

**1. General information****Course:** ORGANIC PRODUCTS FOR DAILY AND INDUSTRIAL USES**Type:** ELECTIVE**Degree:** 409 - CHEMISTRY**Center:** 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY**Year:** 4**Main language:** Spanish**Use of additional languages:** Part of the bibliography in English**Web site:****Code:** 57334**ECTS credits:** 6**Academic year:** 2023-24**Group(s):** 20**Duration:** C2**Second language:****English Friendly:** Y**Bilingual:** N**Lecturer:** ANGEL DIAZ ORTIZ - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
S. Alberto Magno, 2ª planta	QUÍMICA INORG., ORG., Y BIOQ.	3461	angel.diaz@uclm.es	Monday, Tuesday: 10-12 h Thursday: 11-13 h

**2. Pre-Requisites**

Not established

**3. Justification in the curriculum, relation to other subjects and to the profession**

It is said that organic chemistry is the part of chemistry that in charge of the study of carbon-based compounds. This chemistry branch has deeply affected our life in the 20th century and the beginning of the 21st century, since it has improved natural materials and created new substances that have improved our health, increased welfare and production, as well as the utility of the products currently employed.

It is estimated that 95% of the products that surround us in our daily life are organic: plastics, clothes, soaps, detergents, deodorants, medicines, perfumes, paper, ink, paints, etc. Even we are made of organic molecules.

On the other hand, the organic chemical industry plays a very important role in the world economy and affects many aspects of our life with its products, due to the great variety of them and their usefulness.

The objective of this course is to show the sources of organic products, their preparation from these sources, and their industrial applications and in everyday life. It will also show the current and future evolution of the organic chemical industry, as well as its relationship with the environment, pollution and conservation.

**4. Degree competences achieved in this course****Course competences**

Code	Description
CB03	Be able to gather and process relevant information (usually within their subject area) to give opinions, including reflections on relevant social, scientific or ethical issues.
CB04	Transmit information, ideas, problems and solutions for both specialist and non-specialist audiences.
CB05	Have developed the necessary learning abilities to carry on studying autonomously
E01	Understand and use chemical terminology, nomenclature, conventions and units
E06	Know the structural properties of chemical compounds, including stereochemistry, as well as the main structural research techniques
E07	Relate macroscopic properties with those of atoms, molecules and non-molecular chemical compounds
E11	Know the basic operations and the unitary processes of the chemical industry
E12	Understand the chemistry of the main biological processes
G01	Know the principles and theories of Chemistry, as well as the methodologies and applications characteristic of analytical chemistry, physical chemistry, inorganic chemistry and organic chemistry, understanding the physical and mathematical bases that require
G02	Be able to gather and interpret data, information and relevant results, obtain conclusions and issue reasoned reports on scientific, technological or other problems that require the use of chemical tools
G03	Know how to apply the theoretical-practical knowledge acquired in the different professional contexts of Chemistry
G04	Know how to communicate, orally and in writing, the knowledge, procedures and results of chemistry, both specialized and non-specialized
G05	Acquire and adapt new knowledge and techniques of any scientific-technical discipline with incidence in the chemical field
T03	Proper oral and written communication
T04	Ethical commitment and professional ethics
T09	Motivation for quality, job security and awareness of environmental issues, with knowledge of internationally recognized systems for the correct management of these aspects
T10	Ability to use specific software for chemistry at user level
T11	Ability to obtain bibliographic information, including Internet resources

**5. Objectives or Learning Outcomes****Course learning outcomes**

Description

Acquire awareness of the need to use renewable natural resources, biodegradability and recycling of finished materials

Acquire the awareness of environmental protection developing the idea that Organic Chemistry should be used to improve the quality of life without damaging it

Know the methods of preparation of finished products from simple organic compounds

Know the main fields of application of Organic Chemistry as well as the characteristics of the Organic Chemical Industry

Know the main methods of extraction and preparation of primary organic products from natural sources

Understand the importance of the structure-property relationship in Organic Chemistry

Understand the importance of organic products in industry and in daily life

Know the main sources of organic products.

