chemicals:

Prof.: Fernando Novio, fernando.novio@uab.cat, and Roser Pleixats, roser.pleixats@uab.cat. Evaluation: Homework and public presentation.

1. Brief history of the chemical industry (JCB)
2. The chemical industry today: facts and figures (JCB)
3. Bulk chemicals, fine chemicals and specialties (JCB)
4. The waste problem (JCB)
5. *5.* Raw materials for the chemical industry:

- Hydrosphere, atmosphere and biosphere(JCB)

1. Lithosphere: minerals, oil and gas (JCB). The shale revolution (JS)
2. Selected inorganic bulk chemicals (JCB):

- Sulfuric acid

- Phosphoric acid and phosphates

- Ammonia and derivatives

1. Organic Chemicals (JM)

- Basic products for organic industrial synthesis. C1 products

- Synthesis gas. Hydroformilation

- Methanol, Formaldehyde, Acetic Acid

- Hydrogen Cyanide

- Olefins and Acetylene

- Ethylene, Ethylene Oxide, Ethylene Glycol

- Propilene, Acetone

- 1,3-Butadiene, Isobutene, Methyl *tert*-Butyl Ether

- Lower alcohols and higher alcohols

- Aromatics

- Benzene, Phenol, Aniline, Styrene

- Xilenes, Phthalic Anhydride, Terephthalic Acid

- Components for Polyamides

- Adipic acid, Hexamethylenediamine, and e-Caprolactam

Polymers

Prof.: Fernando Novio, fernando.novio@uab.cat. Jesús Santamaria (Lubrizol Corporation) jesus.santamaria@lubrizol.com, Romina Marín (Lubrizol Corporation) romina.marin@lubrizol.com, i Josep Gimeno (Honeywell) josep.gimeno@honeywell.com. Evaluation: Homework and examination.

1. Basic concepts (FN)
2. Polymer classifications (FN)
3. Polymerization reactions (FN)
4. Polymer structure and properties (FN)
5. Biobased monomer for the polymer industry (JS)
6. Techniques for polymer characterization (RM)
7. A survey of some important polymers (FN)
8. A closer insight into the most important polymers (FN)

a) Polyolefins (FN)

b) Polyesters (FN)

c) Polyamides (FN)

d) Polyurethanes: basic concepts (JG)

- Polyurethane foams (JG)

- Polyurethane thermoplastics (RM)

9. Open discussion (FN)

Pharmaceuticals

Prof.: Francesc Cabré (Free-Lance), fcabre@ub.edu , Joan Guasch (Esteve), jguaschs@egesteve.com, Marius Valls (Galenicum), mariusvalls@gmail.com, *Montserrat Closa (Esteve), mclosa@egesteve.com, Evaluation: Exam.*

1. Historical introduction:

- Active principles in folk medicine.

- Drug development in the early twentieth century: from aspirin to antibiotics.

- Some main hits in the last 50 years: anti-tumour and antiviral drugs.

2. Drug discovery from natural products. Pain killers: from morphine to tapentadol.

3. Pharmaceutical Industry overview.

4. Research & Innovation: breakthroughs and blockbusters.

5. Drug discovery and development. From the original idea to the marketplace.

6. Analytical development of active pharmaceutical ingredients (APIs).

7. Good manufacturing practices (GMPs) and regulations.

Surfactants

Prof.: Miquel Osset (BlueSun), miquelosset@hotmail.com, Evaluation: Exam.

1. Applied chemistry of surfactants:

- Industrial sectors.

- Applications.

- Suppliers and formulations.

2. Surfactants as key ingredients in a wide variety of uses and intermediate solutions to

provide consumer relevant products.

Dyes

Prof.: Fernando Carrillo (UPC), *fernando.carrillo@upc.edu*, Evaluation: Exam.

1. Introduction.

2. Clasification of Dyes and chemical structures.

3. Dyeing of textile materials.

4. Quality control of dyed textiles.

5. Environmental aspects of textile dyeing.

Flavors and fragances

Prof.: Amadeo Triviño (Lucta), *amadeotrivino@hotmail.com*, Evaluation: Class exercice.

1. Food and its constitution: a) Basic components; b) Components of biological mechanisms; c) Active substances of sensory system.

2. Sensory attributes of food: a) The flavour of food; b) Chemical composition of natural flavours:

- Classification

- Origin

- Biogenesis of flavours

- Flavours generated by enzymatic action

- Flavours generated by heat

- Flavours generated by oxidation-rancidity

3. Human senses: taste and smell

4. Food flavours: a) Food flavouring definition; b) Function; c) Structure; d) Traditional raw materials; e) Synthetic raw materials; f) Innovative raw materials; g) Carriers and solvents.

