



## 1. General information

Course: CHEMICAL ANALYSIS

Type: CORE COURSE

Degree: 383 - UNDERGRADUATE DEGREE PROGRAMME IN FOOD SCIENCE AND TECHNOLOGY

Center: 1 - FACULTY OF SCIENCE AND CHEMICAL TECHNOLOGY

Year: 2

Main language: Spanish

Use of additional languages:

Web site:

Code: 58306

ECTS credits: 6

Academic year: 2022-23

Group(s): 22

Duration: C2

Second language: English

English Friendly: Y

Bilingual: N

Lecturer: AURELIA ALAÑÓN MOLINA - Group(s): 22

Building/Office	Department	Phone number	Email	Office hours
San Alberto Magno/planta baja	Q. ANALÍTICA Y TGIA. ALIMENTOS	926052033	aurelia.alanon@uclm.es	

Lecturer: ANA MARIA CONTENTO SALCEDO - Group(s): 22

Building/Office	Department	Phone number	Email	Office hours
San Alberto Magno/Planta baja	Q. ANALÍTICA Y TGIA. ALIMENTOS	6703	anamaria.contento@uclm.es	

Lecturer: CARMEN GUIBERTEAU CABANILLAS - Group(s): 22

Building/Office	Department	Phone number	Email	Office hours
San Alberto Magno/planta baja	Q. ANALÍTICA Y TGIA. ALIMENTOS	3442	carmen.guiberteau@uclm.es	

## 2. Pre-Requisites

Not established

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

Not established

## 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.
E01	To acquire basic knowledge in chemistry, mathematics, physics to allow the study of the nature of foods, causes of their alteration and fundamentals of their production processes
E03	To know and be able to apply fundamentals of chemistry, as well its applications in analytical chemistry, organic chemistry, physical chemistry and inorganic chemistry in the field of the Food Science and Technology
E05	To know the composition, phyco-chemical properties, nutritional value and sensory properties of foods
E06	To know and be able to handle the techniques and procedures of food analysis
G01	To develop the aptitude to gather and interpret information and data to issue critical judgments that include a reflection on relevant topics of social, scientific or ethical nature.
G04	To develop the necessary skills of learning to undertake later studies with a high degree of autonomy.
G07	To possess ability of organization and planning, initiative, entrepreneurship and aptitude to be employed in teamworks. To possess capacity of resolution of specific problems of the professional area and to develop the critical reasoning and decision making.

## 5. Objectives or Learning Outcomes

## Course learning outcomes

## Description

To teach the student to search for information on data analysis and interpretation for analytical purposes.

To know the main systems for collection, conservation and treatment of samples for analytical purposes.

To know the basic principles of Analytical Chemistry applied to the chemical analysis of food.

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

To acquire skills for practical laboratory work. Acquiring the ability to experimentally develop analytical processes that include planning of sampling, treatment, and analysis.

To know the principles of volumetric, gravimetric and instrumental techniques and the main analytical methods based on these techniques.

To train the student to become sensitized to the ethical exercise of the profession, becoming aware of the social responsibility of their reports and their impact on decision-making.

## 6. Units / Contents

Unit 1: Introduction to chemical analysis.

Unit 2: Principles of volumetric analysis.

Unit 3: Acid-base titration applied to analysis of food.

Unit 4: Complexometric with EDTA titration applied to food analysis.

Unit 5: Redox titration applied to food analysis.

Unit 6: Principles of gravimetric analysis and their application to food analysis

Unit 7: Introduction to instrumental analysis.

Unit 8: Molecular optical techniques

Unit 9: Atomic optical techniques

Unit 10: Potentiometric techniques.

Unit 11: Introduction to separation techniques.

Unit 12: Chromatographic separation techniques.

Unit 13: LABORATORY PRACTICES

Unit 13.1 Determination of acidity in several samples.

Unit 13.2 Determination of calcium in milk using redox titration

Unit 13.3 Determination of nitrites in meat.

Unit 13.4 Potentiometric determination of fluorides in salt.

Unit 13.5 Determination of sodium and potassium in natural waters by atomic emission.

Unit 13.6 Determination of dyes by high-performance liquid chromatography in different food samples

## 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]	Combination of methods		1	25	N		Explanation of the contents of the subject, promoting the participation of the students. (Teaching material available in Moodle)
Workshops or seminars [ON-SITE]	Problem solving and exercises		0.5	12.5	N		Sessions dedicated to: -Explaining and solving problems or practical cases -Working in groups (4 to 6 students) to carry out problems, questions or practical cases. - Presentation and discussion of the work done by the group
Writing of reports or projects [OFF-SITE]	Problem solving and exercises		0.8	20	Y	N	Group or individual work to carry out numerical problems, questions or practical cases assigned by the teacher, which must be submitted throughout the course. In the seminars the results presented will be discussed in a group
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities		0.62	15.5	Y	Y	Experimental work in the laboratory. They will be carried out in a group of two students. Laboratory Manual available in Moodle
Practicum and practical activities report writing or preparation [OFF-SITE]			0.8	20	Y	Y	Making a report of each of the practices carried out in the laboratory
Group tutoring sessions [ON-SITE]	Group tutoring sessions		0.08	2	N		Group tutoring to solve the doubts of the different topics.
Study and Exam Preparation [OFF-SITE]	Self-study		2	50	N		Autonomous work of the student to strengthen the skills they have been acquiring and successfully tackle the assessment tests
Mid-term test [ON-SITE]	Assessment tests		0.08	2	Y	N	Assessment test of topics 1 to 6
Final test [ON-SITE]	Assessment tests		0.12	3	Y	Y	Final assessment written test
<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	25.00%	25.00%	Jointly evaluated: -Experimental part: general attitude in the laboratory, compliance with laboratory rules, the laboratory notebook and the proper performance of the experimental part. - Practice report: Report for each practice done. It will be evaluated taking into account the numerical operations carried out, the results obtained, the answer to the proposed questions,