To ensure that the student is able to search and select information in the field of Organic Chemistry and that he / she is capable of processing and presenting it adequately both orally and in writing, developing his / her synthesis capacity, being critical and objective

Acquire the awareness that in most of the problems posed by modern life, Organic Chemistry and its products can provide solutions

Encourage and promote in the student all those values and attitudes inherent to scientific activity.

#### Additional outcomes

### 6. Units / Contents

**Unit 1: CHEMICAL PRODUCTS THAT PROCEED FROM NATURAL GAS AND PETROLEUM.** Organic chemicals sources. Petroleum refining process. Petroleum refining reactions. Chemical products derived from ethylene, propylene and butanes. Chemical products obtained from aromatic hydrocarbons: benzene, toluene and xylenes derivatives. Derivatives of methane, acetylene, synthesis gas and substitute natural gas.

**Unit 2: CHEMICAL PRODUCTS THAT PROCEED FROM OTHER SOURCES.** Charcoal. Fats and oils. Carbohydrates.

**Unit 3: POLYMERS.** Introduction. Polymerization reactions. Copolymerization. Most common plastics. Main thermostable resins. Fibers. Elastomers. Additives used in the plastics industry. Plasticizers and flame retardants.

**Unit 4: AGROCHEMICAL PRODUCTS.** Introduction. General features. Pesticides. Insecticides. Fungicides. Herbicides. Acaricides and nematocides. Pheromones of insects. Plant growth regulators.

**Unit 5: PHARMACEUTICAL INDUSTRY.** Introduction. Drug Research and development. Drugs classification. Antibacterial medicines. Medicines that act on the central nervous system (CNS). Analgesics, anti-inflammatories and antipyretics. Cardiovascular drugs.

**Unit 6: CHEMISTRY OF FOOD.** Introduction. Food Additives. The Maillard reaction. Colorants. Preservatives. Antioxidants. Kidnappers of metals. Gellants, thickeners and stabilizers. Emulsifiers and flavor enhancers. Low calorie sweeteners. Vitamins.

**Unit 7: SURFACTANTS.** Introduction. The surfactant industry. Tensioactivity and surface tension. Detergency mechanism. Surfactants classification: ionic, non-ionic and amphoteric. Household detergents.

**Unit 8: TOXIC ORGANIC COMPOUNDS AND POLLUTANTS.** Introduction. Chlorinated products (DDT and analogs, dioxins, polychlorinated biphenyls). Polynuclear aromatic hydrocarbons. Chlorofluorocarbons (CFCs).

### 7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	CB03 CB04 E01 E06 E07 E11 E12 G01 T09 T10	1.2	30	N	-	In-class learning activity to acquire the theoretical knowledge and some competences of the subject
Workshops or seminars [ON-SITE]	Problem solving and exercises	CB03 CB04 CB05 E01 E06 E07 E12 G02 G03 G04 T10	0.6	15	Y	N	In-class learning activity to acquire practical knowledge and some subject competences
In-class Debates and forums [ON-SITE]	Guided or supervised work	CB03 CB04 CB05 E01 G02 G03 G04 T03 T04	0.2	5	N	-	Group resolution of doubts in practical cases
Other off-site activity [OFF-SITE]	Self-study	CB03 CB04 CB05 E01 G02 T10 T11	2.56	64	N	-	Documentation, preparation, learning and solving case studies
Study and Exam Preparation [OFF-SITE]	Self-study	CB03 CB04 CB05 E01 G01 G02 G05 T03 T10 T11	1.2	30	N	-	Documentation, preparation and learning
Progress test [ON-SITE]	Assessment tests	CB03 CB04 CB05 E01 E06 E07 E11 E12 G01 G02 G03 G04 T03 T10 T11	0.12	3	Y	N	Learning activity in which the student must demonstrate the level of achievement of some competences included in the subject
Final test [ON-SITE]	Combination of methods	CB03 CB04 CB05 E01 E06 E07 E11 E12 G01 G02 G03 G04 T03 T10 T11	0.12	3	Y	Y	Learning activity in which the student must demonstrate the level of achievement of the competences included in the subject.
<b>Total:</b>			<b>6</b>	<b>150</b>			
<b>Total credits of in-class work: 2.24</b>			<b>Total class time hours: 56</b>				
<b>Total credits of out of class work: 3.76</b>			<b>Total hours of out of class work: 94</b>				