5. Flavour design: a) Methodology; b) Organoleptic and physical properties; c) Chemical structure and odour; d) Olfactory notes; e) Olfactory families; f) Evolution of aromatic composition; g) Appearance; h) Application.

6. Sensory analysis: a) Types of analysis; b) Quantitative Descriptive Analysis.

7. Flavour production: a) Scaling; b) Practical aspects

8. Legislation: a) Definition and classification of flavours; b) Legislation in the labelling of flavors.

Food Chemistry

Prof.: Jordi Saldo, jordi.Saldo@uab.es, Evaluation: Homework.

1. Food main components and chemical properties:

- Amino acids, peptides and proteins

- Hydrocarbons.

- Oils and fats.

2. Food technology, modifications during storage and industrial processes:

- Water activity (Sorption isotherms, water binding, effect on food stability).

- Processing methods related with changes in water activity, oils and fats, proteins and hydrocarbons.

Functional Foods

Prof.: Manuel Valiente. manuel.Valiente@uab.es, Evaluation: Exam.

1. General Overview of Functional Foods.

2. Regulatory Rules.

3. Chemical Aspects of Functional Foods.

4. Case Studies.

Biotechnology processes

Prof.: Pau Ferrer. pau.ferrer@uab.es, Evaluation: Homework and Oral Presentation of a Case Study.

1. Introduction. Historic perspective. Bio-based products and processes: fields of application.

2. Industrial biotechnology in practice. Case studies of bio-based products and processes:

a. Biofuels: ethanol and others.

b. Organic acids and amino acids.

c. Antibiotics: penicillin.

d. Biopharmaceuticals.

Asymmetric Synthesis and Catalysis in Industrial Processes

Prof.: Pau Bayón. pau.bayon@uab.cat, Evaluation: Exam.

Industrial Applications of Nanotechnology

Prof.: Claudio Roscini (ICN2). croscini@cin2.es. Evaluation: Homework.

Complementary issues in the Chemical Industry

Chemical Diagnostics

Prof.: Xavier Cetó. xavier.ceto@uab.cat, Evaluation: Exam.

1. Automation concepts in chemical analysis.

2. Digital and analogue signal acquisition.

3. Diagnostic kits.

4. Use of biological reagents.

5. Omics technologies.

6. Case applications in the clinical, food & beverage sectors.

Chemical and Biochemical process control

Prof.: Juan Antonio Baeza. juanantonio.baeza@uab.es, Evaluation: Exam

- Instrumentation for control of chemical and biochemical processes.

- Basic control schemes. Feedback. Tuning of PID controllers. Feedforward.

- Other control schemes. Cascade, ratio, override, auctioneering, split-range…

Wastewater treatment

Prof.: Meilyn González. meilyn.gonzalez@uab.cat, Evaluation: Exam.

1. Wastewater treatment.

- Wastewater characterisation: wastewater distribution, analytical parameters of conventional wastewaters.

- Biological, physical and chemical processes occurring during urban wastewater treatment in WWTP.

- Possibilites for industrial wastewater treatment.

- Potabilisation techniques for drinking water.

Solid and gas waste treatment

Prof.: Sergio Ponsá (Universitat de Vic). sergio.ponsa@uvic.cat, Evaluation: Exam.

Green Chemistry

Prof.: Gonzalo Guirado, gonzalo.guirado@uab.cat, and José Peral, jose.peral@uab.cat, Evaluation: Exam.

1. The problem of non-biodegradable industrial wastewaters: Advanced Oxidation Processes for water and air treatment:

- Heterogeneous photocatalysis.

- Fenton and photo-Fenton.

- Chemical reactors for AOPs.

2. Green solvents.

3. Electrochemistry for greener processes.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Exercises classes	100	4	1, 5, 2, 7, 10, 8, 9, 13, 12, 11, 14, 6, 4
Seminars	30	1.2	1, 5, 2, 7, 10, 8, 9, 13, 12, 11, 14, 6, 4
Theoretical classes	170	6.8	1, 5, 2, 7, 10, 8, 9, 13, 12, 11, 14, 6, 4
Type: Supervised			
Project Development	20	0.8	2, 10, 14

Master classes
Problem solving classes
Cooperative activities
Seminars
Preparation and oral presentation of tutored works
Tutorials

Student satisfaction survey

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
Homeworks	25%	10	0.4	1, 5, 2, 3, 7, 10, 8, 9, 13, 12, 11, 14, 6, 4
Oral Presentations	15%	15	0.6	1, 5, 2, 7, 10, 8, 9, 13, 12, 11, 14, 6, 4
Written Exams	60%	30	1.2	1, 5, 2, 7, 10, 8, 9, 13, 12, 11, 14, 6, 4

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.

If the student do not participate in 60 % of the evaluation activities the final mark will be NO Evaluated.

Bibliography

Each Lecturer will recommend its particular preference of textbooks.

Software

No specific software is required

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