			as well as the clarity and presentation of the same. It is necessary to obtain a grade of 5 out of 10 to pass the course. Otherwise, a specific test will be carried out in ordinary and / or extraordinary calls to recover this part.
Assessment of problem solving and/or case studies	5.00%	0.00%	Delivery (individual or in group) of numerical problems, questions or practical cases assigned by the teacher. It will be evaluated taking into account the appropriate resolution of the same and the participation in the seminars
Mid-term tests	20.00%	0.00%	Written evaluation test that will consist of solving theoretical, theoretical-practical questions and numerical / analytical problems on topics 1 to 6. If the mark obtained in this test is higher than 7, the evaluated subject is eliminated, both for the ordinary call and for the extraordinary. It is necessary to obtain a minimum grade of 4 to average with the second test. Recoverable in the final test.
Final test	50.00%	75.00%	Written evaluation test that will consist of solving theoretical, theoretical-practical questions and numerical / analytical problems on topics 7 to 12. For those students who have not passed the progress test or want to improve their grade, the test will consist of a final exam of the entire subject, in which case, its evaluation will be 70%
<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:

To pass the course, it is necessary to have obtained a grade of 5 out of 10, in the final test and in laboratory practices (compulsory completion and passing).  
The final grade will be obtained by applying the assessment percentages indicated in the assessment system.

In case the previous requirements are not fulfilled, the grade obtained will be suspended and the numerical grade will be obtained in the final test or in case of passing this but not the laboratory practices, the suspension grade 4.

##### Non-continuous evaluation:

To pass the course, it is necessary to have obtained a grade of 5 out of 10, in the final test and in laboratory practices (compulsory completion and passing).  
The final grade will be obtained by applying the assessment percentages indicated in the assessment system.

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

There will be a final written exam (80%) and the grade obtained from the laboratory practices will be considered, either in the performance of the same or in the test enabled to pass them (20%). It is necessary to obtain a grade higher than 5 out of 10 in the written exam and have passed the laboratory practices with a grade higher than 5.

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

There will be a final written exam (80%) and the grade obtained from the laboratory practices will be considered, either in the performance of the same or in the test enabled to pass them (20%). It is necessary to obtain a grade higher than 5 out of 10 in the written exam and have passed the laboratory practices with a grade higher than 5.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	25
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	12
Writing of reports or projects [AUTÓNOMA][Problem solving and exercises]	20
Practicum and practical activities report writing or preparation [AUTÓNOMA]	20
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	50
Mid-term test [PRESENCIAL][Assessment tests]	2
Final test [PRESENCIAL][Assessment tests]	3
<b>General comments about the planning:</b> See the course schedule and the practical calendar published on the website of the Faculty of Chemical Sciences and Technologies. <a href="http://www.uclm.es/cr/quimicas/indexr.htm">http://www.uclm.es/cr/quimicas/indexr.htm</a>	
<b>Unit 3 (de 13): Acid-base titration applied to analysis of food.</b>	
Group 22:	
<b>Initial date:</b> 26/01/2018	<b>End date:</b>
<b>Unit 4 (de 13): Complexometric with EDTA titration applied to food analysis.</b>	
Group 22:	
<b>Initial date:</b> 26/01/2018	<b>End date:</b>
<b>Unit 5 (de 13): Redox titration applied to food analysis.</b>	
Group 22:	
<b>Initial date:</b> 26/01/2018	<b>End date:</b>
<b>Unit 10 (de 13): Potentiometric techniques.</b>	
Group 22:	
<b>Initial date:</b> 26/01/2018	<b>End date:</b>
<b>Unit 12 (de 13): Chromatographic separation techniques.</b>	
Group 22:	
<b>Initial date:</b> 26/01/2018	<b>End date:</b> 15/05/2018
<b>Unit 13 (de 13): LABORATORY PRACTICES</b>	

Activities	Hours
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	16
Group 22:	
Initial date: 26/01/2018	End date:
Global activity	
Activities	hours
Workshops or seminars [PRESENCIAL][Problem solving and exercises]	12
Writing of reports or projects [AUTÓNOMA][Problem solving and exercises]	20
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	16
Practicum and practical activities report writing or preparation [AUTÓNOMA][	20
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	50
Mid-term test [PRESENCIAL][Assessment tests]	2
Final test [PRESENCIAL][Assessment tests]	3
Class Attendance (theory) [PRESENCIAL][Combination of methods]	25
Total horas: 150	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
D.A. Skoog, D. D.M. West, F.J. Holler y S.R. Crouch	Fundamentos de química analítica	Thomson-Paraninfo		84-9732-333-5	2005	
Harris, Daniel C.	Análisis químico cuantitativo	Reverté		84-291-7224-6	2006	
Hernández Hernández, Lucas	Introducción al análisis instrumental	Ariel		84-344-8043-3	2002	
Silva, Manuel	Equilibrios iónicos y sus aplicaciones analíticas	Síntesis		84-9756-025-6	2004	
Skoog, Douglas A.	Análisis instrumental	McGraw-Hill		84-481-0191-X	1998	
Yañez-Sedeño Orive, Paloma	Problemas resueltos de química analítica	Síntesis		84-9756-071-X	2003	