

Academic year
2026/2027

Course Guide:

CONSUMER CHEMICAL PRODUCTS



FACULTY OF
CHEMICAL SCIENCES



1. IDENTIFICATION

Degree Programme	Bachelor's Degree in Chemical Engineering			Course Code	801556
Subject	Consumer Chemical Products			ECTS	6
Subject	Applied Chemistry				
Module	Chemical Technology				
Course Type	Optional	Curse	Fourth	Semester	Second
Responsible department	Chemical and Materials Engineering				

Teaching Staff

Activity	Lecturer	Email	Office
Lectures/Seminars/Tutorials	ANTONIO TIJERO CRUZ	atijero@quim.ucm.es	QB-501

2. OBJECTIVES

General objective

The objective is for the student to acquire knowledge of the origin, physicochemical characteristics, manufacturing processes, and environmental impact of the most representative products of the chemical industry, as well as their economic and social integration in the different markets where they are commercialized.

Specific objectives

- To know the origin of the use of raw materials and products of the chemical industry.
- To know the production processes of the main chemical products of current industry consumption and to analyse their evolution, in accordance with technical, environmental, and economic improvements.
- To know the utilitarian and technical-economic characteristics of chemical products.

3. PRIOR KNOWLEDGE AND RECOMMENDATIONS

Prior knowledge

The proper follow-up of this subject requires that the student has previously acquired the knowledge and skills corresponding to the following subjects: Fundamentals of Chemical Engineering and Process Engineering. Although enrolment is not formally conditioned by this prior learning, effective mastery of said knowledge is essential to take this subject with reasonable possibilities of achievement.

Recommendations

It is recommended that the student have a basic level of English that allows them to handle bibliography in English, search for information and communicate in writing and orally in that language. Likewise, it is recommended that you be familiar with computer tools and programs

for solving complex problems, as well as applications for writing, editing, and presenting technical reports. Furthermore, for better use of the subject, it is recommended that the student have adequate knowledge of scientific literature engines such as Google scholar or multidisciplinary databases of citations and bibliographic summaries of scientific literature such as Scopus.

4. CONTENTS

Brief description

The consumption and production of chemical products. The Chemical Industry in the World. Regional distribution. The Chemical Industry in the E.U. The Chemical Industry in Spain. Sectors and subsectors of the Chemical Industry. Macroeconomic magnitudes of the sector. Spanish and European regulations on consumer chemicals. Petroleum products. Main refinery products: LPG, fuels, lubricants, asphalts. Natural gas. Products of the petroleum and chemical industry. Natural and synthetic polymers. Plastics and elastomers. Natural, man-made and synthetic fibres. Production, consumption and applications. Cellulose derivatives products. Dyes, inks, paints and varnishes. Utilitarian and environmental aspects. Chemical fertilizers in relation to the consumption of agricultural products. Other products and applications: detergents, dispersants, solvents. The pharmacochemical industry, both from the point of view of research and production and the economic. The metallurgical industries such as aluminum and steel. With its industrial and economic aspects. The glass and ceramic materials industries. The cement industry and the materials associated with it. Processes and economy.

As a general guideline, the environmental and economic aspects of the processes will be considered in all topics. Thus, the subject studies the integration of the principles of green chemistry in the different industrial processes of the production of consumer chemical products.

Course syllabus

Topic 1.

Introduction to the chemical industry. Production, technical, economic and environmental evolution, turnover, employability, commitment to progress, etc.

Topic 2.

Coal as a source of energy and industrial raw material. Utilization processes: combustion, pyrolysis and gasification. Environmental problems and the safety and hygiene of fossil fuels. Kyoto Protocol.

Topic 3.

Petroleum processes and products. Socioeconomics of oil. Refinery processes. Characterization and use of petroleum products. Petroleumchemical consumption and fine chemicals. Macroeconomic data on Spanish companies in the sector.

Topic 4.

Natural gas. Main producers and suppliers of gas to Spain. Roads and large supply infrastructures. Natural gas processes and cycle of use. Main uses and consumptions: macroeconomic data. Combined cycles.

Topic 5.

Industrial gases. Gases obtained from air: oxygen, nitrogen, industrial air and argon. Forms of supply, main applications and consumption. Other industrial gases and mixtures.

Topic 6.

Paints, varnishes and printing inks. Resin production. Production, consumption and historical evolution. The sector in Spain.

**Topic 7.**

Sodium chloride and the chloro-soda industry. Historical evolution. Derived products: hydrochloric acid and sodium carbonate. Consumption and applications.

Topic 8.

Other mineral acids, salts and alkalis for industrial use: sulphuric, nitric and phosphoric acids, ammonia, bases and calcium and potassium salts.

Topic 9.

Uranium. History and energy use. Technological processes of energy production. Safety and economic and environmental impact.

Topic 10.

Technology for the production and exploitation of biofuels.

