



1. General information

Course: CHEMISTRY AND ATMOSPHERIC POLLUTION

Type: ELECTIVE

Degree: 409 - CHEMISTRY

Center: 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY

Year: 4

Main language: Spanish

Use of additional languages:

Web site:

Code: 57333

ECTS credits: 6

Academic year: 2022-23

Group(s): 20

Duration: C2

Second language: English

English Friendly: Y

Bilingual: N

Lecturer: MARIA DEL PILAR MARTIN PORRERO - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
Marie Curie, 2ª planta	QUÍMICA FÍSICA	926052614	mariapilar.martin@uclm.es	Monday 11 to 13 wednesday and thursday 16 to 18

Lecturer: MARIA SAGRARIO SALGADO MUÑOZ - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
EDIFICIO MARIE CURIE	QUÍMICA FÍSICA	3450	sagrario.salgado@uclm.es	Monday 9.30 to 12.30 and 17 to 18 horas, Thursday 9.30 to 11.30 horas

2. Pre-Requisites

Have approved the basic training module

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

The aim of this subject is that the students know the physicochemical processes that occur in the atmosphere and its influence on the structure, composition and properties of the same. In addition, it is intended to analyze the issue of air pollution and establish strategies to control and reduce it, as well as alternatives. It is a subject directly related to the subjects of Physical Chemistry, mainly more kinetic aspects of the processes, with subjects of organic Chemistry, while studying processes of degradation of organic compounds, and with Physics when dealing with aspects of radiation transfer, transport and climatology. The subject is therefore justified in the curriculum, especially since it is a current issue. In addition, the theoretical-practical aspects dealt with are especially useful for students who will work in the future on issues related to pollution and the environment.

4. Degree competences achieved in this course

Course competences

Code	Description
CB02	Apply their knowledge to their job or vocation in a professional manner and show that they have the competences to construct and justify arguments and solve problems within their subject area.
CB04	Transmit information, ideas, problems and solutions for both specialist and non-specialist audiences.
E03	Handle chemicals safely and with respect to the environment
E09	Know the kinetics of chemical change, including catalysis and reaction mechanisms
E14	Know and know how to apply the metrology of chemical processes, including quality management
E15	Know how to handle the standard chemical instrumentation and be able to elaborate and manage standardized procedures of work in the laboratory and chemical industry
E16	Plan, design and develop projects and experiments
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
T05	Organization and planning capacity
T06	Ability to approach decision making
T07	Ability to work as a team and, where appropriate, exercise leadership functions, fostering the entrepreneurial character
T08	Skills in interpersonal relationships
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

Have a knowledge of atmospheric chemistry: the reactions that take place in each layer of the atmosphere, the responsible species and the derived effects, relating them to human activity and to atmospheric pollution

Have a knowledge and critical vision of new trends in the use of renewable energy.

Dexterity and management of gas systems in the laboratory

Ability to perform a correct evaluation, interpretation and synthesis of the data and chemical information received

Capacity and skill to search and select information in the field of the topics addressed in the subject

Acquire initiative to raise and solve specific problems of atmospheric chemistry

Know and know how to properly use the spectroscopic and analytical techniques (GC-MS, FTIR, electrochemical, optical, ...) most commonly used in air quality control laboratories

Ability to learn to work autonomously in a laboratory and ability to interpret the experimental results obtained.

Ability to understand the fundamental aspects of Atmospheric Physics and related environmental problems

Ability to process and present information adequately both orally and in writing, thus developing their capacity for synthesis and objective criteria.

6. Units / Contents

Unit 1: Composition and structure of the earth atmosphere

Unit 2: Greenhouse effect and climate change

Unit 3: Atmospheric photochemistry

Unit 4: Tropospheric Chemistry

Unit 5: Chemistry of the upper layers

Unit 6: Air pollution and its effects

Unit 7: Control and reduction of atmospheric pollution.

Unit 8: Alternatives to the use of fossil fuels

Unit 9: Laboratory practice

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	CB02 CB04 E09 E16 G02 G05	0.8	20	N	-	Classes dedicated to practical theoretical foundations related to the subject
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	CB02 CB04 E03 E15 G02 G03 G05 T10	0.8	20	Y	Y	realization of laboratory practices
Group tutoring sessions [ON-SITE]	Problem solving and exercises	CB02 CB04 E09 E16 G03 G05	0.4	10	Y	N	Activity dedicated to solving exercises and problems
Workshops or seminars [ON-SITE]	Group Work	CB02 CB04 E16 G02 G03 G05	0.08	2	Y	N	Activity dedicated to solving exercises and problems
Group tutoring sessions [ON-SITE]	Guided or supervised work	CB02 CB04 E15 E16 G02 G03 G04 T10 T11	0.16	4	Y	N	Sessions dedicated to the presentation and exposition of topics developed by the students
Other off-site activity [OFF-SITE]	Combination of methods	CB02 CB04 E15 E16 G02 G03 G04 T10 T11	2.8	70	N	-	Hours of self-work
Study and Exam Preparation [OFF-SITE]	Self-study	CB02 CB04 E09 E14 E15 E16 G02 G03 G04 T10 T11	0.8	20	N	-	Hours of study
Progress test [ON-SITE]	Assessment tests	CB02 CB04 E09 E14 E15 E16 G02 G03 G04 T10 T11	0.08	2	Y	N	Carrying out progress tests
Final test [ON-SITE]	Assessment tests	CB02 CB04 E09 E14 E15 E16 G02 G03 G04 T10 T11	0.08	2	Y	N	Final test run
Total:			6	150			
Total credits of in-class work: 2.4			Total class time hours: 60				
Total credits of out of class work: 3.6			Total hours of out of class work: 90				

