Universitat Autònoma de Barcelona

2019/2020

Industrial Organic Chemistry

Code: 102495
ECTS Credits: 6

Degree	Type	Year	Semester
2502444 Chemistry	OT	4	0

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: Yes
Some groups entirely in Spanish: No

Teachers

Roser Pleixats Rovira

Prerequisites

- It is recomended to have passed the subject "Structure and Reactivity of Organic Compounds"

- Although the classes are in catalan, much of the material that the student will have to work, as well as the main bibliographical sources are written in English. Therefore a suficient knowledge of this lenguage is recomended

Objectives and Contextualisation

Goals

In the course "Industrial Organic Chemistry" the processes for obtaining the main organic products of industrial use are studied. A "downstream" approach starting from the raw materials: oil, natural gas, coal, and renewable feedstocks, is used.

The specific objectives of the subject are:

- To introduce the student to the characteristics and peculiarities of the "Organic Chemistry Industry" of large and medium tonnage from the technological and economic point of view.

- To know the production routes of the main organic chemicals of first and second generation and some important others of later generations.

- To know the properties and applications of the main industrial organic chemicals, as well as the environmental impact of their production and use.

- To familiarize the student with the common characteristics and differences of the main industrial chemical sectors.

Competences

- "Interpret data obtained by means of experimental measures, including the use of IT tools; identify their meaning and relate the data with appropriate chemistry, physics or biology theories."
- Adapt to new situations.
- Be ethically committed.
- Communicate orally and in writing in ones own language.
- Develop synthesis and analyses studies in chemistry from previously established procedures.
- Lead and coordinate work groups.
- 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 texts related to real situations in the context of industrial chemistry and understand the different altertatives proposed to solve problems.
3. Be ethically committed.
4. Communicate orally and in writing in ones own language.
5. Correlate analytical information obtained with ones own information on the studied environmental industrial/process.
6. Design reasonable synthetic procedures for everyday products made from prime materials.
7. Explain the origins and main characteristics of the chemicals industry as an economic sector.
8. Identify the production methods of the main sectors of the chemicals industry with different production levels: commodities and fine chemicals.
9. Identify the relevant aspects of organic and inorganic chemistry in related industrial sectors.
10. Lead and coordinate work groups.
11. Learn autonomously.
12. Manage the organisation and planning of tasks.
13. Manage, analyse and synthesise information.
14. Obtain information, including by digital means.
15. Propose creative ideas and solutions.
16. Reason in a critical manner
17. Recognise the applications of the main organic and inorganic products, and the economic and environmental implications related with their production and distribution.
18. Recognise the industrial methods for obtaining basic products of the chemicals industry.
19. Resolve problems and make decisions.
20. Show initiative and an enterprising spirit.
21. Show motivation for quality.
22. Show sensitivity for environmental issues.
23. Summarise an article written in English in a reasonable time.
24. Use IT to treat and present information.

25. Use common English terminology for industrial chemistry, electrochemistry and corrosion, environmental chemistry, green chemistry, quality management, monitoring systems, and financial and business management.
26. Work in a team and show concern for interpersonal relations at work.
27. Work with the main databases available on the Internet dealing with the physical and chemical properties of pollutants and chemical compounds in general, and learn to select specifically useful data.

Content

Contents:

1.- Introduction. The chemical industry

2.- Chemical products derived from natural gas and oil

3.- Chemical products and polymers derived from ethylene (C2) and their applications

4.- Chemical products and polymers derived from propylene (C3) and their applications

5.- Chemical products and polymers derived from fractions C4 and C5 and their applications. Monomers for the manufacture of tires

6.- Chemical products derived from benzene and their applications. Monomers for the production of nylons

7.- Chemical products derived from toluene and xilenes and their applications. Monomers for the production of polyesters

8.- Chemical products derived from C1 compounds and their applications. Synthesis gas

9.- Chemical products derived from coal and their applications. The Fischer-Tropsch reaction

10.- Fats and natural oils as raw materials. Biodiesel

11.- Carbohydrates as raw materials. Fermentation and biotechnology in the chemical industry