Topic 11.

Natural and synthetic polymers. Natural rubber, latex and top plastics.

Topic 12.

Natural, man-made and synthetic fibres. Production, consumption and applications.

Topic 13.

The agrochemical industry. Fertilizers and fertilizers.

Topic 14.

Pharmacochemistry. The sector in Spain, Europe and the world.

Topic 15.

The pulp-paper industry. Raw materials. Virgin pasta and recycled pasta. Types of paper.

Topic 16.

Iron and steel. Types of steels. Applications. Stainless and special steels. Evolution of production and consumption. Evolution of the sector in Spain.

Topic 17.

Aluminum. History of the sector and current importance. Types of alloys and products. Applications.

Topic 18.

Glass and ceramic materials. Types of glass and their applications. The importance of glass recycling. Classic and advanced applications of ceramics.

Topic 19.

Cement, concrete, lime and plaster. Different types of cements. Specific application of each one. Evolution of its production and consumption. Concrete formulation. Types of aggregates. Use of concrete. Application of lime and gypsum in construction and their importance as a raw material.

5. COMPETENCES

General competences

CG1	Use concepts from basic and technological subjects that enable autonomous learning of new methods and theories and the ability to address new situations.
CG3	Execute and direct the activities covered by projects in the field of chemical engineering.
CG4	Solve problems in the field of chemical engineering with initiative, decision-making ability, and critical reasoning.



Specific competences

CE25-QA1	Recognise the utilitarian properties that determine the use of products, mixtures of products or chemical preparations for consumption, including their safe manufacture and use
CE25-QA2	Assess the risks, both to the environment and to human health, that may arise from the use of consumer chemical products.
CE25-QA3	Develop methodological guidelines for the use of chemical products and, where appropriate,
CE25-QA4	Apply European Union, national, and regional regulations relating to consumer chemical products, with particular emphasis on the requirements established by the new EU Regulation on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Cross-cutting competences

CT1	Develop analytical and synthesis skills.
CT3	Demonstrate ability to organize and plan.
CT4	Communicate in Spanish using the usual audiovisual media.
CT5	Consult, use and analyse bibliographic sources, specialised databases and resources accessible through the Internet.
CT8	Demonstrate the ability to reason critically and self-critically.
CT11	Learn autonomously.
CT12	Know how to assess the social and environmental impact of engineering solutions

5. WORKING HOURS AND DISTRIBUTION BT ACTIVITY

Activity	In-class (hours)	Self-study (hours)	Credits
Lectures	30	57,5	3,5
Seminars	15	22,5	1,5
Tutorials/guided work	4	6	0,4
Laboratories	-	-	-
Coursework and examination preparation	7	8	0,6
Total	56	94	6

6. METHODOLOGY

The teaching practice will follow a mixed methodology based on cooperative learning, collaborative learning and self-learning. This methodology will be developed through:

1. **Theoretical classes:** they will consist primarily of sessions in which the theoretical contents of the subject's syllabus will be presented. Audiovisual material developed specifically for each topic will be used regularly.
2. **Personal work/directed tutorials:** it will consist of a free-choice tutored work, which is part of the subject's syllabus, developed in a small group. A report or technical memory will be prepared in Powerpoint format that will be presented orally during the course. In the tutorials, the evolution of personal work will be monitored.

The UCM Virtual Campus will be used to allow fluid communication between teachers and students and as an instrument to make available to students the material that will be used in theoretical classes, seminars and directed works.

1. BIBLIOGRAPHY

Basic bibliography

- Vian Ortuño, A.: *"Introducción a la Química Industrial"*; 2ª Edición, Ed. Reverté S.A., Barcelona, 1994.
- Austin, G. T.: *"Manual de Procesos Químicos en la Industria"*, 1ª edición en español, Ed. Mc. Graw Hill, México, 1992.
- Kirk-Othmer: *"Encyclopedia of Chemical Technology"*, 5ª ed., John Wiley & Son, 2006.
- Elvers, Barbara; Hawkins, Stephen y Russey, William: *"Ullmann's Encyclopedia of Industrial Chemistry"*, 5ª ed., Ed. Weinheim, 1996.

