

**1. General information****Course:** FOUNDATIONS OF ANALYTICAL CHEMISTRY**Type:** CORE COURSE**Degree:** 409 - CHEMISTRY**Center:** 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY**Year:** 2**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 57307**ECTS credits:** 6**Academic year:** 2022-23**Group(s):** 20 23**Duration:** First semester**Second language:** English**English Friendly:** Y**Bilingual:** N

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**2. Pre-Requisites**

Knowledge of Chemistry and Statistics

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

It is part of ANALYTICAL CHEMISTRY matter, of 12 ECTS taught, in the first semester of the second year.

This subject is part of the Chemistry Fundamentals module.

**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.
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.
CB05	Have developed the necessary learning abilities to carry on studying autonomously
E05	Know the chemical elements and their compounds, their forms of obtaining, structure, properties and reactivity, as well as the main techniques for their analysis
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
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
G03	Know how to apply the theoretical-practical knowledge acquired in the different professional contexts of Chemistry
T04	Ethical commitment and professional ethics
T05	Organization and planning capacity
T06	Ability to approach decision making
T09	Motivation for quality, job security and awareness of environmental issues, with knowledge of internationally recognized systems for the correct management of these aspects
T11	Ability to obtain bibliographic information, including Internet resources

## 5. Objectives or Learning Outcomes

### Course learning outcomes

#### Description

Train the student for autonomous work and learning, as well as for personal initiative.

Train the student to search for information, its analysis, interpretation and use for analytical purposes

Train the student to be sensitive to the ethical exercise of the profession, becoming aware of the social responsibility of their reports and their impact on decision making

Know the stages that make up the analytical process

Acquire skills for practical laboratory work, being able to experimentally develop analytical processes that include sample planning, treatment and analysis using volumetric and gravimetric techniques.

Know the main systems of collection, conservation and treatment of sample for analytical purposes.

Know the principles of Analytical Chemistry.

Know and know how to apply chemometric tools to characterize metrological principles.

Know the foundation and field of application of the main separation techniques used for sample treatment.

## 6. Units / Contents

### Unit 1: INTRODUCTION TO ANALYTICAL CHEMISTRY

### Unit 2: ANALYTICAL AND METROLOGICAL PROPERTIES

### Unit 3: QUALITATIVE AND QUANTITATIVE ASPECTS OF ANALYTICAL CHEMISTRY

### Unit 4: SAMPLING AND SAMPLE MANAGEMENT

### Unit 5: PREPARATION OF THE SAMPLES

### Unit 6: MEASUREMENT AND TRANSDUCTION OF THE ANALYTICAL SIGNAL

### Unit 7: ACQUISITION AND DATA PROCESSING

### Unit 8: QUALITY MANAGEMENT IN ANALYTICAL LABORATORIES

### ADDITIONAL COMMENTS, REMARKS

The previous units will be complemented with four practical laboratory sessions.

## 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 CB03 CB05 E05 E14 G01 G03	1.12	28	N		Master classes to follow the content of the subject
Workshops or seminars [ON-SITE]	Workshops and Seminars	CB02 CB03 CB05 E14 G03 T04 T05 T06	0.4	10	N		Seminary to intensify and work in class the fundamental milestones of the subject
Group tutoring sessions [ON-SITE]	Group tutoring sessions	CB02 CB03 CB05 E05 E14 G01 G03	0.08	2	N		Group tutoring to solve the doubts of the different topics.
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	CB02 CB03 CB05 E14 E15 G03 T05 T09	0.64	16	Y	Y	Laboratory practices to acquire skills and abilities in those aspects of applied character.
Practicum and practical activities report writing or preparation [OFF-SITE]	Other Methodologies	E14 G03 T04 T05 T06 T11	0.68	17	Y	Y	Preparation of reports.
Progress test [ON-SITE]	Problem solving and exercises	CB02 CB03 CB05 E05 E14 G01 G03 T04 T05	0.08	2	Y	N	Written assessment tests.
Final test [ON-SITE]	Assessment tests	CB02 CB03 CB05 E05 E14 G01 G03 T04 T05	0.08	2	Y	Y	Final evaluation written test
Study and Exam Preparation [OFF-SITE]	Self-study	CB02 CB03 CB05 E14 G03 T04 T05 T06 T11	2.92	73	N		Autonomous work of the student to achieve the competences
<b>Total:</b>			<b>6</b>	<b>150</b>			
<b>Total credits of in-class work: 2.4</b>			<b>Total class time hours: 60</b>				
<b>Total credits of out of class work: 3.6</b>			<b>Total hours of out of class work: 90</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
Laboratory sessions	15.00%	15.00%	Carrying out of practices in the laboratory and delivery of reports related to the knowledge acquired in them
Progress Tests	30.00%	0.00%	Continuous assessment through monitoring the acquisition of theoretical knowledge and resolution of practical cases in the classroom that demonstrate the acquisition of the corresponding skills
Final test	55.00%	85.00%	Written evaluation test that will consist of solving theoretical, theoretical-practical questions and practical cases related to the contents of the subject.

