

## COURSE GUIDE 2023/24

**Faculty** 215 - Faculty of Chemistry

**Cycle** .

**Degree** GQUIMI20 - Bachelor's Degree in Chemistry

**Year** Second year

### COURSE

26127 - Analytical Chemistry I

**Credits, ECTS:** 9

### COURSE DESCRIPTION

As it is the first subject of the Analytical Chemistry area that the student will follow, its main goal is to introduce the analytical process from a global point of view, starting from the sampling design, following with the real sampling and the analysis and ending with the evaluation of the results. A special importance will be given to the sampling and sample treatment, separation methods (non chromatographic ones), and to the application of chemical analytic methods (volumetry and gravimetry). In addition, some lab practices have been included to help understanding the basic operations of this topic.

### COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

M02CM04 - Possess knowledge of the analytical process and the various stages involved and be able to plan, apply and process the most appropriate analytical methods in each specific case.

M02CM08 - Be able to select different simple or combined instrumental techniques for the characterisation of chemical substances.

M02CM09 - Be able to make verbal and written presentations of phenomena and processes related to chemistry and similar subjects in a comprehensible way.

M02CM10 - Be able to search for and select information in the field of chemistry and other sciences through the use of the literature and information technologies.

### CONTENIDOS TEÓRICO-PRÁCTICOS

The analytical process. Chemical analysis and basic operations of the analytic process. Reactants types. Identification and determination. Sensibility. Traceability.

Introduction to statistics. Statistics of repeated measurements. Systematic and random errors. Significant figures. Error propagation. Significance criteria and results withdrawal. Precision, accuracy and detection limit.

Sampling and pretreatment. Statistic basics of sampling. Procedures. Storage and sample protection. General conditions and sample treatment requirements. Analytes recovery. Physical pretreatments.

Analytical methods for separation. Principles of analytic separation. Interference elimination and matrix simplification. Pre-concentration methods.

Liquid-liquid extraction. Organic solvents. Equilibrium distribution and efficacy. Metallic chelants extraction.

Ionic Exchange. Ionic exchangers. Exchange equilibrium: capacity and Exchange constant. Analytic applications of ionic exchange.

Applications of ionic exchange in solution. Introduction to volumetric analysis. Acid-base volumetries. Complex formation volumetries. Redox volumetries. Precipitation volumetries. Gravimetric determinations.

Basic operations in the analytic laboratory. Volumetric analysis. Gravimetric determinations. Extraction and ionic exchange techniques.

### TEACHING METHODS

The cronogram of the unit will be explained at the beginning of the course. The lectures hours and the data of the practical laboratory are available at the Faculty website.

### TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	24	8	15	30	13				
Horas de Actividad No Presencial del Alumno/a	36	26	22	36	15				

**Legend:** M: Lecture-based S: Seminar GA: Applied classroom-based groups  
 GL: Applied laboratory-based groups GO: Applied computer-based groups GCL: Applied clinical-based groups  
 TA: Workshop TI: Industrial workshop GCA: Applied fieldwork groups

### Evaluation methods

- Continuous evaluation
- End-of-course evaluation

### Evaluation tools and percentages of final mark

- Written test, open questions 60%
- Exercises, cases or problem sets 20%
- Oral presentation of assigned tasks, Reading 10%
- Computer based practices and problems solving 10%

#### **ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT**

The ordinary evaluation will be divided in the terms presented in the table above.

#### **EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT**

Same criteria as in the ordinary evaluation.

#### **MANDATORY MATERIALS**

Labcoat. Security goggles. Spatula. pH paper.

#### **BIBLIOGRAFÍA**

##### **Basic bibliography**

- D.C. Harris, Análisis Química Cuantitativo 3ª ed. (6ª ed. Original). Editorial Reverté (Barcelona, 2007).
- D.A. Skoog, D.M. West, F.J. Holler, S.R. Crouch, Fundamentos de Química Analítica, 8ª ed. Thomson (2004).
- M. Silva, J. Barbosa, Equilibrios iónicos y sus aplicaciones analíticas. Editorial Síntesis (Madrid, 2004).

##### **Detailed bibliography**

- J.C. Miller, J.N. Miller, Estadística y Quimiometría para Química Analítica 4º ed.. Ed. Pearson Education (Madrid, 2002).
- S. R. Crouch, F.J. Holler, Applications of Microsoft Excel in Analytical Chemistry. (Thomson, 2004).
- D. Cooper, C. Doran, Classical Methods-Volume 1. Analytical Chemistry by open learning. John Wiley & Sons (1987).
- J. Mendham, D. Dodd, D. Cooper, Classical Methods-Volume 2. Analytical Chemistry by open learning. John Wiley & Sons (1987).

##### **Journals**

Journal of Chemical Education. Ed. American Chemical Society, Washington. <http://jchemed.chem.wisc.edu/>

##### **Web sites of interest**

<http://www.asdlib.org>

#### **OBSERVATIONS**

Final evaluation system can be used by the students that cannot make the continuous modality. It will consist in the three tests that have been presented before, and they will produce 100% of the mark.