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

### 8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Assessment of problem solving and/or case studies	40.00%	0.00%	Continuous evaluation of the different activities carried out by the student (work in class and seminars, individual work, participation in tutorials and seminars, etc.).
Progress Tests	20.00%	0.00%	As a part of the continuous evaluation, there will be three midterm exams during class time to monitor the student's progress.
			The student will take a final test of the subjects, which can

Final test	40.00%	100.00%	include the realization, exposition and defense of a group work.
<b>Total:</b>	<b>100.00%</b>	<b>100.00%</b>	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

#### Evaluation criteria for the final exam:

##### Continuous assessment:

If the midterm exams are satisfactory enough, they could exempt the student from the final exam, having them a value of 60% at the final grade.

##### Non-continuous evaluation:

The student's mark will correspond to the final test.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
<b>Hours</b>	<b>hours</b>
Other off-site activity [AUTÓNOMA][Self-study]	64
Study and Exam Preparation [AUTÓNOMA][Self-study]	30
Progress test [PRESENCIAL][Assessment tests]	3
Final test [PRESENCIAL][Combination of methods]	3
<b>Unit 1 (de 8): CHEMICAL PRODUCTS THAT PROCEED FROM NATURAL GAS AND PETROLEUM. Organic chemicals sources. Petroleum refining process. Petroleum refining reactions. Chemical products derived from ethylene, propylene and butanes. Chemical products obtained from aromatic hydrocarbons: benzene, toluene and xylenes derivatives. Derivatives of methane, acetylene, synthesis gas and substitute natural gas.</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	8
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	4
In-class Debates and forums [PRESENCIAL][Guided or supervised work]	2
<b>Unit 2 (de 8): CHEMICAL PRODUCTS THAT PROCEED FROM OTHER SOURCES. Charcoal. Fats and oils. Carbohydrates.</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	1
<b>Unit 3 (de 8): POLYMERS. Introduction. Polymerization reactions. Copolymerization. Most common plastics. Main thermostable resins. Fibers. Elastomers. Additives used in the plastics industry. Plasticizers and flame retardants.</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	7
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	3
In-class Debates and forums [PRESENCIAL][Guided or supervised work]	1
<b>Unit 4 (de 8): AGROCHEMICAL PRODUCTS. Introduction. General features. Pesticides. Insecticides. Fungicides. Herbicides. Acaricides and nematocides. Pheromones of insects. Plant growth regulators.</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	1
<b>Unit 5 (de 8): PHARMACEUTICAL INDUSTRY. Introduction. Drug Research and development. Drugs classification. Antibacterial medicines. Medicines that act on the central nervous system (CNS). Analgesics, anti-inflammatories and antipyretics. Cardiovascular drugs.</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	2
In-class Debates and forums [PRESENCIAL][Guided or supervised work]	1
<b>Unit 6 (de 8): CHEMISTRY OF FOOD. Introduction. Food Additives. The Maillard reaction. Colorants. Preservatives. Antioxidants. Kidnappers of metals. Gellants, thickeners and stabilizers. Emulsifiers and flavor enhancers. Low calorie sweeteners. Vitamins.</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	1
<b>Unit 7 (de 8): SURFACTANTS. Introduction. The surfactant industry. Tensioactivity and surface tension. Detergency mechanism. Surfactants classification: ionic, non-ionic and amphoteric. Household detergents.</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	1
<b>Unit 8 (de 8): TOXIC ORGANIC COMPOUNDS AND POLLUTANTS. Introduction. Chlorinated products (DDT and analogs, dioxins, polychlorinated biphenyls). Polynuclear aromatic hydrocarbons. Chlorofluorocarbons (CFCs).</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	2
In-class Debates and forums [PRESENCIAL][Guided or supervised work]	1
<b>Global activity</b>	
<b>Activities</b>	<b>hours</b>
Other off-site activity [AUTÓNOMA][Self-study]	64
Final test [PRESENCIAL][Combination of methods]	3
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	15
In-class Debates and forums [PRESENCIAL][Guided or supervised work]	5