12.- Main industrial manufacturing sectors: Polymers, detergents, dyes, pesticides and pharmaceutical products

13.- Green chemistry in the chemical industry

Methodology

Methodology:

Students must develop various types of activity throughout this subject:

a) Directed activities: In the classroom master classes will be held on the contens of the subject. In addition, problems will be analyzed and solved once the subject has advanced sufficiently to take advantage of them. The student will consolidate the knowledge acquired in theory and problem classes by preparing a specific work on a particular subject related with the subject that must be presented and defended in public in front of the class.

b) Supervised activities: Tutorials will be conducted to monitor the performance of the work that the student must present in public

c) Autonomous activities: Students must study the contents of the subject, solve the problems, and prepare the work and discussion to be presented in public.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Autonomous work	1	0.04	2, 13, 14, 17, 19, 23, 27, 24
Master classes	35	1.4	2, 5, 6, 7, 9, 8, 18, 17, 27, 25
Problem solving classes	9	0.36	6, 8, 18, 17, 19
Seminars	2	0.08	1, 2, 11, 4, 20, 21, 12, 13, 10, 3, 22, 14, 15, 16, 23, 26, 24, 25
Type: Supervised			
Tutorials	4	0.16	11, 20, 21, 22, 15, 16, 19
Type: Autonomous			
Problem solving	14	0.56	11, 13, 16, 19
Study	45	1.8	11, 7, 12, 13, 8, 14, 16, 17, 19, 23, 24
Text reading	12	0.48	11, 14, 23
Writting of a bibliographic memory and preparation of its public presentation	21	0.84	2, 11, 4, 20, 21, 12, 13, 10, 22, 14, 15, 16, 18, 23, 27, 26, 24, 25

Assessment

Evaluation

There will be a continuous evaluation of the competences that will include a written bibliography work and two exams.

The evaluation system is organized into modules, each with a specific weight in the final grade:

Seminar module: The ability to search information on a topic related to a type of industrial product or regarding a type of chemical industry as well as the ability to synthesize the information obtained and the presentation and defense in public will be evaluated. This module will have a global weight of 20% in the final grade, but its completion is mandatory to pass the subject.

Module of written exams: It will consist of two partial exams with a weight of 40% each in the final grade

The subject will be considered passed when the average of the qualifications of the modules is equal or superior to 5 points out of 10, provided that a minimum of 3.5 points out of 10 has been obtained for each of the two written partial exams, and the oral presentation of the the work of the seminar module has been done. Students that do not pass the minimum score in the first and/or in the second written exam, and those with an average of less than 5 points will be able to take a global recovery exam. Students that want to improve their grade can also take this recovery exam, but in any case, the realization of the recovery exam implies giving up the qualification obtained in the partial exams

According to regulations, "in order to be allowed to attend the recovery exam, the student has had to have been previously evaluated continuous assessment activities equivalent to 2/3 of the final grade." Therefore, in the specific case of this subject this implies that that having done all the activities of continuous evaluation is

an indispensable condittion to be allowed to assist to the recovery exam. When the number of evaluation activities performed is less than 50% of those scheduled for the subject (the work and the two written exams) the grade will be "Not Presented"

Racall that the UAB regulations establish:

"10. In case the student performs any irregularity that could lead to a significant variation of the grade of an evaluation act, this evaluation will be scored with 0, regardless of the disciplinary process that can be instructed. In case several irregularities are produced, the final grade of this subject will be 0."

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Module of written tests	80%	6	0.24	1, 11, 4, 5, 21, 6, 7, 13, 9, 8, 3, 22, 14, 15, 18, 17, 19, 23, 27, 24, 25
Seminar module	20%	1	0.04	2, 11, 4, 20, 21, 12, 13, 9, 10, 22, 14, 15, 16, 17, 23, 27, 26, 24

Bibliography

Bibliography:

Industrial Organic Chemicals, H. A. Wittcoff, B. G. Reuben, J. S. Plotkin, 3rd Edition. Wiley 2012 (electronic version of 2013)

Industrial Organic Chemistry, H. J. Arpe, 5th Edition. Verlag Chemie 2010