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
Laboratory sessions	10.00%	10.00%	---
Assessment of problem solving and/or case studies	15.00%	0.00%	---
Assessment of active participation	15.00%	0.00%	---
Progress Tests	30.00%	0.00%	---
Final test	30.00%	90.00%	---
Total:	100.00%	100.00%	

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:**

In order to pass this subject, it is essential to have carried out and approved the laboratory practices and to have delivered the corresponding laboratory memory.

Non-continuous evaluation:

it is essential to have carried out and approved the laboratory practices

Specifications for the resit/retake exam:

In the extraordinary call the exam grade will be 90% and the practices 10%

Specifications for the second resit / retake exam:

In the special call the exam grade will be 90% and the practices 10%

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Other off-site activity [AUTÓNOMA][Combination of methods]	70
Study and Exam Preparation [AUTÓNOMA][Self-study]	20
Unit 1 (de 9): Composition and structure of the earth atmosphere	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Group tutoring sessions [PRESENCIAL][Problem solving and exercises]	2
Unit 2 (de 9): Greenhouse effect and climate change	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Group tutoring sessions [PRESENCIAL][Problem solving and exercises]	3
Unit 3 (de 9): Atmospheric photochemistry	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Group tutoring sessions [PRESENCIAL][Problem solving and exercises]	2
Unit 4 (de 9): Tropospheric Chemistry	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Group tutoring sessions [PRESENCIAL][Problem solving and exercises]	2
Group tutoring sessions [PRESENCIAL][Guided or supervised work]	1
Unit 5 (de 9): Chemistry of the upper layers	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Group tutoring sessions [PRESENCIAL][Problem solving and exercises]	1
Workshops or seminars [PRESENCIAL][Group Work]	1
Unit 6 (de 9): Air pollution and its effects	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Workshops or seminars [PRESENCIAL][Group Work]	1
Group tutoring sessions [PRESENCIAL][Guided or supervised work]	1
Progress test [PRESENCIAL][Assessment tests]	2
Unit 7 (de 9): Control and reduction of atmospheric pollution.	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Group tutoring sessions [PRESENCIAL][Guided or supervised work]	2
Unit 8 (de 9): Alternatives to the use of fossil fuels	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Unit 9 (de 9): Laboratory practice	
Activities	Hours
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	20
Final test [PRESENCIAL][Assessment tests]	2
Global activity	
Activities	hours
Group tutoring sessions [PRESENCIAL][Guided or supervised work]	4
Other off-site activity [AUTÓNOMA][Combination of methods]	70
Class Attendance (theory) [PRESENCIAL][Lectures]	20
Study and Exam Preparation [AUTÓNOMA][Self-study]	20
Progress test [PRESENCIAL][Assessment tests]	2
Final test [PRESENCIAL][Assessment tests]	2
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	20
Group tutoring sessions [PRESENCIAL][Problem solving and exercises]	10
Workshops or seminars [PRESENCIAL][Group Work]	2
Total horas: 150	

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Baird, C	Química Ambiental	Reverté			2001	
Calvert y Col.	The Mechanisms of Atmospheric Oxidation of the Oxygenates books.google.es/books?isbn=0199767076	OUP USA		978-0-19-976707-6	2011	
Figueruelo, J. E y Dávila, M.M	Química física del ambiente y de los procesos medioambientales	Reverté			2004	
Finlayson-Pitts And J.N.Pitts	Chemistry of the upper and lower atmosphere : theory, experiments and applications	John Wiley and Sons			1999	
Jacob, Daniel J	Introduction to atmospheric chemistry	Princeton University Press			1999	
John H. Seinfeld, Spyros N. Pandis	Atmospheric chemistry and physics : from air pollution to climate change	Wiley - Interscience			1997	
Orozco, C y col	Contaminación ambiental, una visión desde la química	Thomson Paraninfo S.A			2008	
S. E. Manahan	Introducción a la Química Ambiental	Reverté			2007	
Spiro, T.G. y Stigliani, W.M	Química Medioambiental	Pearson Educación			2004	
Wayne, Richard P.	Chemistry of atmospheres : an introduction to the Chemistry of the atmospheres of earth, the planets, and their satellites	Oxford			2000	