Complementary bibliography

- Meadows, D.H.; Meadows, D.L. y Randers J.: *"Más allá de los límites del crecimiento"*, Editorial El País-Aguilar, Madrid, 1992.
- Primo Yufera, E.: *"Química Agrícola"*, Ed. Alhambra, Madrid, 1979.
- Spitz, P.H.: *"The rise of an Industry"*, Ed. J. Wiley, New York, 1989.
- La Industria Química en el siglo XXI. Desarrollo sostenible y compromiso de progreso, Eds. Feique y Fundación General de la UCM. 1999.
- El cemento. Juan J Cano Guillén, Eduardo Garzón Garzón, Blanca María Marín Valiño, Eduardo Garzón Garzón, Blanca Mª Marín Valiño, Universidad de Almería., Universidad de Almería. Servicio de Publicaciones.2000.
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1. EVALUATION

The student's academic performance and the final grade of the subject will be calculated in a weighted manner according to the following percentages, which will be maintained in all calls:

❖ **WRITTEN EXAMINATION: 70%**

The knowledge and skills acquired will be evaluated by taking, during the course teaching period, two partial written exams and a final exam, in the June and July calls, both written, related to the fundamental aspects of the processes of the chemical industry. The partial exam that has not reached the minimum grade of 4 will count as zero when taking the average of the partial exams for the subject. Students who equal or exceed the average score of 5 in the midterm exams are released from the final exam. However, they can choose to take it if they wish to improve their qualification. To pass the subject it is essential to obtain a minimum average grade of 5 out of 10 in the midterm exams or the final exam.

❖ **PERSONAL WORK AND GUIDED ACTIVITIES: 30%**

The learning work carried out by the student will be evaluated taking into account the work carried out in groups or individually, directed in the scheduled tutorials, and which will be presented orally during the course.

❖ **QUALIFICATIONS:**

The grades of the activities planned for the evaluation of the subject (midterm exams, laboratories, tutorials, delivery of problems...) will be communicated to students sufficiently in advance before the final exam, so that they can properly plan the study of this or other subjects.

The grades of the midterm exams will be communicated within a maximum period of 20 days, except in the case of the second midterm, in which the period may be shorter to adapt to the final exam.

In any case, the minimum period of seven days between the publication of the grades and the date of the final exam of the subject will be respected.

In the event that the ordinary or extraordinary exam grade does not reach the required minimum of 5 out of 10, the final grade will be the one obtained from the weighted calculation of the exam grades and the personal work/tutoring according to the following percentages, 70% of the exam and 30% of the personal work/tutoring, with a maximum of 4.5 out of 10.

❖ **ATTENDANCE AND ACTIVE PARTICIPATION IN CLASSES**

In order to pass the subject, it will be necessary for the student to have participated in at least 70% of the face-to-face activities and 100% of the guided tutorials.



ACTIVITY SCHEDULE

UNIT	ACTIVITY	HOURS	GROUPS	INICIO	ENDS
Topic 1 to 4.	Lectures	5	1	1st Week	2nd Week
	Seminars	3	1	3rdWeek	3rd ^a Week
Topic 4 to 8.	Lectures	6	1	3rd Week	4th Week
	Seminars	3	1	4thWeek	4th Week
Topic 9 to10.	Lectures	4	1	5th Week	6th Week
	Seminars	2	1	6th Week	6th Week
Topic 11 to 14.	Lectures	8	1	6th Week	7th Week
	Seminars	3	1	8 ^a Week	8thWeek
Topic 15 to19.	Lectures	7	1	9thWeek	10thWeek
	Seminars	4	1	11th Week	12th Week
Scheduled tutorials	Scheduled Tutoring 1*	1	1	5th Week	5th Week
	Scheduled Tutoring 2*	1	1	6th Week	6th Week
	Scheduled Tutoring 3*	1	1	8th Week	8th Week
	Scheduled Tutoring 4*	1	1	10th Semana	10th Week



SUMMARY OF ACTIVITIES

TEACHING ACTIVITY	ASSOCIATED COMPETENCIES	TEACHER ACTIVITY	STUDENT ACTIVITY	EVALUATION PROCEDURE	P	NP	TOTAL	C
Lectures	CG1, CG3, CG4, CE25-QA1, CE25-QA2, CE25-QA3, CE25-QA4	Presentation of theoretical concepts	Note-taking	Compulsory attendance at 70% of face-to-face hours	30	57,5	87,5	
Seminaries	CG1, CG3, CG4, CE25-QA1, CE25-QA2, CE25-QA3, CE25-QA4	Application of theory to the resolution of exercises and problems	Note-taking. Performing exercises. Formulation of questions and doubts	Grading of the answers (approach and result) made in writing for the resolution of practical exercises and numerical problems	15	22,5	37,5	
Personal work/ Tutorials	CT1, CT3, CT4, CT5, CT8, CT11, CT12	It helps the student to direct their study and group work with bibliographic explanations and recommendations. Correct and evaluate the work done by the student. Exposition of theoretical concepts. Correction of technical reports. To grade students.	Consult the teacher about the conceptual and methodological difficulties encountered when studying the subject. Preparation of the group work proposed by the teacher. Carrying out personal work and preparing technical reports	Assessment and grading of the work.	4	6	10	30%
Exams	CT1, CT3, CT8, CT12	Proposal, supervision and correction of the exams of the theoretical part Student's grade.	Preparation and completion of the theoretical part exam		7	8	15	70%

P: In-class activities

NP: Non-classroom activities (self-study)

C: Assessment weighting