<b>Total:</b>	<b>100.00%</b>	<b>100.00%</b>	
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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:

To pass the course, it is essential to carry out the laboratory practices and obtain through reports delivery at least a grade of 5 out of 10.  
Those students who do not pass the laboratory practices through the delivery of reports must take a specific written test.  
The final grade for the course will be obtained by applying the assessment percentages indicated above in the continuous assessment system.

##### Non-continuous evaluation:

To pass the course, it is essential to carry out the laboratory practices and obtain through reports delivery at least a grade of 5 out of 10.  
Those students who do not pass the laboratory practices through the delivery of reports must take a specific written test.  
The final grade will be obtained by applying the assessment percentages specified above in the non-continuous assessment system.

#### Specifications for the resit/retake exam:

The final mark of this call will be obtained by taking a final exam (85%) and the grade obtained from the laboratory practices (15%) will be taken into account.

#### Specifications for the second resit / retake exam:

Same as in the extraordinary call

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	28
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	10
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	2
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	16
Practicum and practical activities report writing or preparation [AUTÓNOMA][Other Methodologies]	17
Progress test [PRESENCIAL][Problem solving and exercises]	2
Final test [PRESENCIAL][Assessment tests]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	73
General comments about the planning: See details in "Virtual Campus"	
Unit 1 (de 8): INTRODUCTION TO ANALYTICAL CHEMISTRY	
Comment: See details in "Virtual Campus"	
Global activity	
Activities	hours
Progress test [PRESENCIAL][Problem solving and exercises]	2
Final test [PRESENCIAL][Assessment tests]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	73
Class Attendance (theory) [PRESENCIAL][Lectures]	28
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	10
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	2
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	16
Practicum and practical activities report writing or preparation [AUTÓNOMA][Other Methodologies]	17
Total horas: 150	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
R. Cela, R.A. Lorenzo y M.C. Casais	Técnicas de Separación en Química Analítica	Síntesis	Madrid		2002	TEMA 4
R. Compañó y A. Ríos	Garantía de la calidad en los laboratorios analíticos	Sintesis	Madrid		2002	TEMA 7
D.A.Skoog, D.M. West, F.J. Holler, A.R. Crouch	Fundamentals of Analytical Chemistry	Brooks/Cole		978-84-9732-333-8	2014	TEMA 1 al 7
J.C. Miller y J.N. Miller	Statistics for Analytical Chemistry	Ellis Horwood	Chichester	84-205-3514-1	1993	TEMA 2 Y 6
Robert D. Braun	Introduction to Instrumental Analysis	Pharma Med Press	Barcelona	9385433202, 97893854	2016	TEMA 3 Y 5
M. Stoeppler	Sampling and Sample Preparation	Springer	Heidelberg	978-3-642-64486	1997	TEMA 4
M. Valcarcel, M. I. López, M. A. López	Fundamentos de Química Analítica	Universidad de Córdoba;	Córdoba	978-8499272733	2017	
M. Valcárcel	Principios de Química Analítica	Springer-Verlag Ibérica	Barcelona	84-07-00500-1	1999	TEMA 1