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Seymour, R. B.; Carraher, C. E.	Introducción a la Química de los Polímeros	Reverté		84-291-7926-7	1995	It can be found in the General Library (UCLM)
Weissmermel, K.; Arpe, H. J.	Industrial Organic Chemistry, 4th Ed.	Wiley-VCH		3-527-30578-5	2003	
Weissmermel, K.; Arpe, H. J.	Química Orgánica Industrial	Reverté		84-291-7989-5	1981	It can be found in the General Library (UCLM)
Wittcoff, H. A.; Reuben, B. G.	Industrial Organic Chemicals	Wiley-Interscience		0-471-54036-6	1996	It can be found in the General Library (UCLM)
Wittcoff, H. A.; Reuben, B. G.	Productos Químicos Orgánicos Industriales, Vol. 1	Limusa		968-18-1882-2	1997	It can be found in the General Library (UCLM)
Wittcoff, H. A.; Reuben, B. G.	Productos Químicos Orgánicos Industriales, Vol. 2	Limusa		968-18-2047-9	1997	It can be found in the General Library (UCLM)
Campbell, I. M.	Introduction to Synthetic Polymers	Oxford University Press		0-19-856470-8	2000	It can be found in the General Library (UCLM)
Raviña Rubira, E.	Medicamentos, Vol. 1 y 2	Universidad Santiago de Compostela		978-84-9887-002	2008	It can be found in the General Library (UCLM)
Christie, R. M.	La Química del Color	Acirbia		84-200-1009-X	2003	It can be found in the General Library (UCLM)
Climent, M. J.; García, H.; Iborra, S.	Bases de la Química Orgánica Industrial	Universidad Politécnica Valencia		84-9705-331-1	2003	It can be found in the General Library (UCLM)
Corey, E. J.; Czako, B.; Kürti, L.	Molecules and Medicine	Wiley-Interscience		978-0-470-22749-7	2007	It can be found in the General Library (UCLM)
Faruk, A. I.	Syntheses of Organic Medicinal Compounds	Alpha Science		1-84265-280-X	2006	It can be found in the General Library (UCLM)
Green, M. M.; Wittcoff, H. A.	Organic Chemistry Principles and Industrial Practice	Wiley-VCH		3-527-30289-1	2003	It can be found in the General Library (UCLM)
Gómez, M. R.; Molero, M.; Sardá, J.	Química Inorgánica y Orgánica de Interés Industrial	UNED		84-362-4830-9	2003	It can be found in the General Library (UCLM)
Llorente, M. A.; Horta, A.	Técnicas de Caracterización de Polímeros	UNED		84-362-2984-3	1991	It can be found in the General Library (UCLM)
Primo Yúfera, E.	Química Orgánica Básica y Aplicada	Reverté		84-291-7955-0	1995	It can be found in the General Library (UCLM)
Primo Yúfera, E.	Química de los Alimentos	Síntesis		84-7738-451-7	1998	It can be found in the General Library (UCLM)
Quin, L. D.; Tyrell, J. A.	Fundamentals of Heterocyclic Chemistry: Importance in nature and in the Synthesis of Pharmaceuticals	Wiley		978-0-470-56669-5	2010	It can be found in the General Library (UCLM)
Ramos Carpio, M. A.	Refino de petróleo, gas natural y petroquímica	Fund. Fomento Innovación Industrial		84-605-6755-9	1997	It can be found in the General Library (UCLM)